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MINING AND SCIENTIFIC PRESS.

Whole No. 2267.—VOLUME LXXXVIII. Number 1. SAN FRANCISCO, CAL., SATURDAY, JANUARY 2, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents

Costs in Mining.

Comparison of costs in operating mines in different districts of the same country is not always satisfactory, and how much less so must a comparison be of regions widely separated, as, for instance, the Rand, in South Africa, Western Australia and the Western United States. The latter furnishes almost every conceivable condition—good, bad and indifferent. The mines of the Rand are not dissimilar as a whole, yet the cost of operation at various mines in that region varies with the width of banket, the greater or less amount of water encountered, and the arrangement and capacity of the surface equipment. In any region a large mine should usually be operated more cheaply than a small one, the cost per ton being the unit of comparison. In America the mines of the Rand have their nearest type represented, structurally, in the Lake Superior copper mines, and yet the costs per ton in the two regions are widely different. The ores on the Rand contain, generally speaking, about $10 per ton; those of the Lake Superior copper mines range from $5 to $10 per ton, fluctuating with the copper content of the ore and with the market price of the metal. At the Calumet & Hecla 6000 tons of ore are treated daily. The largest tonnage of any mine on the Rand does not exceed 1800 tons. The climatic conditions are wholly different, and comparisons cannot be justly made.

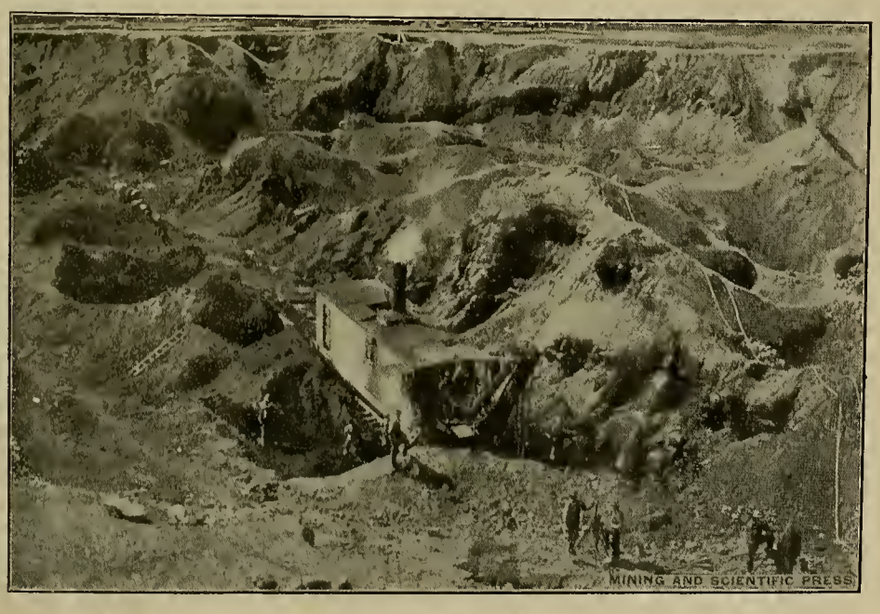
In Western Australia the conditions are essentially similar over a large district—an arid desert without natural fresh water. Wages are high and white labor is employed almost exclusively. Water—furnished by the great system recently completed by the Government—is expensive, and a comparison of costs in that section with those of other regions is not satisfactory, no matter what these figures may indicate. Mines may be operated under favorable conditions in California more cheaply than similar mines under the adverse conditions of the deserts of Arizona or southern Nevada, or the mountain regions of Mexico. The enterprise of the people of Colorado has built railroads to many important districts, and the mines thus favorably located are worked at less expense than those less fortunately situated. These comparisons may be continued to great length, but attention has been called to some of the important mining regions, and it is evident that what is first-class and economical work in one region might be considered as extravagant in another, where the conditions favored the operators and made cheaper methods possible.

Steel Head Frame at Gwin Mine, Calaveras Co., Cal. (See page 5.)

The fairest basis for comparison lies in the methods of different managers of the same property at various times. Some successful managers have made reputation and fortune by being sent to take charge of a property where nothing was being properly done, where all was chaos, where the work accomplished was not nearly commensurate with the number of men on the payroll. The experienced manager is quick to see and change all this. He either promptly cuts down the force to its normal capacity or keeps the force and increases the output without increasing the expense. This is called good management, but there are several degrees of good management as well as of that which is poor, and bad—and occasionally villainous. A man may build up a reputation as a good manager and yet be succeeded by another who will find opportunities to change the methods in vogue for those that are better. Changes in metallurgical processes, due to constantly increasing knowledge, also make it possible to cut down working costs. In short, when studying the cost sheet of some important mine situated at a distance, in order to appreciate the relative merit of the expense of working as compared with some other mine in another part of the world, it is necessary to know much of the conditions under which each operates. Mining costs are influenced to a great extent by the size of the deposit, character of the ore, and of the wall rocks. These conditions determine the methods of mining and timbering. The water problem must be understood, the rate of wages and efficiency of labor is important, and the cost of hoisting varies with the capacity of hoists, distance hoisted, cost of power, etc. Reduction of the ore is equally variable. A free-milling ore should generally be cheaply treated, even in a small mill, while a refractory ore is expensive to reduce in a mill of any sort. Smelting, like milling, is variable as to cost, depending on situation, transportation, character of ore and capacity of plant; finally, the management—it may be as good as can be obtained or it may be bad, with several shades of variation between the extremes. Thus it may be seen how difficult is a just comparison of the costs of mining and treatment of ores in the various mining regions of the world, without an absolute knowledge of the conditions obtaining at the places under consideration.

One of the most important factors in the cost of mining is the efficiency of labor employed. It is not apparent that because a man works for a relatively small wage that he is a cheaper man than he who demands and receives a higher sum for his services. A man may receive $4 per day and accomplish double what two other men may be able to do who are each paid $2 per day. In such an instance it would be wrong to call the $2 man the cheaper, when in fact he is the more expensive. It is true that in some instances it is entirely a question of taking whom you may get in order to secure laborers sufficient to operate at all. This has practically been the case in the mines of the Rand for some time past, with little prospect of immediate relief in that direction.

The Kaffir laborer has proved efficient—when efficiency is compared with the wages paid him, but the great difficulty in getting a sufficient number of the natives has caused the managers to seek elsewhere for men, and China is now looked to as a probable source of supply. Chinese labor will be cheap, but the mining methods of the Rand are totally different from those in vogue in China, and these Asiatics must necessarily be educated to the work, besides which, many of them in all probability will never have seen a mine before. The influence on cost of this new situation in the management of the gold mines of the Rand will be a study in the economics of the industry, but at the same time it is apparent how unfair a comparison of costs would be, when considered as indicating the character of the management, which is placed in an unfortunate position.



Steam Shovel in Open Cut of Minnesota Iron Mine, Also Showing Mill Holes. (See page 4).

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, JANUARY 2, 1904.

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Assessment Work in Alaska.

A petition from Alaska memorializing Congress for the purpose of securing legislative enactment suspending the necessity for annual assessment work has been presented to several Senators at Washington. The reasou given for such a step is stated to be the great cost of living, difficulties of transportation and the short season in Alaska, in consideration of which the memorial asks that annual work be suspended until the country is settled up. Such a request from almost any other mining section of the United States would have caused less surprise than one coming from Alaska, where the richness of the mines and the comparative ease with which the gold is obtained, judging by the output of the past few years, has led the mining world to think that Alaska was not the least favored of the mining regions of America. Such a law as that asked for would do more to retard the development of that wonderful north land than the most rigorous of winters, and would permit the wholesale taking and holding of mining claims without representation for an indefinite period. The argument employed, that as the United States derives no revenue from the performance of the required assessment work, the petition should be granted, is weak, and, in fact, no argument at all. Alaska's mineral resources would uot be promoted by the passage of such a bill as contemplated. Moreover, in consideration of the large amount of gold annually coming from the mines of Alaska, it is evident that the short season, expense of living, etc., form no substantial obstacle to the development and operation of the mines of that Territory.

A GREAT deal is being said and written about mine gases aud their composition. All mines are subject to the accumulation of gases of one kind or another, but the simplest way to deal with the problem is to afford complete ventilation with abundance of fresh air from the surface.

Legitimate Speculation.

The uncertainty in mining is always a pronounced feature in the exploration of a vein when no ore is in sight, and the search for it is being prosecuted on general principles, as it were, in the belief that existing geological conditions warrant such exploration. When day after day and month after month passes and the search continues without reward, those who are paying for this experiment in time begin to feel discouraged, and they eventually will quit, and often, as is subsequently proven, just on the verge of success. The Gladstone mine of Shasta county, California, is one of the most recent examples of this experience. Some years ago an Eastern company operated the mine but failed to find anything of payable value, which fact, coupled with legal troubles, led to the closing of the mine. The original owners did several thousand feet of exploratory work, but without success. After several years of idleness a new company took the property, cleaned out the old workings, drove the main drift about 130 feet ahead and struck a fine body of ore. This instance was not altogether fortuitous, for the geological conditions indicated the probability of the proximity of an ore deposit, but the former owners discontinued work too soon. To hopelessly drift and crosscut through a barren country rock where there is no known ore in the vicinity, and no indication of ore, would be the height of folly, but to thoroughly explore a mineral vein in a mineral country in the belief or hope of finding payable ore is legitimate, and such course is often rewarded with success. It was this spirit that developed the "Big Bonanza" in the Con. Virginia and California mines on the Comstock in the early '70's. It remained an undeveloped block of ground between two mines of proven value. The operators assumed a great risk in undertaking the development of this block of ground, but their faith in conditions which to them seemed proper for the production of a mine was rewarded with success. There are many places in the mining regions of the world where such systematic exploration is justifiable, but the great risk which is a natural accompaniment of such undertakings deters the cautious investor from engaging in an enterprise the outcome of which is so uncertain, but there are frequent examples of satisfactory results from just such ventures. Colorado is full of them, and so is any country or district where the leasing system is followed to any extent. Leasers usually have to take a mine with nothing in sight, and explore for new bodies of ore.

The Development of Africa.

The eyes of the civilized world are directed toward Africa, and much that is good is expected to come out of the central portion of the "Dark Continent." The borders have been explored and are fairly well known, particularly along the Mediterranean and in the south portion of the continent. The phenomenal output of the gold mines of the Rand and of the diamond mines about Kimberly has done more to attract the attention of capital to Africa than anything else. The climatic conditions are such that Americans and Europeans can live in that country in comfort; but the vast wilderness of Central Africa drained by the Congo and its tributaries and by the Nile is most unhealthy, and exploration and development of that region must necessarily be slow. Still it is progressing. The early explorers—Livingstone, Stanley, Speke, Grant, Parke and others—sent out occasional fragmentary reports of the occurrence of mineral in that wilderness; but it is only within the past ten years that more than passing attention has been given it. It is known that large bodies of iron ore exist in numerous places, and Katanga, in the southeast portion of the Congo Free State, which for years has been reported to be a copper country, is now known to be rich in that metal. English capital is exploring the deposits of Katanga and developing some of them. Immediately south of that section is the British colony of Rhodesia, in which are known gold and copper mines. It is even said to be the original "land of Ophir" mentioned in the Bible, and the finding of ancient workings of mines and metallurgical establishments lends color to the idea. About the old native village of Tete, on the Zambezi, there are gold deposits aud gold-bearing veins, and Livingstone wrote over thirty years ago that the hills about Tete everywhere showed evidence of extensive alluvial washings for gold, which could still be obtained in the gravels. Along the west coast gold mines are being developed under extreme difficulties, owing to severe climatic conditions, but the history of mining in the past has shown that white men will penetrate any country and face any hardship for gold. What Africa requires to promote its development is railways, and the signs indicate that within the next decade Africa will have an important system of railroads, and its natural resources will be brought to light.

Efforts to Control Zinc Output.

The zinc miners of the Missouri district in their endeavor to regulate and sustain the price of spelter have curtailed the working days of the miners, and as a result it is stated that more than 1000 miners have left that district seeking a field where steady employment may be secured. It appears to be a question of expediency whether the mines be worked single shifts, with smaller number of men, or to suspend operations entirely at stated times for a period, the object being to curtail output, in order to raise and keep up the price. It is suggested by some of the operators that the curtailment of output begin in September of each year and be continued for several months.

Any scheme to lessen the output would accomplish the desired result were Missouri the only zinc-producing region in America, but within the past year a notable change has taken place in this industry. Mines which had been idle for years have been reopened, and owing to better mining methods and improved means of transportation these mines can now operate profitably. In addition to this, the advent of the electro-magnetic separator has brought the precious metal mining districts into the zinc market as a prominent factor in production. Of these, Colorado, Idaho and British Columbia are the principal producers. In former years the zinc ores of these districts were in some instances rich enough to be shipped direct to zinc smelters, and were a source of profit. All ores too low grade to ship as straight zinc ores were either sent with iron and lead to the lead smelter, where they were charged an arbitrary penalty per unit (variable at the different works) for all zinc over a given amount, or this class of ores was thrown on the dump or left standing in the mine, as too low to pay. The electro-magnetic separator has changed all this, and now the zinc in those ores, once a drawback to their treatment, has become a profitable by-product, while the iron and lead from which the zinc has been separated are in demand at the smelters.

Not only is this the case, but the known extent of the zinc field in the Missouri-Arkansas region is being almost daily extended by new discoveries. The newspapers weekly chronicle new finds of zinc ore on farms outside the recognized limits of the field, and new zinc mines are being opened up in unthought of places. All of this shows that the production of zinc is on the increase and the matter of its control by the operators who are so widely separated becomes daily more difficult of accomplishment.

THERE is much difference of opinion on the Rand, South Africa, whether it is profitable to concentrate pulp from the stamp mills before cyanidation or not. There is a tendency to direct cyanidation of sulphurets, and in some instances in the United States it is successful. Direct cyanidation of sulphurets has also been successfully accomplished in Korea. This method is said to be more satisfactory in the treatment of low-grade sulphides than those which are rich, presumably because, while the percentage of extraction may be about the same in either case, the loss in the instance of high-grade ore would practically prohibit its employment. Fine grinding has demonstrated that a high percentage of value may be extracted from rich sulphides, and also from that caught on canvas tables. It then becomes a question whether the higher extraction obtainable by fine grinding admits of a profit over the cost of reducing sulphides to a fine state. In most instances it is probable that the increased extraction would more than pay the expense of grinding if proper mills were employed for the purpose.

CONCENTRATES.

THE approximate pressure on a board 1 foot square, held perpendicularly in a stream flowing 3 miles per hour, would be 0.129 pound.

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IT requires about 50% more water to start a hydraulic elevator than is required to keep it running after it is started. Lack of knowledge of this fact is responsible for occasional failures of hydraulic gravel lifts.

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THE rock specimens from Bridgeport, Cal., are obsidian and vitrophyre, two varieties of volcanic glass. They are of no commercial value. The former is often shaped into arrow and spear heads and other implements by the Indians.

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WHERE assessment work has been done on an unpatented claim this work will stand whether the same was paid for or not, this being a private matter between the claim owner and the person doing the work, who has recourse in law if he fails to get his pay.

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THE cause of the leakage of the blow-off valve in the steam boiler is probably due to scale or mud getting in between the valve and its seat and grooving one or both parts. An immediate test for leakage there is necessary, the pipe to be disconnected and the valve plugged.

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THE "cut-rate" broker and the knocking blackmailer are closely allied, and small partitions do the bounds divide, in the case of offering treasury stock for sale at a less price than that announced by the company or its authorized agents, where the company is thus trying to get money enough to do necessary development work.

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ORES containing gold, which are to be roasted for chlorination treatment, are usually roasted without addition of salt in the furnace, owing to the heavy loss of gold by volatilization when salt is added. The ore is given a thorough roast, and the chlorine treatment is introduced later in a vat or barrel, according to the process employed.

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ALMOST entirely California oil has an asphaltum base, though there are localities that report oil with paraffine base. It is possible to refine oil having 40% asphaltum. The asphaltum in the California oil is a product peculiar to that State, and is not viewed as a defect or disadvantage. Asphaltum is of great industrial value and will find extended use.

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THEORETICALLY—and, in fact, usually—in case of a shaft connected with a tunnel, the shaft is an upcast, but there are exceptions. Some instances are known where during the winter months a shaft so situated is an upcast, and during summer it is a downcast. Other cases have been noted where a shaft was downcast during the day and upcast at night.

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GABBRO is not generally recognized as a gold-bearing rock, though sometimes forming the wall of a vein, in which case gold might possibly be found in the gabbro as the result of infiltration from the vein. Schists which have been altered from diabase or diorite not infrequently carry gold when associated with gold-bearing veins, and sometimes from zones of ore of value.

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SCHEELITE is a calcium tungstate. It is a heavy mineral, gravity 5.9–6.1; hardness, 4.5 to 5. In luster it is vitrious; color, white, pale yellow, brownish, greenish, reddish; streak white; from transparent to translucent; tungsten trioxide, 80.6; lime, 19.4. Molybdenum is usually present. Tungstic acid occurs in combination with numerous minerals, viz., iron, lead, copper, etc.

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THE obligation to perform the annual assessment work on a mining location ceases upon the final entry at the land office. That is when the money is paid and receipt is issued therefor, for the land then ceases to be a part of the public domain, and becomes the absolute property of the one applying for patent. Mill sites are not subject to the annual assessment law, as a mill site is presumed to be non-mineral.

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THE beach sands on the north coast of New South Wales, Australia, near Newcastle, are said to contain gold, 18 ounces per ton; platinum, 244 ounces per ton; osmiridium, 30 ounces per ton; cassiterite (tin oxide), 65%; monazite, 5%. The sands had been carefully concentrated before the analysis was made. The sands are concentrated in sluice boxes. The valuable minerals are described as being in a very fine state of division.

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LEAKS in concrete can be stopped with linseed oil. Where large cracks occur they may be filled with cement grout and the linseed oil then poured in as long as it is absorbed. There is formed in the crack a gum from the oil, which ultimately fills it to the top, after which the entire surface may be coated with successive applications of the oil until it ceases to be absorbed. Where there is a large fissure it were well to first fill it with asphalt.

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THE International Nickel Co.'s nickel mining property is, mostly, at Copper Cliff, near Sudbury, Ontario, Canada. It is an open quarry proposition at the mine, the pyrrhotite and chalcopyrite averaging 2% copper and 7% nickel. The ore after roasting requires about one-sixth of its weight of coke for smelting. The matte, after smelting, consists of about 17½% copper, 17½% nickel, 25% to 50% iron and about 25% sulphur. The low-grade matte is re-treated at the Canadian works, but for the final separation of the copper and nickel it is sent to the New Jersey Refining Works, where pure nickel is produced.

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THERE is a difference between abandonment of a mining location and forfeiture. Abandonment is intentional neglect to comply with the requirements of the law regarding annual assessment work, and is considered as evidence that the locator no longer thinks the location of sufficient value to warrant assessment work. He may believe the location valuable, but neglect to comply with the law. This makes the claim liable to forfeiture.

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RUBY SILVER is of two kinds, arsenical and antimonial. Pyrargyrite (dark red silver ore) contains sulphur 17.8; antimony, 22.3, and silver, 59.9; luster, adamantine; color, black to grayish black, and, by transmitted light, deep crimson; streak, purplish red; transparent in very thin splinters. Pronstite is light red silver ore; sulphur, 19.4; arsenic, 15.2; silver, 65.4; luster, adamantine; color, scarlet-vermilion; streak same as color; transparent to translucent. These ores occur with the other ores of silver in the sulphide zone.

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PROSPECTORS are sometimes misled in searching for the source of placer gold, when on finding a vein near at hand, apparently the source of the gold found in the placer, they find the quartz contains no gold. Sometimes the gold is in the wall rock and not in the vein at all. This is particularly the case with some pocket veins where the gold is found in the walls in connection with seams which intersect the main vein. There are numerous examples of this in Calaveras, Tuolumne and Mariposa counties, Cal., as well as elsewhere.

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IN the case of co-owners of a mining claim the assessment work must be fully accomplished. A partial performance of $100 worth by one of the co-owners will not save the claim, and for this reason one co-owner to save his own interest may be required to do more than his share, but the law provides a remedy for such cases if the co-owner who fails to do his share of the work also refuses to pay his share of the expense, but the burden of proof rests with the co-owner endeavoring to dispossess his co-owner on the grounds of forfeiture for failure to do or pay for his share of the assessment work.

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THE best way to treat a "low plate in a shaft," by which it is assumed a low timber is meant, is to remove the low plate and substitute another placed in the proper position. A low timber in an inclined shaft is a great menace to the lives of men required to pass it in going up and down the shaft on skips and buckets. In the case of enlarging an incline shaft from a smaller to a larger compartment, where the shaft is made higher, great danger may be avoided by making the change gradually, extending it over three or four sets, and planking that portion to avoid the likelihood of a man being injured while passing that part of the shaft.

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CHALCOCITE (copper glance) is a high-grade copper sulphide, containing when pure 79.8 copper. It is supposed to be of secondary origin, being the result of redeposition of copper leached from lower grade ores at a higher level by escending surface waters. The phenomena is not fully understood. This ore constitutes a large part of the high-grade ore of the Butte district, Montana. Chalcostibite is also a result of secondary enrichment, and consists largely of copper, sulphur and antimony, with some iron. In the Butte district this ore occurs sparingly, and carries as high as 1500 ounces silver per ton. It is known as copper-antimony glance. It also occurs in copper mines of Spain and at Wolfsberg, in Germany.

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REPLYING to a query from Custer City, Idaho: The only court decision having an apparent bearing on the case as stated is that of the case of Elder vs. Horseshoe M. Co., S. D., 87 N. W., 586, in which the Supreme Court of South Dakota said as follows: "We feel justified in the conclusion that Congress, in adopting the provisions in regard to the disposition to be made of a defaulting co-owner's interest in the claim, acted upon the same theory, and the published notice was intended to accomplish the same result as the published notice for application for patent; that is, to cut off the claims of all persons, and vest in the co-owner a clear title to his co-owner's interest, without regard to minors, lien holders, or incumbrances."

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"GRUB STAKE" contracts are not within the statute of frauds and do not require written contracts. They come within or partake of the nature of "qualified partnerships." These contracts are usually in the nature of a mutual understanding wherein one party furnishes the provisions, tools, etc., for a prospecting venture for a half or other stipulated interest in anything that may be found by the other. The outfitter must perform his part of the contract as a condition precedent to sharing in any discoveries. Should the prospector discover anything of value a community of interest is at once established, and the outfitter cannot be deprived of his interest. If the contract contemplates the development and operation of any mine that may be discovered then the contract becomes a partnership. In the absence of this detail of the contract neither partner to a "grub stake" arrangement can be compelled to join the other in development and equipment of the property. They are simply tenants in common, neither party having a right to bind the interest of the other.

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REPLYING to a question from "Hydraulic Engineer:" The situation as stated seems unfortunate, as the quantity of water apparently available is but 1050 gallons per minute, equal to about 88 miner's inches. A hydraulic elevator has been shown by experience to work well on nothing less than a 7-inch throat, and this requires 70 miner's inches, leaving only 18 inches to sluice with. If a reservoir could be created in the gravel deposit, a dredger might be more satisfactorily employed to handle the gravel, the pump as in diagram A being only required to lift the water to the reservoir. Either of the plants as described in the diagrams would be of too limited capacity to make hydraulicking profitable owing to low efficiency of water employed.

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A RUBBER HOSE, made for steam use, can be attached to a mine pump, and makes it possible to lower or raise the pump without disconnecting, if a slip joint be used on the column pipe, and the exhaust be carried into the sump. The hose, however, will vulcanize with the heat and become brittle. Another drawback to its use is due to the leaking of the joint at the couplings. If the steam be kept in the pipe constantly these joints will remain tight, but if allowed to cool the joints will leak, and it is almost impossible to make them tight again owing to the vulcanizing of the rubber. A slip joint on the steam pipe is advised, as it obviates all of the difficulties above enumerated as incident to the use of steam hose. The column pipe should be connected with flange joints, as it makes their removal much easier of accomplishment, and also affords a good means of supporting the pipe by means of yokes.

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THE dry placers of Western Australia greatly resemble some of those found in the arid regions of the southwestern United States. In both of these regions the gold has been derived from outcropping veins, which together with the enclosing rocks were disintegrated into particles ranging from coarse sand to dust. The wind blows the lighter portions away, leaving only the coarse material on the surface, and in this debris, the result of the surface decay and degradation of the rocks, the gold is found. Often the pieces weigh several ounces. In a few districts thousands of dollars have been picked up from the surface of the ground, as on Rich hill, near Wickenburg, Arizona, and at Pipendero in the Cargo Muchacho mountains of California. In some localities a conglomerate forms of this surface debris, in which the cementing material is carbonate of lime, and this is also often gold-bearing. The gold is recovered from the sands by various kinds of dry-washing devices, the most primitive of which is a pan or batea, or a blanket in which the sand is placed, and tossed into the air during a strong wind. The result is the fine material is blown away, only the coarser and heavier particles being left, and with them the gold, which is picked out by hand. The dry washing machines work automatically, the operators supplying the power and feeding the machine with alluvial. These machines are of numerous types, but all operate on the same principle—the sorting power of a gust of air, which is created intermittently while the machine is shaken from side to side to keep the sand in motion. The amount of material two men can handle daily depends upon the character of the alluvial and kind and size of the machine and also on the vigor of the operations.

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THE several rock specimens from Chelan, Wash., are country rock—that is, are not vein rocks or ores, but the kind of rocks which go to make up the general formation of a mountainous country, and are all either metamorphic—that is, rocks which have been changed from their original condition to their present crystalline form—or they are intrusive dike rocks. They may be described as follows: No. 1, a dike rock with small veinlets of quartz; No. 2, actinolite, a calcium-magnesium-amphibole; No. 3, feldspar, quartz and mica, and is apparently from a pegmatite dike or vein, (pegmatite is a coarse-grained granite); No. 4, sericite schist, with small garnets (evidently altered granite); No. 5 is mica schist (metamorphic); No. 6 is much altered, but is apparently mica-andesite, an eruptive rock; No. 7 is black amphibole (bornblende), a constituent of many metamorphic and eruptive rocks; No. 8 is much decayed, but consists chiefly of mica and kaolinized feldspar stained with iron oxide, possibly altered, decaying granite; No. 9 is a variety of silica called opal and may be a silicified wood, many specimens of which it resembles; No. 10 is orthoclase (potash feldspar), a constituent of granite; No. 11 is talc schist, evidently the alteration of a greenstone of some sort; No. 12 is very much altered; the feldspar is kaolinized, but was apparently orthoclase; the green mineral in it is chlorite, probably altered from hornblende; this would indicate that the rock was originally syonite; No. 13 is an altered granitic rock, possibly aplite; it is much decayed. None of these rocks are recognized carriers of mineral, though No. 11, if accompanying a mineral vein, might carry gold, as wall rocks of that sort sometimes do. No. 13 may also possibly be gold bearing, particularly if it becomes more siliceous. Neither 10, 11 or 12 are suitable to make bricks. No. 13 might be utilized for building stone, if the walls were not built too high, as the stone is not very firm in its present condition, judging by the specimen sent.

Development and Operation of a Mine.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

NUMBER II.

The benching methods employed at the Mount Lyell copper mine in Tasmania were described in the first paper of this series. At that mine an amount of overburden, estimated at 3,000,000 tons, has been or is being removed and dumped on either side of the great open cut. The cost of the removal of this waste rock is placed at about 50 cents per ton. In the future it will, no doubt, become necessary to work the large ore deposit at this mine by underground stopes, as has been the case eventually at almost every large mine at some time in its history, and when this time arrives at the Mount Lyell mine these great dumps of waste can be utilized for filling the stopes, but undoubtedly it would be a better, and more economical plan, to have underground stopes under way in order that a large portion of this overburden might be used as it is broken, and thus avoid the expense of rehandling, beside greatly reducing the first cost of its removal to the sides of the cut. This indicates the necessity of foresight, and emphasizes the fact that a large and profitable mine is not always conducted on the most economical basis. In reduction methods the Mount Lyell excels, but their mining methods are evidently the result of existing fortunate conditions. As there is a very large tonnage immediately available, it is seemingly not deemed necessary to anticipate the future to so great an extent as here suggested.

At the Mount Morgan mine, in Queensland, Australia, at one time large underground stopes were made (above drainage level) which were timbered by the square-set method, and these stopes were filled with waste. Subsequently the system of ore extraction was changed and great surface cuts were opened, which now expose the sets constructed in the underground stopes. The large open cut of the Mount Morgan mine, illustrated on page 420, explain the existing condition better than a description could do. Much of the timber is recovered as the work progresses, and the filling is drawn off to be reused elsewhere. The Mount Morgan ore deposit occurred at the surface as a round, isolated hill, or butte, and enjoyed unusual advantages for cheap mining, as far as breaking rock went, but being situated in a semi-desert made other expenses high, still the mine was worked at great profit in the early years of its history, and it is still a large producer, though the grade of its ores is lower than formerly. The underground workings now extend far below the level of the cut shown in the engraving above referred to.

For the lowest possible cost of extraction of its ores a mine must have a situation favorable to it. A mine located on a hill has an advantage over one that lies in a valley but little above the natural drainage level of the vicinity.

The accompanying sketches illustrate what may be termed an almost ideal condition with reference to economical working, and is only surpassed in this respect by a vein which may be worked to great depth by means of tunnels, making shafts unnecessary. Such a mine can be naturally drained and the ore throughout, to the drainage level, can be handled by gravity. In the case illustrated a less fortunate situation is conceived, and represents a medium condition, and one not uncommon in montainous mining regions. The object of the sketches is to show the va-

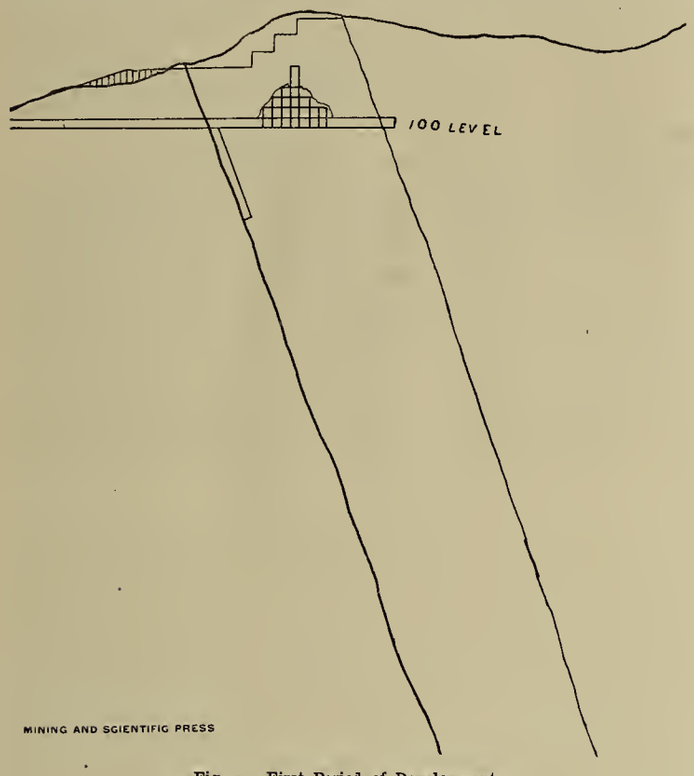


Fig. 1.—First Period of Development.

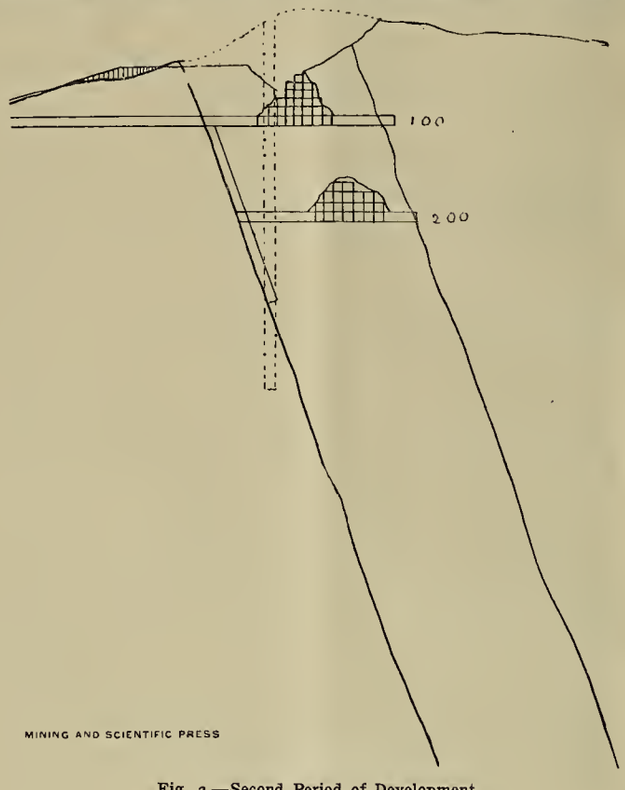


Fig. 2.—Second Period of Development.

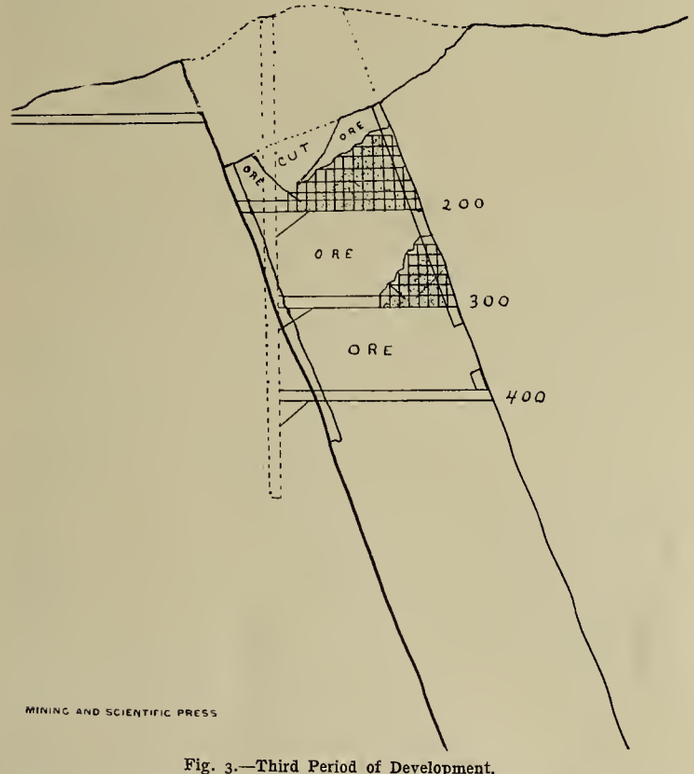


Fig. 3.—Third Period of Development.

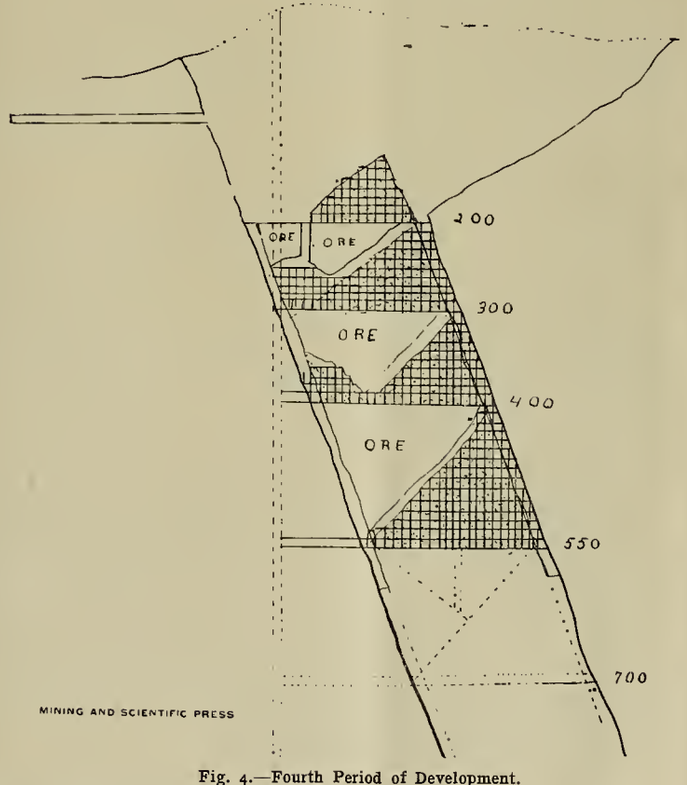


Fig. 4.—Fourth Period of Development.

rious methods of mining adopted from time to time, though it is not claimed that those of the early period, as illustrated, are worthy of emulation, but rather the reverse, under the circumstances which admit of a more economical method.

In the first period, the vein, which is represented as about 150 feet wide, was attacked by a series of terraces, similar to those at Mount Lyell, the ore being shoveled and thrown into chutes which delivered it at the lowest terrace to bins whence it was drawn off into cars and trammed to the incline, down which it was sent to the mill, supposed to be situated at the foot of the hill. During this period it was deemed wise to run a tunnel across the formatiou to the vein, and a stope was started in the heart of the ore body, the ground being supported by the square-set method of timbering. No filling was used during this early period, but a raise was driven upward in advance of the stoping operations. This raise eventually reached the floor of the terraced open cut, and mining by the "mill hole" system was commenced. Where it is possible to introduce this method of mining it should be done, as it is uudoubtedly the cheapest way of breaking and handling ore. In large veius a series of shots may be put in and fired simultaneously, and at times as much as 1000 tons at a blast can be broken down. The mill hole should be covered with a grizzly made of heavy logs to prevent jamming of the chute constructed in the chamber below, all large rocks being broken up before they are allowed to go to the bin. This can be done by hand on medium-sized rocks, but in the case of large masses powder must be used, either as surface shots, or by drilling holes a few inches deep in the mass aud charging these with powder. If the rock is hard it is better to use plenty of powder, and in "springing" the deep holes the ground should be shattered as much as possible before charging black powder or "low-nitro" iu order to cause the rock to break up as fine as possible.

The second period of development is shown in Fig. 2. A shaft has been started and sunk to a depth of about 400 feet. This shaft is presumed to be located along the strike of the vein, but uot necessarily directly withiu it. It is connected with the several levels by means of drifts, and, where necessary, by crosscuts also. A second level has been opened, and a winze, started on the foot wall of the vein at the adit level, has been continued below to the 200 level. A stope has also been started on this level, which is timbered by square sets, but no filling has, as yet, been introduced.

During the second period it will be noticed that in removing the ore by the mill-hole system a considerable block of hanging ground has been taken out, either from uecessity or intentionally. This was sent down through the mill hole and trammed out through the tunnel and dumped. Operating in this manner, it is found that the method is susceptible of improvement, and a third period in the mine's history has been reached. The great mass of overburden has become a source of expense, and of danger, as well, if the open cut method is to be followed. Fig. 3 shows the condition as it is found in the third period. The stope on the 200 level has been carried back to the hanging wall, and a raise made along the wall to the surface, aud the overburden is now beiug iutentionally broken, the debris being sent down the winze to fill the stope below. The winze on the foot wall has been continued downward, the main shaft sunk below the 400 level, and that level started by running a crosscut from the shaft to and across the vein to the hanging wall, where a raise has been begun to meet a winze being sunk below the 300 level. A raise has been put up in the back of the 200 stope, and a quantity of ore is still being broken in the opeu cut, which passes downward through the mill hole to be loaded into cars and trammed to the shaft. A stope has also been opened on the 300 level, into which filliug from the hanging wall surface is introduced, an apron controlling the direction of this rock on the 200 level. It will be observed that the stope ou the 300 level has been started adjacent to the hanging wall to take advantage of the opportunity to distribute the waste in the stope by gravity. This waste will run from the hanging wall mill hole, forming a conic section, lying on the floor of the stope aud extending upward along the hanging wall. It will have a uniform slope into the stope of about 35°, and can bc extended upward to the level above. It may then be necessary to shovel some of the waste. In this condition of the operation of the mine, we conceive that the fourth period of the development has been reached.

In Fig. 4 the conditions are found materially changed for the better. The main shaft has been deepened to about 800 feet; the 400 level is well opened up, and on that level, as well as the 300 level, separate stopes have been opened near the foot wall. From the 300 level a raise has beeu put through to the 200 level, and the filling originally in the stope on that level has been partially used in filling the stope immediately below it, and a good amount of timber, and wood for fuel, is being recovered from these old workings. This point has been previously referred to in connection with the opcration of the Mount Morgan mine. On the 400 level a stope has also been opened near the foot wall of the vein, and filliug from the surface can be sent into that stope diagonally and dowuwardly across from the 200 level to the 300 level. When this work is completed, a raise from the apex of the inverted wedge of ore remaining above the 400 level will make it possible to fill that excavation also from the 300 level.

In opening the 550 level it has been determined to increase the distance between levels, in order to reduce expeuse of preliminary work, and to make it possible to fill the stope on that level to the full extent possible by gravity. The waste from the hanging wall will now extend from the point where the 400 level joins the hanging wall to where the 550 level joins the foot wall. The block of ore lying along the foot wall above the 550 level may be removed and filled iu the same manner as was done on the 400 level.

The dotted lines below the 550 level show proposed development below that level. The winzes are continued along both walls, and the triangular space next the hanging wall indicates what portion may be filled from the hanging side. That adjacent to the foot wall shows what may be filled from the foot wall side, the waste being directed into that winze from 550 level, either coming directly from the surface, or from filliug already in place above the 550 level. A vertical raise is also showu in the center of the 700 stope to reach the fill above the 550 level.

Iu this way the development of the mine will progress. It is evident that the later methods are those calculated to reduce the cost of mining to the lowest figure. The details of mining have thus far been omitted, it beiug the intention to first merely outline the general plan of development.

(TO BE CONTINUED.)

Steel Head Frame at the Gwin Mine.

At the Gwin mine, near Valley Spring, in Calaveras county, Cal., a new steel head frame has been completed at a total cost of a little over $13,300. The Gwin mine is situated in a deep canyon, and the ground about the collar of the shaft has been filled to a depth of not less than 26 feet, and in some places it exceeds 30 feet. This rendered the cost higher than it would have been had no concrete foundations been necessary. The shaft is vertical and has reached a depth of nearly 2000 feet. A crosscut from the 1900 level has recently reached the vein, which was passed through by the shaft at about the 1200 level.

The frame proper sets on heavy concrete foundations, and is 100 feet in height from the sills to the center of the sheaves. It contains thirty tons of steel, and is of the "A" type. The general appearance of the frame and its position relative to the hoist is shown in the engraving on the front page. The shaft was sunk, and the mine has been operated, up to the time of the completion of the steel frame, by means of a hoist situated on the opposite side of the shaft. The original head frame was of timber.

This disposition of the two hoists made it possible to operate the mine uninterruptedly during the construction of the steel frame. In addition to the sinking of caisson-like piers, the site of the steel frame was underlaid by two water-wheel pits and a drain tunnel, neither of which were disturbed during the work, but which added to the expense of construction. Following is an itemized statement of the cost of this frame completed:

Labor on foundation, cement and two large iron cylinders for piers	$705 19
Contract for frame	4,000 00
Hauling from railroad	231 21
Extra hand rail	135 00
Incidentals	14 62
Two 10-foot sheaves and shafting	475 00
Total	$5,561 02

ORE BINS AND HOUSE.

Labor on foundations	$567 86
Cement	323 70
Lumber	1,523 80
Windows and frames	40 00
Corrugated iron sheathing	442 20
Labor on frame	1,914 65
Hardware, etc	100 41
New grizzly	254 68
New breaker	775 00
Old breaker	400 00
Shafting, etc., for same	218 00
Two 6-foot Pelton wheels	1,090 00
Hauling and freight	23 63
Total	$7,773 88
Cost frame	5,561 02
Total cost	$13,334 90

The rock skips have a capacity of four tons, and with skip aud cable weigh, when at the 1900-foot level, about 30,000 pounds. The water tank holds 1200 gallons. A round trip is made from the 1750 level with the rock skips in three minutes, including loading and dumping. This makes it possible with two skips running to hoist forty loads per hour, or 160 tons per hour. The hoisting reels are 10 feet in diameter, cylindrical in shape, and are operated by cut gears, 12 feet in diameter, the pinions being 36 inches in diameter.

Two high-lift ceutrifugal pumps, operated by three-phase induction motors, have been installed by the De Beers M. Co. of South Africa, says the Mechanical Engineer of London. One of the pumps contains four chambers and is designed to lift 1000 gallons of water per minute against a total head of 320 feet. The pump is driven through a flexible coupling by a three-phase induction motor, taking power from a fifty-cycle circuit at a pressnre of 220 volts, and giving 150 H. P. at 730 revolutions per minute. This motor is started by a water rheostat. The second high-lift pump has two chambers, and is arranged to lift 1000 gallous of water per miuute against a total head of 160 feet. It is driveu by a three-phase induction motor giving 75 H. P. at 730 revolutions per minute. In designing these motors a high efficieucy was sought, because, when installed iu the mine, ventilation would be poor and the work would be continuous.

Mining Addresses.

Written for the MINING AND SCIENTIFIC PRESS by CHARLES H. FITCH

During the past twenty years I have had much occasion to use mining addresses, and think that a few things I have learned regarding them may interest other users.

In the first place, I am absolutely convinced that the use of such addresses for sending out circulars can never be made to take the place of display advertising in miniug papers. When such a paper as the MINING AND SCIENTIFIC PRESS has been reliable and popular, a favorite with mining people, for I reckon not how many years, to turn from it to circularizing is like leaving a smooth, well-built turnpike and trying to drive your wagon over plowed ground. If we have a machine or tool of large use, the first thing to be done to maintain that use, and keep it from being displaced, is to keep the picture and merits of the thing before the people in such a paper. That is simply using the railroad and paying the fare. Circularizing, like walking, may seem cheaper, but it is not, being out of the question in economic comparison.

But we must use addresses in correspondeuce, as well as in circulars, following up the good introduction and perpetual reminder furnished by the mining paper. Also as we might judiciously walk a few blocks instead of taking a train, there are some things of minor demand not sufficient to pay for display advertising, in which a nice little business may be picked up by circularizing, especially where the circulars can be used as "riders" with other mail matter, so traveling practically postage free.

Mine addresses, as a rule, have a large degree of inconstancy. Where a list of merchants, such as might be used by wholesale dealers, changes 10%, a list of mines will in the same time show about 30% of changes. This does not at all argue against the stability of mining as a judicious investment by experienced people, but mines are started differently from stores; there is more of the speculative element, more experience is needed and less is used. Many mining enterprises "die a-borning," like unfortunate infants, their promoters "lie down" from lack of capital for larger investment, and even a good mine, well exploited, is often worked out, and its succcssful managers turn to new locations, leaving the old name and place a blank.

Hence, mining directories are always in disrepute. "We once tried," said a representative of an Eastern paper, "to publish a mining directory, but we found that it was bringing us into discredit and gave it up." Poole's directory, as good as any, was gotten out on the "try it every few years" plan. After an issue the publishers seemed to be too tired to try again for several years. A man who sent letters to every address claimed that 60% came back, but perhaps he did not send them promptly after the book was published.

Geo. W. Ramage of Chicago started a semi-aunual mine directory, with novel copyrighted features, weekly bulletins, etc. In less than a year he gave it up, claiming that he had sunk $18,000. Other directories have beeu published in Denver, New York and San Francisco, but the best of them serve only an ephemeral purpose, and the uusatisfactory results obtainable at best seem to discourage painstaking accuracy in their preparatiou. The MINING AND SCIENTIFIC PRESS published an excellent list of California mining properties, but closed the edition owing to changes. I think that only between 10% and 20% of California gold prospects are on a really active basis, such as would interest sellers of machinery and supplies. The rest are developing, or in litigation, or idle, waiting for capital.

Other inconveniences are changes of officers—personal address being always desirable—changes of name and corporation, and management of up to as many as a dozen concerns by one man. Such a man in receipt of circulars gets rather tired of the twelve-times-told tale, "A Twice-told Tale" being sufficiently vexatious, according to Hawthorne. If he is kind enough to writc the machinery man about it, the clerk of the latter probably goes on sending the duplicates. An instance of clerical stupidity occurred in the use of Poole's directory. The mine addresses were very clearly given in one place, and in another the character of mine—as gold, silver, copper, etc. A stenographer was found to be using these descriptive columns as postoffices. It was a man—a woman would not have been so stupid. There is a little postoffice called Gold in California. Near it are a few prospects. Not until the postmaster at Gold

reported the receipt of hundreds of letters for mines elsewhere was the blundering discovered.

Mining news tells us what properties are alive and likely to be in the market. It is invaluable, but often very fallible. A New York mining paper published a departmeut of news for machinery and supply men, in which mistakes were so numerous as to seem intentional. I wrote them, calling attention to fourteen errors in twelve lines of type, and advised them to quit. They did.

How shall we keep the best possible list?

It involves some labor. We must have the best available stable list, and must check it by news. The news is reported by counties, which have no postoffice address value, but we must keep it by counties for this reason, also giving postoffices. Mining camps are often mentioned, and I have for some States the postoffice of every mining camp.

Having a supposedly correct list for a year, say 1904, check mines mentioned in news as active with a 4. At the end of 1904 strike out all the names not so checked after use of return postals, in addition to press news. Then begin to check by 5 in 1905. Keep nothing over a year old.

I prefer book page lists by counties. You see the county at a glance. Cards require say forty handlings to see as much, and they stick together and get misplaced, and are a great nuisance. Reference to officers, reports, etc., may be made to other books or pages. Now, if you see a press item important to follow up, but without complete address, your mines book will be likely to help you out.

Have a column to indicate responses, inquiries and orders. The salesman should supervise this work, and the clerk attending to it should know when a "hit" is made. This will keep him encouraged and interested, without which his work will become perfunctory and unintelligent.

I would not ordinarily send out manifold letters. The deception may be cleverly done, but the nature of the letter "gives it away." I would not circularize by letters at all. A letter presumably calls for a reply, and annoys. I do not want a reply (except in case of return postals to keep up address list), unless I can do the party some good. For circulars I would send something of value, apart from what I have to sell. Such are vest pocket compilations of useful data, blotters, calendars, thermometers, etc.—something that will, if possible, be cherished, yet not cost too much.

A letter, if sent, should be a letter based on information of what requirements or conditions are in sight. When you ask for information always try to give some when you ask. Your customer will then feel like working with you, and you will get a good many points in one place which will be useful in another. Put yourself in his place, and think first of the "fish that he has to fry." In this spirit he will be likely to give your fish a chance, and will not be bored by your epistolary calls.

A Cripple Creek, Colo., Mine.

The accompanying illustration is that of the Vindicator mine, shaft No. 2, in Cripple Creek district,

No. 2 Shaft, Vindicator Mine, Cripple Creek, Colo.

and one of the important properties of that section. It was in the Vindicator shaft that a mysterious explosion of nitro powder occurred at the station on the sixth level a short time since, which wrecked the station and killed the superintendent and foreman, who were passing the station at the moment of the explosion. The damage has been repaired and the mine is again in active operation.

Testing Ores for Cyanide Treatment.

Written for the MINING AND SCIENTIFIC PRESS by R. STUART BROWNE.

There have always been two antithetical views regarding the value of metallurgical investigations made in the laboratory. Undoubtedly it is unwise to place too much dependence on results obtained from a miniature scale of work. But is it not likewise the extreme of foolhardiness to undertake the erection of an expensive reduction plant when an investigation might have demonstrated its unfitness beforehand? Witness the fruits of the opinions of these rash extremists in the abandoned mills dotting the hillsides of our mining camps.

To what degree can laboratory work be accepted as indicating the probable behavior of a process on a large scale? This is a difficult question to answer. The writer has had considerable experience in carrying to maturity plans elaborated from laboratory investigation, and gives as his own opinion that the results of careful laboratory work can be duplicated in a mill if sufficient attention be given to the reproduction, approximately, of the same conditions.

I do not wish it understood that I have such faith in the infallibility of laboratory work that I would advise the erection of a mill on the obtaining of a favorable extraction from a sample of two or three pounds. There may be cases where the preliminary investigation on a small scale will show so conclusively the fitness of the process for the ore that it is safe to proceed to build, but as a general rule, after selecting a form of treatment, a final test should be made on a scale commensurate with the importance of the work and the facilities available.

There are metallurgical processes where laboratory work would be impracticable—e. g., smelting. Still, it is not necessary to test an ore to determine its fitness for this. An analysis of the sample will furnish the requisite information. The adaptability of an ore to mechanical concentration is always a difficult matter to determine, unless the work is conducted on a working scale. Concentration is a delicate operation, calling for a nicety of adjustment of movements, water supply, feed, and a number of matters that play a small but important part in the work. Results obtained from any other source than the actual work of a standard size machine are of doubtful value. But, nevertheless, the laboratory can supply data from a chemical, physical and mineralogical examination so that the probable behavior of the ore can be foretold, and the indiscriminate testing by various machines avoided.

It is with the lixiviation processes that the real value of laboratory investigation makes itself apparent. Particularly is this true of the cyanide process and its vast number of modifications. In this article the writer will endeavor to give a general outline of the method of procedure in determining the adaptability of an ore to this class of treatment. The subject matter is not altogether new, but as it is more complete than what has appeared on the subject, and embraces a few new ideas—the result of his own experience—he presents it to his colaborers in this interesting field.

THE SAMPLE.—It might seem superfluous to dwell upon the importance of getting an accurate sample of the ore, but any one who has had much experience in a laboratory will understand how rarely such samples are brought in. In the case where a metallurgical process has failed to treat an ore successfully after an experimental investigation, the fault can usually be traced to the non-representative character of the sample worked with. A sample that represents nothing but itself is not only valueless, but apt to cause the useless expenditure of large sums of money. Let the sample be sufficiently large to represent the ore from every part of the mine, and let it be of the same general character as that which would be sent to the mill. Should the mine produce two or more distinct classes of ore, separate samples should be taken of each, for it may be necessary to subject them to different kinds of treatment. A frequent source of trouble is the failure to include the proper proportion of waste matter. In the process of mining, wall rock invariably creeps into the ore. The amount so included is variable, but a rough estimate can be made and the necessary amount added to the laboratory sample.

The sampling of tailings deposited in a reservoir is in most cases a simple matter, and susceptible to a high degree of accuracy. The most convenient way of taking the samples is by means of a borer similar to the ones employed in testing placer ground. These take out a core which forms an ideal sample, and also determines the depth of the deposit. They work best in ground which contains sufficient moisture to prevent the ground from running. Where the borer is not employed, pits must be dug, and the sample taken from a shallow groove running from the top to the bottom of the excavation. It is best to take these samples along the line of a geometrical figure, as it facilitates calculations of the tonnage, if measurements of depth are taken at these spots. The practice of taking grab samples from the surface of the tailing is to be severely condemned. It has been observed that in the arid regions what may be termed surface enrichment sometimes takes place with tailings that have come from lixiviation works. Such tailings always contain values that have not been removed by the water wash, and capillary attraction brings them to the surface. This phenomenon does not take place so readily with sandy material, but with slimes it always occurs to a more or less extent.

An important thing to consider in taking the samples is the relative amount of coarse and fine material. The slimes always lie at the point farthest from the intake of the reservoir, and from the difference in their physical and chemical condition sometimes require a treatment different from the sandy material. In estimating the tonnage, a convenient way of finding the weight of the tailings is by filling a small box with a weighed amount of the dry tailings, and then packing them down by the addition of water. By measuring the space occupied by a weighed amount of the wet material, it is easy to figure out the number of cubic feet required to make a ton.

PHYSICAL CHARACTERISTICS.—We will suppose that we have received a sample of ore to be tested for cyanide treatment. The first thing to do is to make an examination of its physical properties in order to determine their probable influence on the proposed method of treatment. Determine the specific gravity of the ore and its texture. See whether it be hard, soft, tough, friable, porous or close grained. From this a general opinion may be formed as to the mechanical treatment the ore will have to undergo, and its probable behavior under the conditions. A hard, massive quartz would indicate fine crushing, while a soft or friable one would mean coarse crushing in order to avoid sliming. Sometimes a clew may be found regarding the mode of distribution of the values in the ore—e. g., a system of fractures would suggest that the precious metals lay between the planes, in which case coarse crushing in a rock breaker might be sufficient to prepare the ore for the solutions.

The character of the wall rocks and the gouge, if one accompanies the vein, must be looked into. A gouge of clay or soft, decomposed matter, or wall rocks with a tendency to form slimes, is always bad and may exert a powerful influence on the work by retarding percolation.

In the case of tailings the physical examination would be confined to determining the proportion of slimes and sand. This is of importance only with slimy material, where percolation is dubious; but with sands where percolation is obviously practicable it is of little consequence and may be omitted. The method that I usually adopt in making this determination is to take 500 grams of the material, dried and accurately weighed, and remove the fines by agitation and decantation. The remaining portion is then dried, weighed and the slimes calculated by difference. The sample should be shaken in a large bottle, and sufficient time given for the heavier particles to settle, before pouring off the water carrying the suspended matter. After three or four washings it is safe to consider the remaining portion as sands.

The sizing test made by passing a weighed amount of the dry tailings through sieves of various sizes, and determining the percentages retained by each one, is of little practical value. The vital point is to determine the leachable and unleachable portions. This resolves itself into a question as to what constitutes slimes. I would define slimes as material so fine that when packed the percolation of a solution through it is stopped,

or else goes on so slowly that for all practical purposes it may be considered nil. The definition of the word must necessarily be elastic, and any attempt to limit it to material of any particular dimension must fail, for the size that constitutes the slimes of one man produces the leachable pulp of another.

These tests are of value simply for the analytical consideration of the leachability of the pulp, and in all doubtful cases must be determined from a trial run on a fairly large scale. As every one knows who has had very much experience with the process, the mechanical difficulties in cyaniding are of about as much frequence as the chemical ones, and this preliminary examination, apparently unimportant, may yield valuable information.

MINERALOGICAL EXAMINATION.—An attempt should be made to determine the various minerals in the ore, and the amount of the more important ones. Particular attention must be paid to seeing if compounds of copper, arsenic, antimony and tellurium are present. Frequently they will occur in such minute quantities that a chemical analysis of small amounts may fail to disclose their presence, and yet be in sufficient amount to eventually give trouble in the metallurgical operations. Particularly is this true of copper. The best thing to do is to crush down two or three pounds of the sample, pan it, and then examine the concentrates. If possible, a determination should be made of the forms in which the gold and silver occur. Free gold can always be shown by panning, and tellurides by the presence of tellurium in the concentrates. Should the sulphurets carry the values, the fact can be established by panning out some, removing the free gold by amalgamation, and then obtaining their values by assaying.

(TO BE CONTINUED.)

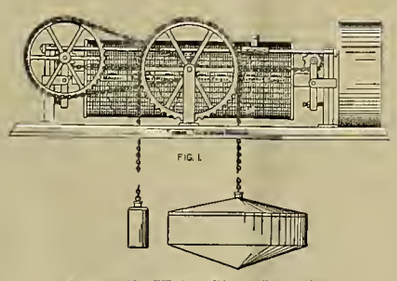
Automatic Water Stage Recorder.

Since the field work under the direction of the United States irrigation investigation began the use of water registers has grown in favor. For many years inventors have striven to design an automatic regulating gate to furnish a constant discharge under a varying head with unsatisfactory result, for the "ditch rider" is still compelled to read the depth of water flowing over a weir or through a flume as often as his other duties permit. The water register takes the place of the ditch rider, and its work is more accurate and is continuous. It also gives an impartial record.

If the user of the water and the party who furnishes the same are present when the register is installed and both are satisfied that the pen records the proper depth at that time, the week's record should be satisfactory to all concerned.

The water register used in this work can be kept locked and the records watched and the computations made by a disinterested party. The depth of water flowing over the weir or other measuring device can be checked whenever there is any doubt as to the accuracy of the record. The register sheets can be computed at the end of the irrigation season, and the volume of water corresponding to the recorded depths can be found in a few minutes. If the irrigation season covers a period of four months there are only sixteen or seventeen register sheets to be considered. It has been found to be more satisfactory to the company disposing of the water, as well as to the irrigator, to be informed of the volume of water furnished rather than to contract for the delivery of a definite number of cubic feet per second for an indefinite period, and for neither one to know whether or not the specified volume was being delivered.

J. S. J. Lallie of Denver, Colo., has invented an automatic water stage recorder, herewith illustrated,



Automatic Water Stage Recorder.

in which the rise and fall of the water in the reservoir, river, canal or flume raises and lowers a float and counterpoise. The float and counterpoise are connected by a substantial chain which passes over a cut sprocket wheel, motion being imparted by the float, and rises and falls with the changes of level in the river, reservoir or canal. A paper divided and ruled into rectangular spaces is securely fastened to the cylinder and the time divisions running parallel to the axis of the cylinder, and the depth divisions at right angles thereto. The pen or pencil making the record is moved along the cylinder by the positive action of the sprocket chain connected to the float, in which the movement from the float to the pencil point is positive at all times and under all conditions of water and weather. The fluctuations in discharge create a zigzag line and the mechanism is so constructed that the record can be extended to cover several revolutions of the cylinder if necessary, with no confusion of the record.

Gold Deposits of New Zealand.*

Written by ALEXANDER MCKAY.

Gold was discovered at Coromandel in 1852; at Collingwood, Nelson, in 1857; at Gabriel's Gully, Otago, in 1861; and on the west coast of the South Island in 1864. In all cases the gold was first obtained from alluvial or slope deposits.

In the Preservation Inlet and Wilson River Goldfield auriferous reefs have been discovered, the yield from which might be held to indicate these as a source of the alluvial gold of the district. This may be true as regards the reefs, but it is also certain that a considerable part of the alluvial gold has been derived from a source outside the area within which the reefs occur. The balance of gold from the two sources is therefore accidental.

On the Orepuki and Longwood Range Field no payable quartz lodes have been discovered, and the alluvial gold, it has been shown, had a source distant from where it is now found. In this case the alluvial gold does not indicate the existence of reefs in the neighborhood.

The goldfields on the west slopes of the Richardson mountains, though containing but one known payable reef, yet gives evidence that the alluvial gold has been locally derived, the gold being confined to the beds of mountain streams which expose only schist rocks, in which, though not abundant, quartz lodes occur at intervals. Areas of schist rock, strongly foliated with laminæ of quartz, appear in the middle and northern part of the range.

In the Shotover Valley Goldfield but few reefs have been found, and the yield of gold from these has been totally disproportionate to the amount of alluvial gold obtained from the district. Although at no point have the cements and quartz gravels at the base of the coal-bearing series been worked for gold, it is certain that they have yielded gold to the enrichment of the modern gravels in the tributary streams and to the Shotover itself. The great amount of alluvial gold obtained from this field does not indicate a corresponding abundance and richness of auriferous quartz lodes within the district.

In the Arrow River Goldfield the number and richness of the gold-bearing reefs as yet discovered are scarcely the equivalent of the alluvial gold found; but the great bulk of the gold obtained on the Arrow River was from a little above the junction of the river with the Kawarau, and it is certain that over this part the gravels worked have been enriched from a source not within, but west of the Arrow Valley. The gold in the upper valley above the Arrow Valley. The gold in the upper valley above the Arrow Falls probably had its source in the reefs of the district; and, having regard to this only, the amounts of alluvial and reef gold are proportionate.

In the Cardrona Goldfield, although gold-bearing reefs probably occur, none are being worked. The alluvial gold, as regards its original source, is for the most part foreign to the valley.

On the Mount Criffel and Luggate Creek Goldfield the alluvial and cement gold is also foreign to the district. Lodes of gold-bearing quartz are of probable occurrence in the Mount Pisa range, but they have yet to be discovered, and the gold of the district is not an indication of their existence.

In the Kawarau Gorge and Roaring Meg Goldfield no workable gold-bearing reefs have been found. The alluvial gold of the Kawarau and its banks has been derived from various sources, while that of the Meg Stream may also in part be due to an extension south of the Doughboy line of quartz grits on the Criffel field.

In the Nevis Goldfield part of the gold may have come from reefs in the Carrick range, on the east side of the valley, and part also from reefs in the upper valley; nevertheless, the greater amount of gold obtained has been derived from heavy terraces of sandstone gravels and the quartz grits of the coal period. Therefore part only of the gold has been supplied from reefs in the Carrick range, and the alluvial gold is not a measure of the abundance and richness of the auriferous reefs of the Carrick range.

On the Upper Clutha and Bendigo Goldfield but one gold-bearing reef has been discovered and worked. This, the Cromwell reef, has yielded considerable gold, but it is impossible that it can account for the gold present in other parts of the field. Much of the gold got in the vicinity of the Cromwell reef has evidently come from a considerable distance, as shown by the character of the wash in which is found rocks that are not known in situ nearer than the Mount Alta range.

On the Bannockburn and Fraser River Goldfield, part of the gold is referable to reefs in the Carrick range, but here also the amount of alluvial gold, taken as an indication of the richness of the reefs, would prove misleading.

In the Clutha Valley, from the Fraser river to Roxburgh, the known reefs within this part of the Clutha watershed are not likely to have supplied more than a tenth of the gold found.

At Switzers, and over the Waikaia Valley Goldfield, few or no reefs have been found, and the greater part of the alluvial gold has been derived from reefs and rocks outside the watershed of the Mataura.

In the goldfields of the Mauuherikia, Idaburu, and Poolburn Valleys no reefs are being worked for gold, and it is certainly remarkable that over an extensive district, easily prospected for reefs, and which for forty years has yielded large annual returns of alluvial gold, there should have been no important discovery of gold in reefs. One reef that has been prospected at the northern end of Rough Ridge, and near Ophir, is what was known as Green's reef, which turned out to be a belt of mica-schist country, more than ordinarily laminated with quartz that carried a little gold, but not enough to pay for working the deposit.

In the goldfields between the Taieri and Clutha rivers known reefs are few. Some reefs are being worked in the Upper Taieri Valley, and the denudation of these may account for the gold found in the valley above Pigburn, where the auriferous grits terminate on the flanks of the Rock-and-Pillar range.

On the Waipori Goldfield the O. P. Q. reef has been worked, and some reefs carrying gold are known to exist in the valley of Lammerlaw creek; but these cannot account for the considerable amount of alluvial gold obtained from this goldfield. The presence of extensive deposits of quartz grits of at least Miocene age yielding gold otherwise accounts for the larger part of the gold found on this field.

On the Tuapeka Goldfield some small reefs carrying gold have been found near the source of the Tuapeka River, and the Canada reef may also be here considered; but reefs on this field have not yielded a percentum of the alluvial gold which has been raised, and scarcely deserve mention in this connection.

On the Maniototo Goldfield no reefs carrying payable gold are known to exist. A reef was found in the Catburn, and to some extent this was prospected, but nothing of value appears to have been found.

On the Taieri Ridge, Macrae's, and Nenthorn Goldfields a number of reefs have been found, but the yield of gold from these at no time bore any proportion to the alluvial gold raised, such as might lead to the inference that the latter had been directly derived from reefs in the district.

On the Moeraki and Maerewhenu Goldfields reefs are almost unknown. A reef has been discovered on Balruddry Run, between the Kurow and upper valley of the Kakanui river, and another, in the Otekaike Valley, was prospected many years ago. A battery was erected, and some crushing done, but the quartz proved too poor in gold, and the working of the reef has been discontinued.

As far as the goldfields of Otago are concerned, the unavoidable conclusion is that of the £23,000,000 to £24,000,000, representing the value of the gold raised since 1861, but a small part of it is the product of reef mining. Even at the present the disproportion is as great as it has ever been. This is most remarkable; the more so as the country generally, and more particularly the mountainous parts, afford great facilities for the detection of reefs.

(TO BE CONTINUED.)

*Abstract Report of Government Geologist.

Canadian Bounties on Lead.

Following is the law granting bounties on lead in Canada:

That it is expedient to repeal Chapter 8 of the statutes of 1898 entitled, "An act to provide for the payment of bounties on lead refined in Canada," and to enact as follows:

The Governor-General-in-Council may authorize the payment of a bounty of 75 cents per 100 pounds on lead contained in lead-bearing ores mined in Canada, such bounty to be paid to the producer or vender of such ores, upon evidence that such ores have been smelted in Canada; provided, that the sum to be paid as such bounty shall not exceed $500,000 in any fiscal year; provided, also, that when it appears to the satisfaction of the minister charged with the administration of this act that the standard price of pig lead in Loudon, England, exceeds £12 10s ($60.83) per ton of 2240 pounds, such bounty shall be reduced proportionately by the amount of such excess.

Payment of the said bounty may be made from time to time to the extent of 60% of the full bounty authorized, subject to adjustment at the close of each fiscal year. If at the close of any year it shall appear that during the year the quantity of lead produced on which the bounty is authorized exceeds 33,333 tons of 2000 pounds, the rate of bounty shall be reduced to such sum as will bring the payments for the year within the limit mentioned in Section 1.

If at any time it shall appear to the satisfaction of the Governor-in-Council that the charges for transportation and treatment of lead ores in Canada are excessive, or that there is any discrimination which prevents the smelting of such ores in Canada on fair

and reasonable terms, the Governor-in-Council may authorize the payment of bounty at such reduced rate as may be deemed just on the lead contained in such ores mined in Canada and exported for treatment abroad.

The said bounties shall cease and determine on the 30th day of June, 1908.

The Governor-in-Council may make regulations for carrying out the intention of this act.

Number Scheme for Mines.

TO THE EDITOR:—I have read with interest the several articles on "A Number Scheme for Mines," and recognizing merit in the methods of both Mr. Aldersou aud "Mine Superintendent," and realiziug that uearly every mine worked has its individual conditions, differeut schemes may be adopted. Twenty-five years ago I adopted a scheme, so far as I know original, of dividing my workiugs into spaces designuated by letters. All levels, whether opened by tunnels or shaft stations, are numbered 1, 2, 3, etc., without regard to the distance between, unless the distauce equaled about double the usual space, in which case I skip a number. To illustrate: If I am opeuiug a mine with very wide veins and large shoots of ore, it may be uecessary to have stations 50 feet apart, in which case the first station 50 feet would be No. 1; secoud station, 100 feet, No. 2, and continuing iu same manner. If levels are 100 feet apart the stations are numbered in the same manner, No. 1, 100 feet, No. 2, 200 feet. The spaces between levels I designate by letters, thus, from surface to No. 1 level is A space, between No. 1 aud No. 2 levels, B space, continuiug in same order. My ore chutes are numbered according to distance from station, north or south, east or west. For instance, if in a continuous, well defined vein, the ore chutes are 20 feet apart, they will number on No. 1 level No. 1 A, No. 2 A, No. 3 A, etc. No. 5 A would be 100 feet from the statiou. My winze spaces are divided in

Building and Observatory to be Erected by the State of Washington.

hundreds; No. 4 winze is located 400 feet from the shaft or crosscut, if shaft is vertical and off the vein. The same plan is used for crosscut tunnels, distauce is measured on the veiu or ore body. If working in two directions from a shaft the north or south, east or west, designation is used. Chutes aud winzes from No. 2 level are designated No. 1 B, No. 2 B. The letter indicates the space being worked, and the uumber the distance from the station. If a portion of the vein is barren, that portion is measured and numbers passed over. In case of several veins being worked from one shaft or tunnel opening, I have made a practice of naming the veins, usually the same name as given by locatiou, except where more than one vein is found in a claim, then a special name is given, and so marked on the mine map. One case in mind, we have twelve defined veins withiu our working territory, and no difficulty is experienced iu locating our chutes or winzes. If I have the naming of veins I prefer and adopt short names. If working both ways from a shaft or station, a simple arrangement by my system is to give even numbers to one side, and odd in the other direction. Thus, No. 5 A chute would be located 60 feet south on No. 1 level, and No. 8 C would be 80 feet north on No. 3 level. In two properties where we are openiug the vein by loug crosscut tunnels, and the tunnels are 200 feet apart, I designate the first crosscut No. 2 level; second, No. 4 level; third, No. 6 level, dividing each space by one blind drift along the vein from a main winze; these levels are No. 1, No. 3, No. 5, and the spaces lettered as before explained, two spaces between each crosscut tunnel level. I recognize the difficulty of using one scheme for all mines, but I illustrate my method, trustiug other mine operators may find it convenient to use at times. It is quite inconvenient to chauge methods once adopted, unless in opening a new miue, and eveu iu that case a superintendent having worked for several years and become accustomed to a method, finds it difficult to adopt something new that has no effect on the economy of working his mine.

B. M. NEWCOMB.

DRILLINGS from holes which have been drilled with the vein should be distrusted as furnishing a key to results, for not infrequently rich streaks occur in a vein parallel with the walls, and should the drill hole chauce to follow one of these possibly a 5-foot hole might indicate ore having a value of $100 per ton or more, wheu the ore broken there might uot average $10. For the same reason chips taken along the side of a vein that has beeu stripped, or a chaunel made aloug it, caunot be considered as properly representing the mass of ore adjacent to it. Ore that is spotted is difficult to sample, and only large samples can be trusted to represent eveu approximately the value of the vein. Many veins carry the values in their seams or ribbous, which are essentially parallel with the walls. In other veins the values occur in bunches with low grade or valueless material between. This latter class is most difficult to sample, either for daily report or for examination as a whole. In such iustauces mill or smelter returns ou large quantities are the safest means of determiuiug the value of the miue or any particular part of it.

California State Building at the St. Louis World's Fair.

State Buildings at St. Louis.

Preparations are goiug on in every mining State to make a creditable exhibit at the coming exhibition at St. Louis, Mo. Most of the miuing States will have separate buildings, some of which have been illustrated hereiu. The California State building, illustrated in the accompanying engraving, is to be built after the Moorish architecture, which has been adopted so largely in Spaiu and iu Spauish speaking countries. This style of architecture is also typical of the missions established throughout the West aud Mexico more than 100 years ago. The Califoruia building will be a duplicate of the Mission Santa Barbara, as far as outward appearances go, though, of course, far less substautial than the original.

The Washington State building, also illustrated herewith, is of such unusual style of architecture as to attract attention. It will be octagonal iu shape, having eight huge timbers rising from the base, and all uuiting near the top, formiug a pyramidal structure. The building will be divided iuto five stories, and will have a height of about 100 feet. It is said that it will be the ouly State building at the Exposition which will afford a geueral view of the grouuds, owing to its altitude. Au elevator is to be provided in the center of the building, which will take visitors to the observatory tower.

Power at Niagara.

Considering the prospective transmission of electric power from the Cauadian side at Niagara Falls to Toronto, Ont., says the American Mauufacturer, it is interesting to note that up to the present day the longest transmissiou from the big power houses at Niagara Falls, N. Y., is to Olcott, a distance of 39 miles, whereas the contemplated trausmissiou to Torouto will be over a distance of about 90 miles. Other places in the United States have longer transmissiou liues, but the fact remains that at Niagara Falls there is the greatest development of power the world knows.

The first power delivered by the Niagara Falls Power Co. was September 25, 1895. It weut to the Pittsburg Reduction Co. for the manufacture of aluminum. To-day the Niagara Falls Power Co. has 105,000 H. P. at its commaud, and of this wonderful amouut of energy, 57,365 H. P. is sold in Niagara Falls to twenty-four customers. Across the river 1900 H. P. is exported to Canada and 36,969 H. P. is sold in Tonawauda. To sixty-three customers in Buffalo, 23,421 H. P. is delivered, the largest individual customers there being the Buffalo Railway Co., which takes 7000 H. P. The Buffalo Geueral Electric Co. comes next, and takes 6000 H. P. Altogether the Iuteruational Railway takes 12,000 H. P. for the

operation of its lines in Buffalo, Lockport, Niagara Falls and other places. To Lockport 1500 H. P. is sent and 1000 H. P. goes to Olcott to operate an electric road.

In Niagara Falls the second largest consumer is the Pittsburg Reduction Co., which takes 8000 H. P., while the largest consumer of Niagara power in any place is the Union Carbide Co., of Niagara Falls, which takes 15,000 H. P. The Castner Electrolytic Alkali Co. uses 7000 H. P., and the International Paper Co. gets 7000 hydraulic H. P. The Carborundum Co. uses 5000 H. P., the other consumers ranging from 2000 H. P. down to 15 H. P.

Up to the present time, the Niagara Falls Power Co. has made an expenditure representing $13,000,000 and it pays one-fifth of the taxes of the city of Niagara Falls.

Accuracy of Commercial Samples and Assays.*

Written by Ernest H. Simonds.

One of the most frequent questions asked by students of assaying is with regard to the accuracy practically attainable by and demanded of assayers under the conditions of everyday work. This same question is asked with an equal interest by ore buyers and ore shippers; by the buyers, because they work on a margin, which is only a small percentage of the value of the ore, so that an erroneously high assay may wipe out their profit or cause actual loss; and by the shipper, because the ore and bullion sales generally comprise the total income of a mine.

The following discussion of this subject is based upon the assays of several thousand ore samples, and mill and metallurgical products of great variety as to character, contents and origin. The results of the writer are compared with those of about half a dozen other chemists of the highest reputation. The operations include the method of fire assay of gold and silver, the fire or the molybdate method for determining lead, and the iodide or the battery method for copper.

The limit of allowable error cannot be stated to be invariably a certain percentage of the amount of the metal present; because, except where only approximate results are needed as in assays at the mine of daily samples of the workings, as high a degree of accuracy is needed as is practically attainable; and this accuracy varies greatly according to the material to be assayed. The cause of this variance of possible accuracy is to be found in the lack of homogeneity of the pulp, in the composition of the material assayed, and in the contents of the ore in valuable metal, all of which are variable. The agreement in assays of the various common vehicles of gold and silver, or materials in which these metals go to market, will therefore be discussed separately. These materials are gold and silver bullion, silver sulphide, copper matte, pyritic concentrates, and silver-lead ore and concentrates.

Gold and Silver Bullion.—The fire assay of silver can be relied upon to within about two one-thousandths (0.2%) of the content, although, with care, more accurate results can easily be obtained by cupelling simultaneously with the assay, a proof center of approximately the same composition as the bullion. It should be remembered, however, that proof silver (1000 fine) must be used and not ordinary test or quartation silver, which, although free from gold, is only 997 or 999 fine. When the bullion to be assayed is 875 to 925 fine, United States coin silver makes a good proof center, as it can be relied upon to be 900 fine within one or two ten-thousandths. If a possible error of two one-thousandths is too great, the wet assay should be used.

The fire assay of gold bullion is one of the most accurate of quantitative determinations, hence its use for controlling not only the valuation of all gold bars both crude and fine, but also the gold coin of all countries. Assays of deposits of unparted gold bullion are reported to one-half a thousandth (0.05%), and results from assays of chips taken from the opposite corners of a bar, or of two assayers checking one another, should not differ by more than this amount, in any case where there is little base metal present and the bar has been well melted. Generally chips from opposite corners, top and bottom, of $2000 to $6000 bars do agree within one four-thousandth (0.025%), and occasionally balance exactly. The surcharge, or difference between the weight of the parted gold and the weight of gold actually present, is found by means of a check of proof gold, and varies between zero and one one-thousandth. It is usually four to seven-tenths of a thousandth. For accurate work proof gold and bullion rolls must be used, and the assay weights should be checked to prove them consistent. If the bullion is less than 100 fine in gold, assays of it ought to check to one-tenth of a thousandth (0.01%). Bullion containing much base metal must be sampled by dips, not by chips. The following table gives actual results obtained in valuing typical bars. Bars 1 and 2 are mill gold, or retorted amalgam, from the battery and plates of a California stamp mill. Bars 3 and 4 are cyanide bars, obtained by melting the gold sludge formed by acid refining of the zinc box precipitate of a cyanide plant; hence the base metal zinc is present. In bars 5 and 6, most of the base metal is lead. Bar 7 is base silver bullion from Mexico. The seller used the fire assay, the buyer the humid assay for silver:

Bar.	Weight (oz.)	Sample.	Seller. Gold.	Seller. Silver.	Buyer. Gold.	Buyer. Silver.
1	225	Dips	722.25	268	722½	265
			722.30	267		
2	50	Chips	713.65	...	714	...
			713.88	...	...	...
3	600	Borings	603.25	333½	602½	330
4	600	Borings	603.00	333	...	...
			607.00	334½	...	...
			607.25	335½	607½	...
5		Dips	81.00	595	81	591
			81.02	595½	...	...
6		Dips	84.34	593½	84.2	591
			84.35	592½	...	...
7	780	Dips	0.04	314.86	trace	316
			0.04	314.76	...	...

Silver Sulphide.—This material is obtained as a chemical precipitate by adding sodium or calcium sulphide to the silver solution in the thiosulphate leaching process. It gives pulps which are perfectly homogeneous, provided that in drying, they have not been overheated so as to cause partial conversion of the silver sulphide into metallic silver. The pulp contains from 3000 to 20,000 ounces of silver per ton, (averaging about 10,000 ounces), and from 1 to 100 ounces of gold per ton. The material is generally bought and sold on the basis of the results of the fire assay, without the corrections for slag or cupellation loss such as are made with silver bullion.

However, an assayer's duplicate assays should agree closely, within thirty ounces to the ton or 0.1%, on account of the homogeneity of the pulp. The fire assay for silver is not only not scientifically accurate, but it is not sufficiently accurate even for business purposes, the slag loss on 10,000 ounces of the precipitate being about fifty ounces, and the cupellation loss three times as great. The error could be rendered so small that it might be neglected by assaying the slag and the cupels and adding the silver they contain to that in the first bead, but this very much increases the labor of assaying. It would appear, therefore, that the silver should be determined by the Volhard† sulphocyuate titration, the insoluble residue being scorified and cupelled to recover the small amount of silver always found in it. This method gives results which agree within a few ounces in 15,000 with that obtained by the corrected fire assays and is much easier and quicker. The following results show what is possible with this material by uncorrected fire assay:

Assayer.	Method.	Oz. Gold.	Oz. Silver.
A	Crucible	29.90	11,293
A	Scorifier	30.00	11,278 and 11,308
B	Scorifier		11,323

Copper Matte.—This material also is perfectly homogeneous, and it is, therefore, easy to sample and to obtain from it duplicate assays agreeing closely. The gold can be determined with precision by the fire assay, and the copper, by the electrolytic method or by the iodide titration. The determination of the silver is more difficult, on account of the large percentage of copper (40% to 60%) contained in the matte. Each assayer must use his own judgment as to the best cupellation heat for producing uniformity of results. The fire assay for both gold and silver is always used in the West. The combination of wet and dry methods is claimed to be more accurate; the wet method is better for the determination of silver, but the fire assay is certainly more accurate for gold. The following table gives the results on "shipping matte" from three different furnaces in widely separated localities:

No.	Seller. oz. au.	Seller. oz. ag.	Seller. % cu.	Buyer. oz. au.	Buyer. oz. ag.	Buyer. % cu.	Umpire. oz. au.	Umpire. oz. ag.	Umpire. % cu.
1	9.85	64.20	34.23	9.81	...	34.00	....	65.29	....
2	16.47	91.20	50.15	16.47	91.70	49.90	....	....	....
3	11.97	73.74	28.67	11.83	74.50	28.70	12.00	72.80	....
4	13.39	69.20	35.65	13.33	69.80	36.90	13.33	....	35.80
5	30.03	285.95	49.25	....	....	49.30	30.04	286.90	50.24
6	1.28	41.26	52.20	1.24	41.35	52.30	....	....	....
7	1.45	35.15	55.70	1.47	35.30	....	....	....	55.77
8	1.37	34.51	48.74	1.32	33.16	....	....	....	48.73

In 1, 2, 3, 4 the buyer determined the gold and silver by scorification and the copper by electrolysis; the seller used the crucible assay for the gold and silver, and the iodide method for the copper. In 5 both buyer and seller used the crucible assay for the gold and silver and the iodide for the copper. In 6, 7 and 8 the seller used the scorification method with re-scorification of the buttons for the gold and silver, and the buyer used the crucible method; both used the iodide method for the copper.

In 1, 2, 3 and 4 the contract between the buyer and seller provided that: "Three samples are to be drawn, one for our joint assayer, one for the refiners and one to be reserved for an umpire in case the assays should vary from ½% for the copper, one ounce for the silver and 1-20 ounce for the gold; if the difference does not exceed the above splitting limits, the mean of the two assays to be taken for settlement, but if an umpire's assay should be made, the mean of the two nearest assays out of the three to be taken, and the party further away from the umpire's assay shall pay the umpire's charges for assaying." This seems a fair contract, as payment is always made on the average of two assays—the umpire's and the one nearest his—not on the umpire's assays alone. This particular matte was of higher grade than had been anticipated when the contract was drawn up, and hence there was some difficulty in coming within the prescribed limits of variation.

(To be continued.)

*California Journal Technology.

†——SILVER——
oz. au.—oz. ag.—% cu.

Grand Encampment District, Wyoming.

The mines of the Verde Mining & Milling Co., generally known as the Ferris-Haggerty, are 19 miles southwesterly from the town of Encampment, a place of about 1000 inhabitants, in Wyoming. Here are located the smelter of the Encampment Smelting Co., which treats the ores of the Ferris-Haggerty mine; the office of the Encampment Tramway Co., operating an aerial tram 16¼ miles in length; the Encampment Pipe Line & Ditch Co., owning a 48-inch stave-pipe line, used in developing power and supplying the smelter and town with water; electric lighting plant and other industrial and corporate companies, all owned by the North American Copper Co. Encampment is situated at an altitude of 7000 feet, and the mines at about 9000 to 10,000 feet above sea level, near the village of Battle, which is on the Continental divide, at an altitude of 10,000 feet, and is 7 miles from the mines.

The district was discovered in the winter of 1896-97. The principal mines discovered were the Doane-Rambler, Hercules, Portland, New Rambler and Ferris-Haggerty.

The Doane-Rambler and New Rambler have produced and shipped considerable high grade copper ore, principally chalcopyrite, a feature of the New Rambler being covellite carrying platinum.

The Ferris-Haggerty is the large producer of the district. This property is opened to a depth of 700 feet, with shafts, tunnels, drifts, crosscuts, raises and winzes, showing large ore reserves, blocked out; $700,000 had been produced (at a cost of $600,000) when the present owners, the North American Copper Co. (the principal parties in interest being the Carey Bros. of the Mine & Smelter Supply Co. of Denver, and Chas. Collins of Penusylvania, and his associates) purchased it for $1,000,000, and proceeded with the erection of the tramway, water power, smelter, etc., at a total additional cost of about $1,000,000. During September, 1903, the smelter made a test run of twenty days on 8% ore, concentrating about four into one, and shipping eleven carloads of refined copper averaging about 99¼%.

General Geology.—The geology of the Encampment region, says A. C. Spencer of the United States Geological Survey, when studied in detail, is found to be intricate, but the more general features can be readily outlined. Among the most prominent features of the region are bands of white quartzite. The bands or reefs of quartzite, which cross the country in a nearly east-west direction, are separated from one another sometimes by bands of conglomerate, slate, and limestone, and in other cases by dikes of dark diorite. All these formations have a general dip toward the south, and frequently stand at steep angles. Taken together, they occupy a narrow wedge-shaped area, extending for 20 miles westward from its point or apex below the mouth of Purgatory gulch on the Encampment river, a few miles south of Encampment. The widest part of the quartzite area is upon the west, where it becomes covered by surface formations in the drainage of Big Sandstone creek and of Savery river. With the exception of the diorite, all the rocks mentioned are of sedimentary origin, thrown into east-west folds by compressive forces acting in a north-south direction. The diorites were intruded into the sedimentary series after the greater part of the folding and compression had taken place. They occur in dikes from a few feet up to half a mile in width, frequently extending along the strike for several miles. They are of almost universal occurrence throughout the quartzite belt, and are also found cutting the granites, gneisses and schists which occur both to the north and to the south of the quartzite. The schists are mostly hornblende schists, which may be seen in typical development upon the north slopes of the continental divide in the heads of Jack creek and North Spring creek, and also in the region of Huston Park. The other rocks of the mineral belt may be classed under the general names of granite and granite-gneiss, and all of these appear to have been formed since the hornblende schists, though they are probably older than quartzites and associated formations. The formations represented in the Sierra Madre are of pre-Cambrian age and belong to the most ancient series known within the Rocky Mountain province. The topography of the region is more than ordinarily smooth for a mountainous country reaching elevations above 10,000 feet, a fact which allows the building of wagon roads to almost any desired locality at comparatively slight expense.

Economic Geology.—The ore deposits of the Encampment region have not, as a rule, been developed to a sufficient depth to afford opportunity for an exhaustive study. Hence, while the few mines in the

district which have been opened to a cousiderable depth have been carefully studied, the information obtained with regard to the occurrence of economic deposits as a whole is largely based upon general geological relations ascertained from surface examinations.

ORES.—Copper is the predominant metal of value in the ores of the district, though there are a few deposits carrying values in silver, and gold occurs alone in quartz veins, or in variable but always small amounts accompanying the copper ores. The ores of copper comprise the sulphides, chalcopyrite, chalcocite, bornite, and covellite and their usual alteration products, malachite, azurite, chrysocolla, and the oxides. The silver-bearing ores are argentiferous galena, occurring with sphalerite and pyrite in fissures with a gangue of quartz, together with calcite, or the carbonate of iron, siderite.

THE COPPER DEPOSITS.—Considered in a geueral way, the deposits of copper in the region fall into two classes. The first class includes all where the mineral is chalcopyrite unaccompanied by oxides, carbonates of copper, or rich sulphides, except very superficially where the former minerals have been oxidized by surface weathering. Deposits of this sort, which occur invariably inclosed in undecomposed rock, are regarded as original ores. Their distribution is almost universal, and they are found in all sorts of rocks, frequeutly without any recognizable vein material, but sometimes accompanying masses of quartz with a small amount of feldspar, calcite, or siderite (carbonate of iron). In those cases where little vein matter is present the ore occurs, as a rule, in pockets or lenticular masses following the schistose or slate structure of the country rock, and more or less mixed with the inclosing material. No instances were observed where bodies of this character gave promises of sufficient size or permanence to warrant the expectation that they would lead to important masses of ore. As an exception to deposits of the above type where there is uo well-defined lead traceable for any considerable distance upon the surface, there are others, still without associated quartz, occurriug iu strong leads traceable for long distances upou the surface. A typical example of this variety of deposit is the Verde property. The Verde is a zone along which iutense metamorphism has taken place, involving hornblende schists, a band of limestone, and some thin strata of quartzite. The zone seems to follow the limestone which appears to lie parallel to the geueral schistosity of the regiou. There is every reason to anticipate that metamorphic zones of this kind will persist in depth, though the extent to which copper has been deposited in them must be proved by exploration. In a third type of original ores the copper pyrites occur in a matrix of quartz accompanied by calcite and siderite or by feldspar. The sulphide here occurs in bunches throughout the mass of the gangue, and the value of such veins is dependent upon their persistence. Some veins of this nature are lenticular bodies lying with their longest surface dimeusions parallel with the structure of the iuclosing rock. Certain of such masses of quartz reach a width of 50 feet or more, showing in outcrop a length of from twice to several times this figure, but these seldom show any considerable amount of copper, though they are reported to carry a small amouut of gold. Iu other cases the quartz occurs in a disconnected series of thiuner lenses, extending along the same general trend in the schistose rocks. Sometimes these interrupted veins carry chalcopyrite in promising amounts. If they are irregular and interrupted upon the surface, they are likely to be discontinuous in depth, but where strong and persistent iu outcrop they may be expected to continue in depth. This type includes such deposits as the Continental in Cow creek, the Cascade, aud the Kurtz-Chatterton. In the ores of the two properties last named there has been some secondary deposition of ore, but the sulphides are regarded as mainly primary. The second class of copper deposits iucludes all those where the principal copper minerals are rich sulphides, such as chalcocite or copper glance, covellite, and bornite, with or without high-grade copper pyrites. In the surface portion of such deposits large amounts of oxide and carbonate ore are found, and they are commonly capped at the outcrop with strong gossan. Also the inclosing country rock is often to a greater or less extent decomposed. Ores of this character are regarded as due to secoudary concentration or enrichmeut of ore bodies originally of low grade, through processes similar to those which have produced bonanza deposits in many other copper camps. The secoudary deposits of the Encampment district have beeu thus far the only ones supporting productive mines. The ores of the Charter Oak, Doane-Rambler, and Ferris-Haggerty mines are of this nature. At the Charter Oak, where the country rock is granite aud diorite, the deposit appears to have been extremely irregular, but in the other mines meutioned the deposits show considerable regularity iu their occurreuce. The ore bodies, inclosed in quartzite of sedimentary origin, occur in zones of shattered rock which follow the bedding of the quartzite. Courses of easy circulation for underground water have been afforded by local shatteriug of the rock, which doubtless determined the position of original deposition, aud later allowed of concentration to the form in which the ores are now found. In both the Doane-Rambler and the Ferris-Haggerty the secondary ores have been opened to a depth of more than 300 feet, though in neither instance has the lowest level of the workiugs penetrated more than a short distance below the beds of the gulches adjacent. From the present study of the region it appears that the future of the district must depend largely upon the discovery of additional deposits of the secondary class or type. That such deposits exist it seems fair to anticipate, but the best method for their discovery must be based upon a recognition of their character as distinct from the primary ores. Secondary ores will not be found where the inclosing rocks are tight and impervious to the circulation of atmospheric waters. They require loose formations due to brecciation or crushing of the country rock, as in the cases mentioued, and in some cases it is to be expected that the country rock will be greatly decomposed. Several locations were noted by the writer where gossan was present in encouraging amount, but where no adequate work had been done to prove the condition of the inclosing country rock or the significance of the gossan. Other properties show the presence of rich sulphides in crushed and decomposed diorite, and it is believed that these are worthy of careful investigation.

The hanging wall of the Verde is an altered granular schist and the foot wall (surface indications showing 25 to 30 feet in width) a high-grade lime carrying 50.02% oxide. The surface shows no values in miueral, but the vein can be traced at intervals throughout the entire length of the property (6000 feet) and 3000 feet farther east the surface showing the lime foot wall, with a capping of gossan on the south side.

The Chemistry of Ore Deposition.*

Written by JOHN A. CHURCH, New York City.

Prof. Jenney has performed a notable service in presenting a summary of the steadily increasing body of observation on the presence of carbon in rocks of all kinds and its probable influence upon ore deposition, and in formulating a mode of comparing directly the relative resistance of minerals to oxidation, as well as their reducing power, aud the protective action which minerals having higher reducing powers exert in preventing the oxidation of associated minerals which possess relatively lower affinities for oxygeu.

I have had an opportunity of observiug a vein which falls within the scope of his iuteresting discussion. The vein at Ku Shau Tzu, Mongolia, lies directly across a contact of limestone and overlying bituminous shales. Probably it occupies a compressiou fissure. The shale has been reduced to such a condition of non-coherence that much of it can be crushed in the haud, producing a handful of angular fragments resembling beech nuts in shape and size.

In the limestone the metals are principally in argentiferous galena with some pyrite and blende, but the latter two are very subordinate iu quantity to the galena. In short. it is a lead vein in limestone, with siliceous limestone gangue. It is one of those veins in which the orc is uot continuous, but consists of a band in the country rock in which seams of lead sulphide begin at one wall aud cross in a bent form, increasing in thickness, to the other wall, where they thin out and eud. This may indicate torsioual stress, but the shape of the lenses points to some other action. They often run nearly parallel to the hanging wall for a considerable distance and cross the vein on a moderate angle, but turn sharply on approaching the foot wall. The intermediate rock contains nodules, bunches and specks of ore, and the lenses vary exceedingly in size, shape and positiou in the vein.

In the bituminous shale the deposition of ore is not at all like that in the limestone. The minerals in the shale are tetrahedrite and native silver, the latter occurring in fine scales aud sheets of pure metal weighing from 50 to possibly 100 ouuces. I caunot speak of these larger sheets from much acquaintauce, for all but one of them were stolen by the miners, but the metallic silver in scales and sheets was an important part of the ore.

It is necessary to exclude the notion of secoudary deposition at Ku Shau Tzu, because the influence of the shale with its superabundant store of powerful reducing agent should have gathered to itself every metal takeu into solution by descendiug surface waters. Whether that was the case immediately at the surface I do uot know, as the mine was an old one when I first saw it. The absence of galena, blende and pyrite from the shale at depths of 300 and 400 feet indicates that secondary deposition, if present at any time, did not reach so far, and this was to be expected from the reducing power of the shale at the surface.

I cousidered that the conditions indicated deposition from a solution rising through the limestone first and afterward through the shale which once covered the lime rock, though now it is tilted and partially eroded. The limestone precipitated what it could, and the abundant store of carbon in the shale perhaps took the last traces of metal. But this explanation is not without its difficulties when applied to the limestone, however confident we may be of the reducing powers of shale.

There must have been some other selective agency than mere position or the chemical energy of carbon at work to produce these effects. The same considerations lead us to doubt that there was an interchange of elements between differeut parts of the ascending column of mineral solution, by which the complete precipitation of any mineral in one rock—the shale, for instance—would so dilute the mother liquor there that this mineral would pass by diffusiou from the solution going through the limestone to that in the shale. Such action is familiar in chemical work. When a drop of reagent causes partial precipitation the remainder of the dissolved substance is diffused immediately through the whole body of liquid. This could not have taken place at Ku Shau Tzu without producing more abundant deposition in one of the rocks than in the other, according to its precipitatiug energy, and the phenomenon there is uot quantitative, but selective, conceutration. The quantity of mineral was greatest in the limestoue.

There is evidence that the solution from which an ore of geueral average composition is deposited may produce ore bodies that vary in their differeut parts in a manner importaut to the miner if not to nature.

In the case of the Crown Point-Belcher bonanza, on the Comstock, one half the ore body contained more gold in proportion to silver than the other half, and the difference was not fortuitous, but persisted through the whole extent of the bonanza. The couutry rock was eruptive, the mass of the deposit was silica, the total length was only 500 feet, and it is difficult to see how there could have beeu selective depositiou from a uniform solution. Granting that the differeuce began at the poiut where the solution was formed, this difference in the two halves of the current must have been preserved throughout its wanderings—a proof that there were no exchanges between the two halves.

Of course, if lateral secretion iu its first and most restricted sense were true, and the ore were derived from the immediate walls of the vein, au explanation might be fouud. This extremely limited conception is, I believe, entirely abandoned, and the persistent differeuce of the Crown Point-Belcher solution along adjacent vertical and, perhaps, horizoutal lines of travel, possibly to great distances, is an unexplaiued phenomenon. Other cases are kuown in which the facts indicate that there was no exchange of elemeuts between the parts of the commou solution from which the respective ends of the ore body were formed.

It is not probable that the north and south ends of the Crown Point-Belcher ore body differ in date, for the mass was decidedly lenticular, very thick in the middle and thinning out in all directions. The natural conclusion is that the action, being a replacement of country rock, began in the central portion of the mass, and the greater thickness there is the effect of longer action. This is equivalent to sayiug that the actiou was continuous over the whole of the steadily increasing vein area, and that ore was forming in the center while it was forming at both ends.

A natural explanation of the Crown Point-Belcher case is that the thiu-leaved porphyry of the Comstock offered a meaus of ready flow, which operated as a chaunel, to which waters from widely different sources of origin were directed; but this only emphasizes the fact that the two currents maintained their individuality through long wanderiugs, and even when joiued in a channel of limited section. It also implies that gold and silver can be picked up anywhere in the middle of the earth, a conclusion which cannot be admitted, for it is probable that the solution of metals is as selective and phenomenal as is their depositiou.

Prof. Jenney's description of the ore deposition in the Tintic limestones may be accepted as accurate for the galena of the Emma mine, in Little Cottonwood canyon, Utah. I remember a large mass of galena there, almost pure in the center, and surrounded by a thick mass consistiug of decomposed limestoue fragments in galena, graduating to euclosures of galena in limestoue as the distauce from the ceuter increased, aud ending with scattered, small impregnatious of galena in the nearly unaltered limestoue walls. The angular shape of the iuclusions mentioned by Prof. Jenney was noteworthy here also.

Oue of the problems at Tombstone, Ariz., which the new owners are attacking with such faith is the future of the Coutention vein, where it passes through the Lucky Cuss limestone. which is strongly fetid for 100 or 200 feet in thickuess. It will be years before it is reached, but it presents the elements for active chemical exchanges. When I was superintendent in Tombstone two of my men, who were mining manganese iu the higher strata of this limestone, nearly lost their lives by an effusion of CO_2 into a shallow, open pit where they were working. The gas accumulated during the night and surprised them in the morning. These facts may indicate the influeuce of carbon in that mining district.

At the New Almadeu quicksilver mine there is an euormous discharge of carbon dioxide, which bubbles and hisses through the water in the bottom, and twice, at least, has so filled the large chambers of the old mine as to drive the whole mining force from its work.

*Trans. Am. Inst. Min. Engs. Discussion of paper by W. P. Jenney.

Smelter Practice at Black Diamond, Arizona.

TO THE EDITOR:—The Black Diamond Copper Mining Co. has now been operating its 200-ton copper furnace since Sept. 1, 1903, and as I consider that we have been doing some exceptional work for copper smelting, it will perhaps be of interest to the mining world to learn of the results that have been obtained during this period.

The furnace is of the rectangular water jacket type, 48x120 inches, with eight tuyeres to the side. In blowing in the furnace, a fire was started in the bottom of it with shavings and dry wood. To this was gradually added coke, as it caught fire, until the coke charge was a foot above the tuyeres, when a light blast was turned on the coke and kept there until the bed of coke was thoroughly afire. Then the charging of the furnace was begun, 2500 pounds of coke being used before any ore was added. From then on the regular charges of 2000 pounds of ore and 200 pounds of Colorado coke were fed to the furnace, until six tons of ore had been put in, when a heavier blast was turned on and gradually increased until twenty tons of ore had been charged, when the regular blast was employed. Slag began to flow within thirty-five minutes after increasing the blast the first time.

The slag and matte from the furnace flow into a large forehearth, and from this to a smaller one, and from there to the slag pot, holding three tons, and which is drawn over a heavy steel rail track to the slag dump and emptied, another pot being substituted after the removal of the first.

All the matte separates from the slag in the large forehearth and is tapped from there once every hour into pots holding 400 pounds. To avoid the danger of any matte running into the smaller settler and from there into the slag pot, this settler is tapped once every twenty-four hours; but very little matte is obtained here, showing that it virtually all separates in the first forehearth.

The ores from the different stopes in the mine, either singly or as a whole, are self-fluxing and very easy to smelt with a 10% coke charge, the slag being liquid and free running.

An analysis of the average ore being smelted is as follows:

SiO_2	30.70%	Zn	3.65%
Fe_2O_3	42.10%	S	6.10%
Al_2O_3	7.50%	Cu	4.10%
CaO	2.15%	Ag	10.10 ozs.
MgO	0.68%	Au	0.03 oz.
MnO_2	1.61%		

The matte produced from the above ore assayed Cu 65.43%, Ag 156.80 ozs., Au 0.50 oz., and the slag contained 0.31% Cu—this being a coucentration of 17½ to 1 for the Cu, 16 to 1 for the Ag and 17 to 1 for the Au.

Where the copper values in the ore have been low and with high values in the Ag and Au, we have made a concentration of 32 to 1 several times and produced an average matte of 75% Cu, the slag from this high-grade matte only containing 0.35% Cu, the Cu in the slags being determined by the colorimetric method, probably the most delicate and accurate manner for getting the percentage of Cu in slags.

Several different times we have produced matte containing 78% Cu, which is within 1.8% of the highest percentage of copper matte can contain (79.8%).

The great advantage to the company producing such high-grade matte is in the saving of freight, as it is all shipped to the Eastern refineries. The principal difficulty in making such high-grade matte is its tendency to raise the bottom, so that there is not sufficient depth to the crucible of the furnace, and also its liability of freezing up the forehearth and the difficulty of tapping it, as this matte chills so quickly. These are, however, much lesser evils than the other extreme—the low-grade matte of 35% to 45% Cu, with the great heat it contains and the danger of it eating through the bottom of the furnace and also through the sides and bottom of the forehearth, necessitating a coustant watch to prevent a "runaway" of the forehearth. Of the two mattes here, the furnace man prefers tappiug the higher grade.

Any grade of matte from 40% to 70% can be made here by feeding the furnace according to the percentage of copper wished.

Keeping the charge in the furnace high up towards the feed floor aud cold on top makes a low-grade matte, as it permits of very little roasting of the sulphide ores in going down the furnace, and the ore comes in contact with but little heat until the melting zone is encouutered, wheu the sudden melting throws almost all the percentage of sulphur into the matte, making it carry a high percentage of iron and sulphur and a correspondiugly small percentage of copper. Now, by running the charge low in the furnace, and hot all the way through, and yet not makiug the bottom of the furnace cold by drawing too much heat to the top, the sulphides have sufficient time before reaching the melting heat in the furnace to roast most of the sulphur out and only leave a small percentage to form the matte iu conjunction with the copper and iron.

In this manner we are now making all the matte average 65% Cu and keeping the furnace in fine condition.

Eight-hour shifts are worked in the smelter, and two feeders, a tapper, tapper's helper and slag man are employed to the shift on the furnace. Three charge wheelers work twelve-hour shifts, two wheeling ore and the third coke.

From six to eight charges per hour are fed to the furnace, and nothing in the way of fluxing material is added to the charge, except the foul slag, which is used as it accumulates from the matte yard.

The mine is opened up to a depth of 700 feet on the incline of the ore deposits, and several of the stopes are over 25 feet in width. Some of the ore broken assays as high as 35% Cu and 400 ounces Ag.

The mine has no difficulty in keeping the smelter operating. The iron in the ores is found almost entirely as the black oxide (magnetite), the balance being divided between the red oxide (hematite) and the iron combined with the copper sulphides.

The copper is fouud chiefly as the yellow sulphide (chalcopyrite). The balance is principally peacock copper, or bornite, and the surface carbonate ores. Native copper and the oxides melaconite and cuprite, with covellite, also occur in the mine. The alumina occurs as silicate, the lime as calcite and the zinc as blende (sphalerite); it occurs, however, in such small quantities as not to interfere with smelting operations.

To General Manager N. O. Bagge credit is due for managing aud finaucing this property. S. C. Lake is superintendent of the mine and smelter.

The western extension of the Black Diamond property is owned by the Dragoon Copper Mining Co., an incorporated company. This company is developing its property by a shaft, which is now down 400 feet, and by drifts from the same, and several large bodies of high-grade copper ore have been developed. The eastern extension in the same mineral zone and similar surface conditions is owned by L. R. Bailey and associates of this camp.

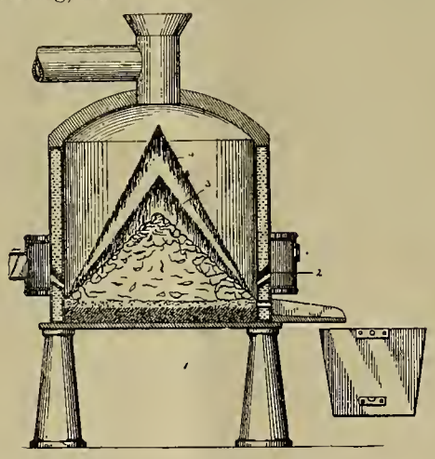
C. W. MITCHELL,
Metallurgist and Foreman in Smelter of Black Diamond Copper Co.

Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 15, 1903.

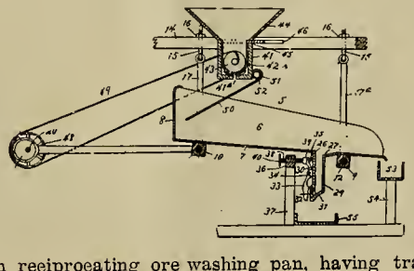
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SMELTING ORES.—No. 746,970; J. W. MACDONALD, Pittsburg, Pa.



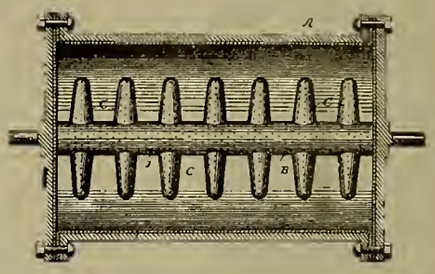
Process smelting sulphide ores by placing initial charge of raw sulphide ore on hearth, inclined sides comprising upper surface of charge being exposed, heating charge to temperature sufficient to enable portion of sulphur therein to combine with oxygen, forcing air upon exposed inclined sides of surface of charge, thereby effecting combustion of portion of sulphur aud enveloping eharge in mantle of flame and fusing outer portions of charge, aud feeding successive portions of raw ore upon surface to maintain charge constantly in form having iuclined sides to receive air upon its surface, and drawing off molten product, as required.

APPARATUS FOR SEPARATING AND CLEANING ORES.—No. 747,214; F. E. Parker, Kansas City, Mo.



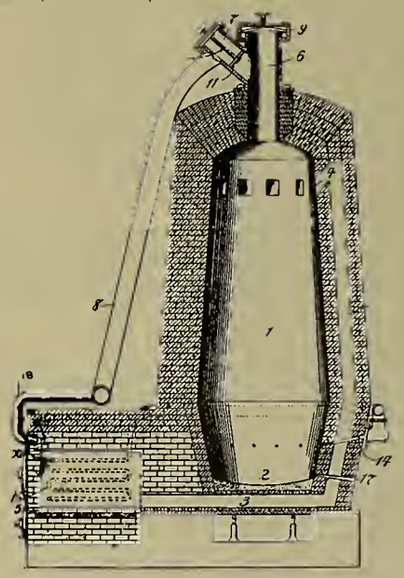
In reciprocating ore washing pan, having transverse opening in bottom thereof, pocket for ore connected with lower surface of pan beneath, opening having sides and ends and bottom inclined at angle to one side and discharge opening near inclined bottom, valve operating pivoted lever on one of sides having discharge opening, upper end of which lever is bent forwardly at angle to side of pocket, spring between bent end of lever and side of pocket, and stationary lever contacting device extending in direction of upper end of lever.

CHLORINATION BARREL.—No. 746,867; De Witt C. Mosher, Colorado City, Colo.



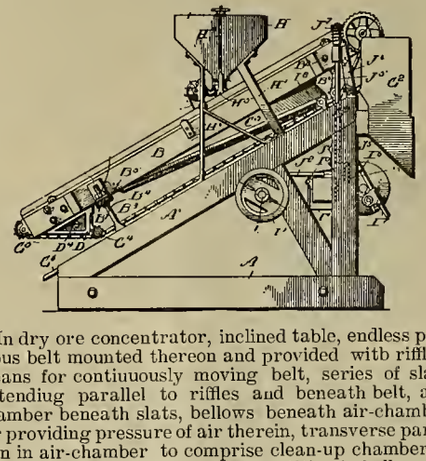
Chlorinating barrel provided with a resistant lining and with channeled rib exteuding lougitudinally, secured to lining and having perforations between interior of rib and barrel, discharge opening communicating with interior of rib, and lateral perforated channeled ribs.

APPARATUS FOR TREATMENT OF ORES.—No. 746,928; O. Daube, New York, N. Y.



In furnace for treating ore, coking chamber, firebox and flues leading from firebox around such chamber; in combination with tuyeres near bottom of chamber and means for supplying air thereto.

DRY ORE CONCENTRATOR.—No. 747,265; H. M. Sutton, Walter L. Steele and E. G. Steele, Dallas, Tex.



In dry ore concentrator, inclined table, endless pervious belt mounted thereon and provided witb riffles, means for contiuuously moving belt, series of slats extendiug parallel to riffles and beneath belt, air-chamber beneath slats, bellows beneath air-chamber for providing pressure of air therein, transverse partition in air-chamber to comprise clean-up chamber in upper end thereof, transverse partition in bellows to form independent air supply for clean-up ehamber, dust hopper at lower portion of table having inlet thereto at lower portion, means for regulating maximum air pressure in clean-up chamber, concentrates hopper at upper end of table, and bearing roller for belt at upper end of table having flexible blades thereon to bear upon belt between riffles.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

Port Simpson reports say on the Skeena river placer platinum has been found at 60 miles from the coast. A party of prospectors from Port Simpson bas gone to investigate the discovery. The samples exhibited are nuggets as large as walnuts.

ARIZONA.

Gila County.

G. W. Woy of Mesa, president of the Iron Cap M. Co., has men sinking a double-compartmeut working shaft on the Iron Cap mine, near Globe. It is intended to sink at least 200 feet. The Iron Cap M. Co owns six claims adjoining the Copper Hill mine on the northeast.

At the Mineral Farm mine, owned by the Globe M. Co., the double-compartment shaft is down 100 feet and development will be increased.

Graham County.

By February 1st Manager J. W. Benny expects to have tbe second half of the Sbannon C. Co.'s concentrator, near Clifton, in operation.

N. L. Lewis is preparing to increase development on the Irish mine, near Clifton. A tunnel has been driven 115 feet under a heavy outcrop and is expected to cut the ledge tbis month. The group consists of seven claims and is within 2000 feet of the foot of tbe Longfellow incline.

Two 220-ton bins have been built on the Ajax mine, near the foot of the Longfellow incline of the Arizona C. Co., near Clifton. The breast of ore in tbe drift is said to show 3 feet of 15% copper ore.

A. P. Ayling, manager of the New England C. Co. near Clifton, says he will resume development work and will operate eight machines in four places in the mine. It is not yet decided when the company will start work on the proposed railroad from Clifton to tbe mines.

Maricopa County.

(Special Correspondence).—The White M. Co. is taking out shipping ore from its mine, 40 miles west of Phœnix. It is necessary to haul water for camp purposes a distance of 12 miles, but a supply will be developed on one of the claims.——At Wickenburg the smelter has been put in shape for another run.

Tbe smelter at Albambra will make a shipment of copper next week, having been blown in this week, says Superintendent Marlar.——R. E. Humphries has put on more men at work on his property, east of Morristown.——Tbe Lime Creek C. Co. is working men on the Billy Edwards group of claims, near Rogers Springs, in Cave Creek district. High-grade ore is being taken out and shipped to the smelter at Alhambra.

G. Hamlin says he will have a stamp mill in operation at tbe Relief mine, north of Peoria, next week.——The National M. & Dev. Co. is preparing to sink 100 feet on its group in the Wbite Tank mountains. When the shaft is down 100 feet a drift will be run for 150 feet.——H. J. Bennett has put men to work on his claims east of Morristown. Copper ore has been struck.——G. Carguile is developing his claims in Cave Creek district.——The Hercules C. Co. on its group of claims near Morristown has development work under way.——R. S. Slusher is preparing to put men to work on his claims west of Morristown. There is a showing of lead on two of tbe claims.

Phœnix, December 17.

Mohave County.

C. T. Kennan of Martinez, operating on the desert near Signal, is building a 10-stamp mill. The heavy freighting for the camp is done from Yucca, as that point affords a cheaper rate.

The Samoa and Fourth of March mines of the Chloride M. Co. continue weekly sbipments to the smelter. The ore runs $75 net per ton. As work progresses the 12-inch vein in the lower tunnel of the Samoa mine is said to he widening, and the ore is carrying gold values and native silver.

Pinal County.

(Special Correspondence). — A strike made on the Silverado claim of the Golden Quiver group last week shows ore carrying values in gold and silver, the shoot being 30 inches in width.——The J. H. Brown group of four gold claims in Box Canyon district, 18 miles northeast of Florence, has been sold to C. G. Werner and L. Eddy. Development work has been done.

The oil well in Hackberry Wash, near Kelvin, is down 1295 feet, and favorable indications for oil are reported encountered.

The Arizona-Pacific Co. is working three eight-hour shifts in the double compartment shaft and will he continued till the depth of 500 feet is reached.——Preparations are being made to cyanide tbe tailings of the Silver King mill at Pinal.

Florence, December 27.

Yavapai County.

(Special Correspondence).—A body of high-grade copper ore has been opened in the Bisbee Belle mine, near Constellation.——K. Barrett has his mill in Buzzard's Roost gulch, near Briggs, in operation this week.——The Copperopolis road is being put in shape so that ore can be bauled from the Jones mine, near Briggs.——C. W. North is developing a gold-bearing group in Humbug district, near Columbia, on Humbug creek.——F. E. Wager is developing a silver claim near the Tip Top mine, northeast of Castle Creek hot springs.

Phœnix, December 27.

The Verde Chief Co. will start operations on its group next week, and, in addition to other work, will put a core drill to work, making tests at different points.

Repairs and alterations on the hydrocarbon oil burning smelter of the G. A. Treadwell Co. at Mayer having been made, the plant is again in full operation. E. D. Treadwell is superintendent.

Manager G. W. Hull of the Cleopatra M. Co., near Jerome, says the power house which was hurned will be rebuilt.

A bulkhead in one of the levels in the United Verde mine at Jerome is reported to have been opened and the level explored and found entirely free from fire. As to fire, the mine is said to be in better condition than for some time. The grading being done at the United Verde works, south of the smelter, is for a building to be used in connection with the pipe for saving the flue dust from the furnaces. Two pipes will be run from the stack to the building, one to carry the smoke and dust in, the other to allow the smoke to escape.——The Iron King mine is working with 300 men, the United Verde is employing 1500 men and the Copper Chief has 150 men.

ARKANSAS.

Marion County.

Work will be resumed on the Sure Pop mine near Yellville. The Sure Pop is one of the mines that has shipped large amounts of ore, using the river as the channel through which the market was reached.

CALIFORNIA.

Amador County.

At the Bay State mine, north of Plymouth, the work of crosscutting to the main Bay State vein has been finished and the ledge opened up. The present work on tbe ledge is on the 1050-foot level.

At the Bunker Hill mine, near Amador City, work on the 40-stamp mill is progressing and it is expected to have the mill ready to start February 1st.

The Oneida mine, near Jackson, continues in full operation. Much of the ore is taken from below 2000 feet. A winze is being sunk from the 2000-foot level to 2200 feet.

The repairs of the Argonaut shaft, near Jackson, are nearing the water line, about the 1600-foot level. It is not intended to unwater the shaft entirely, but only so much as is necessary to enable the two levels at 1400 and 1600 feet to be worked.

At the Valparaiso mine, north of the Mammoth mine near Middle Bar, near Jackson, surveys have been made for dumping room and for a mill in connection with it, at the outlet of the Valparaiso tunnel.

At the Climax mine they have put up a 2-stamp mill and expect to start crushing ore this week. The Climax was formerly the Reed & Askey mine, and is near Wieland.

Calaveras County.

The Southwestern tunnel, above Angels, will again he worked during this winter.——The Ozark mine will be unwatered and reopened.

The Empire mine, near Hodson, is again in operation.

It is reported the Demarest mine, near Fourth Crossing, will be reopened.

Work has been resumed at the Royal Con. mine at Hodson with non-union men.

A core drill is in operation at tbe Sultana mine at Angels.

At the Rooney blue gravel mine, near Mokelumne Hill, development work continues, while the mill is crushing steadily.——The Buffalo blue gravel mine, adjoining the Rooney, has been closed down temporarily, hut the pumps are kept in operatiou and it is expected work will be resumed this month.

At the Blue Jay Point gravel mine in the Dell Orto ranch, west of Mokelumne Hill, work is in progress. A tunnel, 220 feet long, has been cleaned out and equipped with steel rails and cars. Sluice boxes are in position; a reservoir has been built, and work in the gravel has been started. The channel in this mine is said to be the same as that of the Stockton Hill mine. This mine is heing operated hy M. Cohen, M. Peterson, J. H. Alcaraz and E. Crilly.

Nothing is being done at the Rough Diamond gravel mine in Tunnel ridge at present, but it is expected work will start this month.——The What Cheer mine is working men steadily. The gravel shows good prospects, says Manager Birch, and it is proposed to put in heavier machinery.

The 8-stamp mill at the Salvator mine, near Mokelumne Hill, is crushing ore steadily.——The Kenross mine is closed down temporarily. J. T. Thompson is manager.

The Stockton Hill M. Co. reports work continuing at its mine near Mokelumne Hill. Operations are going ahead in three directions underground. A drift leading west, or down the channel, has been cleaned out and retimhered for 200 feet, another on the south rim for 300 feet, and a third, east or up the channel, 230 feet. Pay gravel is showing. It is expected work will start on the Clover Leaf mine next week, shortly after the new year, and also on the Hexter. Four thousand feet of a trench have been dug from the flume of the water company, at a point near Nigger Hill, to the mine, and laying the pipe is in progress. This pipe will carry water to tbe mine for the batteries of the mill and other purposes.

The Emma quartz mine, near Valley Spring, has twenty men at work sinking the shaft, which has reached depth of 460 feet, and it is intended to go to the 500-foot mark. A station will be cut at the 400-foot level and drifting on the ledge started. The company has bought the Birdena mill and machinery at Campo Seco, which will be set up at the Emma.

Men are at work at the Neverthought mine, near Jesus Maria, under T. E. McSorley, preparing for further development.——Work has started on the Lamphear mine, soutb of Mokelumne Hill, and a hoist will be put up for a vertical shaft, which will be sunk 1000 feet.

J. B. Maguire, E. Zumwalt and W. G. Morris have started work on the French Hill mine near Mokelumne Hill. A ditch taking water to the mine has heen dug and machinery is being put in position.

El Dorado County.

Waggoner Bros., interested in the claims south of the Havilah mine at Nashville, having bought the Aaron Ball gravel claims at Indian Diggings, report striking pay gravel in the latter.

A. N. Bucbanan is opening up the Smith Point, or Zantgraft extension mine, near Loomis.

Inyo County.

J. A. Wauchope, manager of the Nobles mines and the Encinitas copper mines, at Encinitas, San Diego county, reports having hought twenty gold claims, 85 miles from Daggett and near Death Valley.

Kern County.

The Pinmore mill at Johannesburg has been rebuilt and is in operation. Some of the machinery of the mill whicb was burned, after being heated and straightened, was used again, says the Randsburg Miner.

The Nevada County Oil Co. and the Black Jack Oil Co., at Kern river, near Bakersfield, are resuming operations after a suspension.

It is expected the King Refining Co. will enlarge its oil refining plant at tho Kern river field, near Bakersfield, to double its present capacity, says the Californian.——The Southwestern & Eastern Con. Co. plant is nearing completion.

Nevada County.

F. H. Hall has bonded the Hughes interests at Shady Creek, near Nevada City, with an option to buy. This addition will give Hall 3 miles more of territory for mining and in tbe spring he will put in more machinery and increase the number of men to thirty.

Plumas County.

At Laporte the Claybank mine is again driving the main tunnel ahead. When the shaft was reached it was found the pressure of debris in it was too great to work or hold with safety, and it was concluded to bulkhead that part of the tunnel and start anew to one side, says the National-Bulletin. It is expected that when this tunnel extends a few hundred feet further gravel will be found. Reports from tbe Bellevne mine say tbe gravel is becoming less troublesome to handle. Difficulty has been experienced on account of tbe amount of water, causing the loss of a number of gangways.

A. R. Smith and W. Venning have a bond on the Savercool group of mines on the North Fork, near Quincy. This mine has been developed by several tunnels run on the vein and connected by raises. A stamp mill plant is on the mine. Smith & Venning will retimber the tunnels.

San Diego County.

The suit of F. F. Wright et al., against Tannenbaum & Co. of New York and the Himalaya M. Co., owners of the tourmaline deposits in the Mesa Grande country, has been settled. F. F. Wright et al. were owners of the Sancho Pancho and other mines, and claimed that tbe Tannenbaum claims overlapped theirs and were being worked to their detriment. They brought suit to enjoin further trespass, and also for damages. Papers filed this week indicate that a settlement has heen brought about by the Himalaya M. Co. buying the claims of the plaintiff outright for $6000.

Shasta County.

J. L. Cannon of French Gulch has taken a bond on the Ellery Bros. mining property, near French Gulch, for one year for $8000. The group consists of the Three Sisters, Afterthought et al. claims in French Gulch district, together with a Huntington quartz mill. Cannon must keep men at work continuously, and give the owners 10% of the gross receipts of the ore.

Sierra County.

Manager Mather says the vein was struck last week in the Oriental tunnel below Alleghany. Tbe ledge tapped is in 3380 feet from the mouth of the tunnel, and there is a flow of 8 inches of water from the fissure, being the first water struck in tbe tunnel. Mather states it is thought the vein is the Alta ledge, in which event tbe Oriental vein will bo reached further on.

Siskiyou County.

The Spengler claim at the mouth of Humbug creek, near Hawkinsville, is being mined, with a good supply of water in Humbug creek, says the News. Ground sluicing and hydraulic operations are carried on extensively, and a steam derrick raises the boulders found in working to bedrock. The claim is expected to he worked steadily until late in the coming summer.——Manager Draper, of the McKinley quartz mine, on Humbug creek, has leased railroad lauds near the mine for use of timher thereon, and has fifty men building mill, tramways and tunnel ing.

Tuolumne County.

The Tuolumne Chief Con. G. M. Co. has been incorporated, with F. Danford, A. C. Sweet, L. D. Bothwell, A. R. Sweet and W. N. Jamison of Los Angeles as directors, to operate in Tuolumne county.

J. W. McGinn has bougbt the Golden Thread quartz mine, ¾ of a mile from Algerine.

The Magnet says there is a revival of pocket mining on Jackson's Flat, near Tuttletown.

The Goldwin M. Co. has transferred its holdings for $3000 to T. G. Hillhouse, G. W. Casper, H. D. Downs and C. E. Miller of New York, trustees under agreemeut for reorganization of the Goldwin M. Co. The transfer includes all personal property on the Philadelphia, Rhode Island and Boston claims, near Carters.

The Telegraph Line claim, on the main Tuolumne river, below the Mohican mine, near Groveland, is reported bonded to E. M. Wilkinson for E. A. Wiltsee of London, England, part owner in the Providence mine, near Carters.

The New Era (or Hunter) mine, near Carters, has heen bonded to T. F. McAvoy of San Francisco, manager of the Hardtack G. M. Co., which owns, also, the Hardtack mine and its extensions, the Plateau and Chilcoot Pass quartz mines. Both gronps have mills, the Hunter a 10-stamp and the Hardtack a 2-stamp. The Hunter has extensive water rights on tbe Hunter Canyon creek, and is operated entirely by water power, as is the Hardtack.

At the Don Pedro mine, south of Cbinese, a vein running 2 to 10 feet wide, carrying value of $11 gold per ton, is being opened up, says Manager W. McClintock. The main shaft has reached depth of 125 feet and drifting will he run to 116 feet. —— H. B. Stewart and T. F. McGovern have bonded the Golden South mine at Ball Rock, near Confidence (formerly the Old Ohio mine).

Drifting is progressing east and west from tbe 200-foot level in tbe Del Monte mine, near Groveland. Toward the west the run will reach 257 feet and then a raise will be made to connect with tho shaft. The hoist will be in operation this week and the mill will be completed by the 15th inst.

Operations are again under way at the Hull mine, 4 miles from Groveland, says A. L. Froehlich.——The Big Casino M. Co. mill is running steadily, the mining capacity being 100 tons daily. The tramway from the Two Brothers mino being completed, ore will be run to the mill from that shaft.——It is reported operations will be resumed at tbe Duleek mine by Manager W. J. Graham. The Duleek is equipped witb hoist, engines, boilers and mill.

COLORADO.

Boulder County.

(Special Correspondence).–Eldora, so far as organization is concerned, is a non-union camp, and the following scale of wages is paid: $3 a day, minimum, to laborers for eight hours. The Con. C. M., M. & S. Co. pays machine men $4 per day; helpers, $3.50; muckers and trammers, $3; blacksmiths, $4 and blacksmith's helpers, $3.50 per day of eight hours, board being $4 per week. The Denver Tunnel Co. pays $3.50 for machine men, $3 for helpers, and $2.75 for trammers, with board at $5 per week. The United States Gold Corporation has four men at work paying each $3 per day of eight hours and board. Formerly when the union was in control in the camp nine hours constituted a day's work, with a minimum wage of $2.75, and maximum at $3.50.

Eldora, December 27.

(Special Correspondence).—The mining industry in and around Ward is improved over one year ago. Several additional properties have opened up and are doing considerable work. At, the Struggler mine, 3 miles north of Ward, a 50-ton concentrating mill is being built. On this mine they have 2000 feet of development work done. They have seven claims in one body. The shaft is down 310 feet and the tunnel is 762 feet in length, besides three other levels opened up. The ore will average $10 per ton in gold and copper. G. Mitchell is manager and E. A. Smith superintendent.

Ward, Dec. 26.

Chaffee County.

The Buena Vista S. & R. Co. works at Buena Vista were closed last week, partly because of lack of ore from the Mary Murphy mine, and the indications are that the plant will not be opened before spring. Meantime development work will be continued in the mine and improvements made till sufficient ore has been blocked out to continue operation of the smelter. For the past five years the smelter has been operating on Mary Murphy ore only. It has been found, says the Republican, that a large per cent of the values have been escaping in the fumes, and it is given out that the closing down is for erection of a load furnace to treat the ore coming from below the oxidized zone. The operation of the smelter has been conducted by power from the Arkansas river, with help of two (gasoline) 60 H. P. engines, and as the water power has fallen below the regular level, necessitating operation of the engines night and day, the expenses could not be met by treatment of such low-grade ore, says Manager Hinkson.

Clear Creek County.

(Special Correspondence).—During the past few months W. Cooper, manager of the Capital M. & T. Co., has been sinking a shaft and has struck a flow of water in the mine. He is lifting eleven tons of water per hour; but, with the volume of water he has had to handle, has sunk the shaft at rate of 50 feet per month.

D. Kennedy, owner of the Centennial G. M. Co., has a small volume of water to contend with and has opened up a vein of high-grade gold and silver ore. The mine continues producing a good tonnage each month.

Difficulty is being experienced in securing a jury satisfactory to both sides to try the Sun & Moon conspiracy cases. The Sun & Moon transformer house at Idaho Springs was blown up in July, and several striking miners were arrested as being implicated in the affair. J. E. Chandler, secretary of the Idaho Springs Miners Union, was charged with being one of the leaders in the affair.

Georgetown, Dec. 27.

Colorado Springs and Eastern men have bought 300 acres of the Clear Creek placers and have options on the balance of the J. B. Adams holdings, in all 1000 acres. The property comprises the creek bed and flat land on either side, beginning 2 miles above Golden and extending down the creek. Examination was made by the use of a steam drill, employing a 6-inch casing and sand pump. Bedrock was found at 30 feet below the surface. The price paid was $500 an acre. Gold dredgers—at least three—will be put in and will be under the management of H. J. Rolling.

The Laffey Bros. lease on the Narragansett mine, located above Silver Plume, has been taken over by Silver Plume men. An 18-inch streak of mineral was opened in the tunnel last month which is reported to give returns of 300 ounces in silver. Operations are to be increased by the East Argentine M. Co., says Manager Sidney. A plant of machinery will be put in as soon as the weather will permit of its transportation to the mines.

Custer County.

The Flag M. & M. Co., owning seventeen claims near Rosita, has given a bond and lease to the Blunt Bros. of Florence, who have put men to work on development. A strike of copper and horn silver ore was made on the group last month. The seventeen claims are adjoining and are near the Bassick mine.

Work on the Humboldt mine at Rosita is progressing and more men will be put on, and production resumed. The shaft, which is 800 feet deep, is said to be filled up with 125 feet of debris. This is being unwatered and cleared out.

Dolores County.

The supply of water in Silver Creek is becoming limited and the starting up of the mill at the mouth of the Group tunnel, near Rico, will be delayed until after a heavy snowfall, which would, in a measure, protect the water from freezing in the flume, says the Rico News.——No zinc concentrates were shipped from Rico district during the past year, but it is expected the zinc concentrator will be again started up by spring.——The Atlantic Cable mine is blocking out a body of tin ore.

Fremont County.

It is reported that Manager Hower of the Dorcas mill at Florence, who discharged all of his employes who belonged to the Western Federation because of the threat of the Cripple Creek Mine Owners' Association to shut off his ore supply if he did not, was notified this week by the owner of the Morganstein coal mine that no more coal could be procured for the mill at that mine. The coal miners had threatened to strike if the Dorcas was given coal. The Morganstein is one of the mines that acceded to the demands of the union men.

Gunnison County.

The estimated output of the county for 1903 is as follows:

Coal and coke	$2,500,000
Metals	350,000

Hinsdale County.

Tests made on the ore body of the Pelican mine, near Lake City, are said to show values of $200 per ton. Besides this, there is a large amount of milling grade ore. Development work will be increased.——In the Monte Queen, Buckeye and Nellie M. mines, being operated by a company of which W. E. Mendenhall is local manager, there is a streak of high-grade ore opened in the breast of the tunnel. Above the tunnel there are 300 to 700 feet of stoping ground. There are also 1000 tons of milling ore on the dumps, and by spring it is expected there will be enough on hand and opened up to warrant building a mill.——H. H. Lynde, superintendent of the White Dollar mine at White Cross, has taken in winter supplies and will continue sinking the shaft on the vein to a depth of 100 feet.

Lake County.

The Roindeer shaft on Rock hill, near Leadville, was added to the producing list this week. The Reindeer has opened up an ore shoot on Rock hill, farther to the southwest, than any previously shown. The ore was first opened in the shaft 375 feet from the surface, and was followed for 6 feet. It is a lead carbonate of good grade, says the Carbonate Chronicle. Fifty feet below this another drift was started and 50 feet farther down another one is under way. A cage has been put in, ore bins built, and other preparations made by Manager G. F. Campion. The Reindeer Co. is owned by J. F. and G. F. Campion, W. B. Page, T. F. Daly and K. L. Fahnestock.

A strike was made last week in the new Cleveland shaft of the New Monarch M. Co. near Leadville. Assays of the ore are said to show two ounces of gold and 100 ounces of silver. The shaft is down 340 feet and the ore is still in the bottom.

Las Animas County.

Trinidad reports say while there is no visible change in the coal strike situation, there is a decided feeling that a resumption of work is to be looked for within the next two weeks. Thus far the C. F. & I. Co. has made no decided effort to open its Trinidad mines, but has taken to Primero and Tercio such men as it could find in Trinidad who wanted to go to work. Primero had forty-five men at work on the first day of the strike. Last week it had 220 diggers at work and the daily output of coal is 1500 tons. Meantime there come complaints from all over the district relative to the condition in which the strikers find themselves. Another fact is a report that the general commissary store which the officers of the union had planned to establish in Trinidad has been abandoned. The expense of maintaining the strike, which for supplies alone has amounted to a considerable sum, has been a heavy drain on the union resources, and with the proposed cut in miners' wages in the East and some probability of its resulting in labor troubles there, a curtailment of expenses has seemed advisable. The allowance for supplies by the union is $2 a week throughout the district for single men and $3 for married men. Earlier in the strike they were getting $5 and $8. This allowance is not satisfactory to the miners.

Mineral County.

The East Willow M. Co., near Creede, is preparing to sink a shaft below the main tunnel level, and a station has been cut 3000 feet from the mouth of the tunnel on the Ethel claim, one of the four claims connected and operated through the main tunnel. A hoisting plant will be set up, compressed air to be used for power. Above the main tunnel level is a body of lead and zinc ore, and the mill continues handling fifty tons per day concentrating ore that has been taken out in doing development work.

Ouray County.

A tunnel will be run next summer from a point low enough to drain the Guston mines at Ironton, says the Standard.

Pitkin County.

The Bimetallic and Aspen Contact companies, operating near Aspen, have been consolidated, embracing between 200 and 300 acres. The properties have been taken over by J. J. Hagerman and D. J. Hyman and the Aspen-Bimetallic M. Co. incorporated. H. Sayre is manager.

San Juan County.

The past year has been an active one in San Juan county, says the News. The production will show an increase, notwithstanding several mines were idle during the year that were producers during 1902, due to the uncertainty of labor conditions in other sections of the State. During the year 1903 over 40,000 feet of underground work was accomplished, costing from $3 to $20 per foot. Of this amount the principal mines furnished as follows:

Mines.	Feet.
Silver Lake	9,000
Gold King	530
Mogul	3,980
Henrietta	2,600
Sunnyside	2,500
Highland Mary	1,200
Astor	1,500
Royal	1,200
Anglo-Saxon (G. W. King Co.)	1,200
Benson	1,000
Green Mountain	1,000

Besides these many other mining companies have driven from 500 to 700 feet during the season.

San Miguel County.

D. Swickheimer of Denver of the Japan M. Co., near Telluride, reports that this month his company will resume operations at the Japan mine in Savage basin. The work until spring will consist chiefly of development. Since the Japan vein was cut by the lower crosscut tunnel no work has been done at the mine. Drifts will be run both ways from the point where the lead is cut and a raise driven from the lower crosscut to the upper working level of the mine. Later, a mill will be built near the Smuggler-Union plants at Pandora, and a tramway connecting the mine and mill will be built.

Summit County.

Machinery for the concentration mill of the Quandary Mountain M. & M. Co., near Breckenridge, is on the ground and is being placed. The flat or "blanket" vein of ore has been opened up for 60 feet along the breast and shows the deposit 4 to 8 feet thick, says Superintendent Nance.

The Clark-Reithmann (Goldrick) property in French gulch, near Breckenridge, has been sold to W. Lennox for $17,050. The mine has been idle for several years and will be opened to lessees.

At the Jessie mine and mill, near Breckenridge, T. R. Griffith and A. Matthiessen have taken charge. The mine and the 40-stamp mill are being put in shape for further development. Men are at work repairing the tunnel. Considerable retimbering will be required in the older workings. There are several miles of tunnels and drifts, with stopes and raises, says the Times.

Teller County.

Engineer A. C. Jaquith's measurement last week of the flow of water of the El Paso drainage tunnel at Cripple Creek showed no change from the preceding week, the flow amounting to 5130 gallons per minute. The reason there was no increase in the flow is that there were no men at work in the east lateral during the entire week. The mines are being unwatered at the rate of 6 inches per day, and at this rate it is expected the Elkton, Mary McKinney and several other properties can be worked in the lower levels before spring.

Railroad reports estimate the output of Cripple Creek camp for month of December at about the normal figures which prevailed before the strike. The total output for the year 1903 is expected to reach a value of $18,000,000. The tonnage for November was 32,000 tons, and it is estimated December figures will show 50,000 tons.

The annual report of Manager W. F. Rock of the Gold Sovereign M. & T. Co., operating at Cripple Creek, shows the property of the company is being operated by three sets of lessees, all of which are producing ore. The Jackson shaft is 625 feet deep and is leased until Feb. 1, 1905, to the Cripple Creek Gold Temple M. Co. During the past year this shaft, which is the main working shaft, has been sunk from 550 feet to the 625-foot point. Ore has been produced continually from this shaft of a gross value of $25 per ton. There have been three levels extended from this shaft. The fifth level was extended 25 feet additional, which took it to the south end line. At a point 190 feet from the shaft ore was opened and extended 53 feet to the south end line of the location, with an average width of 6 feet by 120 feet high, with ore still extending upward. The seventh level at depth of 625 feet is the bottom of the shaft. A level has been extended south 200 feet from the shaft and 30 feet north of the shaft, but no ore is showing as yet. The lessees on this block are required by the terms of their lease to start sinking another 75-foot lift on Jan. 1, 1904, and to complete the sinking of the shaft to the 700-foot point by April 1, 1904. —— The Whisper shaft is 375 feet deep. No sinking has been done during the past year. Some development work has been done and some ore produced, but this block is nearly all stoped out above the bottom. It is proposed to re-lease this block for another year as soon as the present lease expires, Jan. 7, 1905, requiring the lessees to sink the shaft immediately an additional 100 feet. This block is too remote from the main workings to allow it to be operated at present from that shaft. —— The Rowson shaft has been completed to the 430-foot point by G. Lenecke & Co., who hold a lease on this block running to Feb. 1, 1905. No ore has ever been produced in this block below the 200-foot level.

The Vindicator mine, at Victor, is shipping out ore from all its levels but those under water. There are 100 men in two shifts. The company is producing fifty tons of ore per day, and the values average 1.5 ounces in gold to the ton.

The annual report of the Acacia G. M. Co. of Cripple Creek shows that the company is still operating its properties by the leasing system, there being seven leases in active operation. During the past year considerable development work has been done and several new ore bodies have been opened up. Following is the statement of ore returns for the year ending November 30: Morning Star claim, block No. 1, 652 tons, $4464.81 in royalties; Burns, block No. 1, 166 tons, $665.74 in royalties; Burns, block No. 3, 264 tons, $1168.90 in royalties: Burns, block No. 5, 238 tons, $2223.12 in royalties; total tonnage, 1321; gross value, $49,167.33; net value, $33,857.82; royalties, $8522.57. J. Hundley is president and K. McKenzie vice-president and manager.

The Empire State Con. G. M. Co. has bought the Phœnix lode holdings of the Orphan Bell Co. The Phœnix claim is east of the Wilson and the Free Coinage Co. and north of the Trachyte, on Bull hill, Cripple Creek, and measures one acre. It is under lease to W. J. McChesney and three associates. They have sunk a 50-foot shaft and are developing an ore body 18 inches wide, from which they are saving ore of medium grade. The addition of the Phœnix brings the holdings of the Empire State Co. up to twenty-one and one-half acres.

There are being employed on the Stratton's Independence, Ltd., mine at Cripple Creek an average of 475 men. Production varies between 200 and 225 tons per day, the ore coming for the most part from the upper levels.

The Acacia G. M. Co. of Cripple Creek has issued its annual report for the year ending Nov. 30, 1903, showing seven leases in operation, from which fair results have been secured, says the Republican. The total production for the year was 1321.17 tons, of a gross value of $49,167.33. The net value was $33,857.82, the company's royalties amounting to $8522.57. The royalties average 25%. The company's principal claims are the Burns and Morning Star, covering twenty patented acres on Bull hill. The gross production to date approximates $400,000.

IDAHO.

Blaine County.

S. Shaefer has bought an interest in the Horn Silver and Last Chance mines near Arco, on which he and O. B. Floischer have a bond. Shaefer says they have opened up a vein showing horn silver ore, running 300 ounces in silver per ton. There is a copper vein on the mine which will also be developed.

Boise County.

The Golden Rod M. Co. last week made its final payment of $21,500 on the Mineral Hill group of seven claims near Placerville, including mill site, water rights and a 5-stamp mill. In addition to this is in-

cluded two groups in Thunder Mountain district—the Excbange and Brooklyn.

Lemhi County.

Control of the Ima M. & M. Co., operating at Patterson, has been taken over by New England men, and J. W. Taylor of Columbus, Ohio, is manager. A 100-ton concentrator will be built and development work in the mine increased.

Shoshone County.

C. C. Groesbeck, manager of the Beartop M. Co., near Murray, says the company is preparing to ship ore which is blocked out as soon as the roads are passable. The Monarch also will make shipments from the upper tunnel, and the Terrible-Edith is taking out galena which is to be shipped during the winter.

Tbe Hypotheek lead and copper mine, near Kingston, has put in a compressor and is sinking its shaft with power drills. The property has been mainly developed by tunnel. Peacock copper and high-grade lead ore have been taken from the mine. —— The Lombardy M. & M. Co., 1 mile north of Kellogg, has men at work drifting on the ledge in 750 feet, with a drift of 450 feet. The face of the tunnel, 27 feet across the ledge, is said to assay 30% lead, with values in silver, copper and gold. P. Albinola is president.

MICHIGAN.

Houghton County.

Fire in No. 1 shaft of the Isle Royale mine, near Houghton, imprisoned and suffocated three men last week. The fire broke out about noon, with 1400 men underground. Fire doors were closed, cutting off the workings in No. 2, and men were warned to flee for their lives. The entire shaft, ucarly ½ mile in depth and heavily timbered, was afire. Water poured into the top merely kept down the fire for a hundred feet or so below the surface. The bodies of the three men were found the following day by a party that descended the old Grand Portage shaft at the north limit of the mine. Gas filled the mine around No. 1 shaft and the old timbering is all gone in the Grand Portage shaft. No. 2 Isle Royale shaft is expected to be supplying rock this week. In the week previous to the fire several additional drills were put to work at tbe Isle Royale mine and driftiug was underway on several of the lower levels; rock shipments averaging 950 tons daily with production of refined copper being maintained at rate of 150 tons a month. The rock yields an average of fourteen pounds of copper per ton.

Ontonagon County.

The Victoria mine is approaching the 21st level, although the plat at the 20th was only finished Nov. 18th, says the News. The work of sinking the main shaft for the bydraulic compressor is under way; dimensions, 20x20 and 300 feet deep. Three auxiliary circular shafts will be put down by drilling with a device built on the ground.

MISSOURI.

Jasper County.

The mines and mills of the Zinc Miners' Association of Joplin district resumed full operations last week after three weeks' shut down, the curtailment policy having had tbe desired effect of improving the market conditions.

C. W. Arbuthnot, W. H. Howard and T. L. Brown have incorporated the Hermit M. Co. to operate near Joplin.

B. Pepper of Webb City has a 60-acre lease on the G. Wilmoth farm, near Webb City, and at 10 feet struck jack in a drill hole, and at 25 feet the drill went into lead. ——A. R. Caulkins last week started the Yellow Dog mine on full time after being shut down eighteen days. He kept all his men at repairing, etc.

Lawrence County.

At Stotts City, C. Sprinkle and J. Stotts have sunk a shaft in the north part of the city to depth of 20 feet, and have developed a body of fire clay. The last work shows mineral indication with "shines" of lead. —— J. B. Davis moved his prospecting machiuery from the Shipman land to a shaft on the Albert Wbite land last week. This is a shaft sunk several years ago to 100 feet.

The Randolph M. Co. has been incorporated to operate a lease on forty acres of the Quinn land adjoining the Golden Rod mine, near Joplin. Several drill holes on this forty-acre lease are said to show the same formation as has been developed by the Golden Rod. They are having the forty acres platted, and as soon as same is finished work will start on a number of shafts, as they have several applications for sub-leases, says the News-Herald.

MONTANA.

Fergus County.

R. E. L. Townsend et al. have bought a group of properties ou Gilt Edge peak, betweeu the Gold Reef and Chicago & Montana mines, near Gilt Edge. Men are at work upon the group and development will be continued during the winter.

Madison County.

J. N. Kirk and W. Owsley et al. of Butte have incorporated the Walker-Penn M. Co. to develop a group near Twin Bridges.

Silver Bow County.

The Raven M. Co., developing the Raven mine, is sinking a 1000-foot shaft and expects to strike a body of copper-silver ore before the 1000-foot mark is reached. The shaft has cut the iron capping which is claimed to be the dividing line between the gold-silver ores and the copper-silver zone of the Butte copper belt. This capping is 125 feet thick, and so far as mineral is concerned is practically barren. The shaft is down 550 feet deep. From the surface to the point at which it struck the iron capping gold and silver ore was taken out (the shaft being sunk on the vein). W. W. Morris of Pony and J. W. Forbis, J. Berkin and C. Mattison of Butte are principal owners.

NEVADA.

Nye County.

The mill of the Midway M. & D. Co. of Tonopah has been put in operation. There are 1000 tons of Midway ore on the dumps which will be milled.

J. H. Sullivan, J. Gleason and P. B. Kotelman have bought a half interest in the Dryland Sailor M. Co., whose claims adjoin the Bob Tail claim and are near the Golden Anchor.

A company has been organized to operate a group of claims at Timber Hill by P. Smithmyer, H. H. Clark, L. E. Benson, A. K. Clark, J. F. Hemen and M. M. King as directors. Developments have shown ore carrying gold, silver and copper values. Machinery will be put in.

It is reported the Tybo M. & R. Co. has suspended operations at Tybo, and that attachments and liens had been levied against the company's property at that place for $8000. It is thought the trouble is only temporary and that work will be resumed next month.

NEW MEXICO.

Grant County.

Ten cars of high-grade ore are being shipped every thirty days from the Monument Key mine at Pinos Altos by W. C. Chandler, says the New Mexican. He has twenty-five men employed iu developing the mine and taking out ore. This number will be increased to fifty men. In the past six months 400 feet of drifting on the 700-foot level has shown the vein of ore to be continuous, and the copper, silver and iron values equal tbe gold it contains.

OREGON.

Baker County.

The 10-stamp mill of the Snow Creek mine, 1 mile from Greenhorn, is in full operation.

P. D. Healy, managing owner of the Grizzly mine, on McCulley's Fork, 5 miles from Sumpter, has resumed operations.

Operations have been resumed at the Carpenter Hill mine, Pocahontas district, near Baker City, says E. A. Milks of New York, manager.

Crook County.

(Special Correspondence).—Superintendent J. Wood of Ashwood reports he has completed 80 feet of drift on the 200-foot level of the Red Jacket mine, and that he has cut a 5-foot vein of good ore. The Red Jacket is a few miles east of the Oregon King mine, which has opened a 4-foot body of ore, specimens of which assay $60,000 per ton. The King is sinking below the 500-foot level, a heavier hoist having been put in.

Ashwood, Dec. 28.

Grant County.

A hoist has been set up on the Indiana mine, near Prairie City.

SOUTH DAKOTA.

Lawrence County.

The Hidden Fortune G. M. Co. is running its cyanide plant near Lead City and treating an average of 200 tons of ore per day. This plant started on fifty tons a day and with twenty stamps dropping. It is being increased to 300 tons daily. The ore is delivered over the Burlington and Northwest railroads, which involves a haul of 5 miles, all down grade. The ore runs $20 per ton in gold. Both amalgamation and cyaniding are used.

The Golden Crest M. Co., near Deadwood, continues dropping ten stamps and crushing daily fifty tons. The company experienced difficulty in melting its product from the zinc boxes, says the Lead City Call, owing to large amount of sulphates, and after reducing to bullion less than a quarter of the precipitates, were obliged in the interest of economy to abandon the usual metbod of melting and throw down the gold by addition of litharge to the flux. This produced a lead matte wbich was not marketable at the United States assay office, and the company has consequently shipped the matte, together with 1000 pounds of rich slag, to a Denver, Colo., refinery. Owing to coal shortage the company has been obliged to hang up at intervals during the past month. Development in the mine is progressing and ore is being taken from five different faces. They are mining rock averaging $15 gold per ton. The ore is being taken from several shafts, varying in depth from 85 to 125 feet, sunk on the divide between Two Bit and Little Strawberry gulches. The company is preparing to unwater the double-compartment shaft at a point on the Two Bit side, 1200 feet below the top of the divide. At the bottom of this shaft, which is 200 feet in depth, the vertical veins of ore will be opened and followed in a southeasterly direction toward the divide, where a depth of 400 feet from the surface will be obtained. The completion of this work will increase the output of the mine so that an enlargement of the mill will be necessary, and the company expects to add twenty stamps to its plant in the coming spring.

The main shaft of the Columbus Con. M. Co., in Sawpit gulch, near Deadwood, is down 500 feet and a crossent started to open up the vein west of the shaft at that level. The main vein showed a width of 247 feet at the 200-foot level. At this depth the Columbus vein carries values of $2 to $8 per ton, and 300 assays from samples taken while work was in progress on this level gave average of $4.96 per ton. The two other veins cut on this level show ore of lower grade.

J. S. Ford et al., of Chicago, Ill., have bought the property of the Cooper G. & S. M. Co., near Galena, for $45,000. They will begin development in the spring.

UTAH.

Utah's mineral production, says the Denver News, began in 1864, and up to 1871 the output consisted largely of placer gold, coming mainly from tbe gravels of Bingham canyon. Prior to 1871 there are no statistics to indicate the production, but estimates place it at less than $1,000,000. From 1871 to 1875, inclusive, the Government compiled statistics which show the production of those five years to have been $20,558,079. Copper did not enter into the production of metals until 1873. The State statistician has obtained figures as far back as 1877, to represent the State's output in gold, silver, lead and copper, which are included in the following table:

YEAR.	Gold.	Silver.
1880	$ 165,773.40	$ 4,029,501.30
1890	699,700.17	8,492,209.44
1900	4,263,414.87	6,248,610.07
1901	3,945,303.57	6,801,816.18
*1902	3,972,235.41	16,391,804.97
**1903	4,000,000.00	20,000,000.00
1877 to 1903 inc.	$34,564,459.12	$180,000,336.27

YEAR.	Lead.	Copper.
1880	$ 786,065.97	.....
1890	2,098,766.51	$ 76,536.00
1900	3,122,863.25	2,514,597.46
1901	3,210,967.50	3,750,247.32
*1902	4,500,698.15	3,017,415.06
**1903	5,000,000.00	5,000,000.00
1877 to 1903 inc.	$51,563,589.61	$ 17,947,859.76

Year.	Aggregate.
1880	$ 4,981,340.67
1890	11,367,212.76
1900	16,149,485.65
1901	17,708,334.57
*1902	27,882,153.59
**1903	34,000,000.00
1877 to 1903 inclusive	$284,076,656 82

*From Government Assayer at Helena.
**Estimated.

Salt Lake City reports show tbe ore and bullion market settlements for the year aggregate $22,591,322, as against $20,073,616 in 1902. These figures do not represent the complete output, for the reason that it is difficult to account for the ores and bullion shipped to market outside the State. The settlements by months for 1903 were:

January	$ 2,036,810
February	2,039,500
March	2,784,479
April	1,341,221
May	1,561,300
June	1,604,510
July	1,829,250
August	1,771,550
September	1,905,212
October	2,050,305
November	1,667,095
*December	2,000,000
Total	$22,591,322

*Estimated.

Beaver County.

The Lenora group of nine claims, in Star district, near Milford, has been taken over by I. D. Carpenter, P. C. Evans and J. Ingebretzen of Salt Lake, and M. L. and W. J. Burns of Milford. The Lenora group is located in Elephant canyon, near the Elephant, Talisman and other mines. There is a vein of silver-lead ore exposed.

Manager C. Baxter of the Kittie Cliff mine is arranging to build a mill on his holdings. The Kittie Cluff is near the Vickshurg mine of the Majestic group, near Milford, and has been developed to a depth of 250 feet, showing ore with values in gold and silver. The plant will handle the ores by cyanide process.

Juab County.

Work is in progress on the Ralph claim in East Tintic, uear Eureka, by M. M. Kellogg.

The Carisa mino of Tintic, near Eureka, which was temporarily closed down to repair its boilers, will resume this week.

The table given below shows an increase for Tintic district for 1903 of 95,770 tons over 1902, and when the product from the mines for month of December is added the showing will he further increased. The Grand Central, Centennial-Eureka and Dragon Iron mines marketed one-half of the entire amount. The Gemini and Mammoth were also heavy shippers during the year. The shipments from four of the largest in the district—the Centennial-Eureka, Bullion-Beck, Gemiui and Bullion Hill mines—were curtailed on account of the underground fire in the last-named mine in August. However, the Centennial-Eureka Co. put men at work shipping low-grade ore which had been accumulating on the dump and in this way the output from the mine during that period was about normal and the smelter at Bingham Junction, of the United States M. Co., was also kept in operation. The advance in price of silver, lead and other metals during the past year made it possible for the mine owners in Tintic section to market ore which two years ago they could not have handled at a profit. Legal difficulties and a suspension of work at the Centennial-Eureka mine pending erection of the smelter caused output for year 1902 to be lighter than it would otberwise have been:

ORE SHIPMENTS FOR 1903.

Name of Mines.	No. Cars.	No. Tons.
Ajax	39	1,170
Bullion Beck	220	6,600
Black Jack (iron ore)	161	4,830
Centennial Eureka	1,481	44,430
Carisa	115	3,450
Dragon Iron	931	27,930
Eureka Hill	86	2,580
Eagle & Blue Bell	67	2,010
Gemini	427	12,810
Grand Central	1,033	30,990
Joe Bowers	3	90
Lower Mammoth	155	4,650
La Clede	20	600
Little Chief	3	90
Mammoth	392	11,760
Mordue (iron ore)	1	90
May Day	17	510
Martha Washington	23	690
Noon's Iron	65	1,950
Rising Sun	1	30
Richmond & Anaconda	2	60
Rabbit Foot	1	30
Star Con	92	2,760
Swansea	42	1,260
South Swansea	59	1,770
Uncle Sam	90	2,700
Victor	124	3,720
United Sunbeam	15	450
Whiting (iron ore)	4	120
John Moore (Tesora lease)	1	30
Tetro	30	900
Yankee Con	224	6,720
Total for eleven months of 1903	5,924	177,780
Total for year of 1902	3,278	81,950

CONCENTRATE SHIPMENTS.

1903.

Name of Mill or Jig.	No. Cars.
May Day mill	2
May Day jigs	20
South Swansea jigs	1
Total for eleven months of 1903	23

1902.

Alaska jigs	2
Mammoth mill	47
May Day mill	10
May Day jigs	18
Tesora mill	42
Total for 1902	119

In this table it is figured there are thirty tons to the carload, this heing the average. In shipment of ore from tbe Tintic mines this year a number of new steel cars have been used and some of these have been loaded to their full capacity (about sixty tons). In that part of comparative table referring to year 1902 an average of twenty-five tons to the car was used. The shipments for the year 1903 are given only to November 30, and it is estimated tbat the output for the month of December will amount to 500 carloads, or 15,000 tons.

Carbon County.

Had it not beeu for the strike in the coal region of Carbon county, the year's business in Utab coal, as indicated by official figures, would have shown a considerable increase, says the Salt Lake Tribune. Taking into account the average daily output of the several mines of the Utah Fuel Co., the total tonnage raised for the first ten months of 1903 was as follows:

	Tons.
Winter Quarters	420,900
Clear Creek	494,700
Castle Gate	352,800
Sunnyside	485,100
Total	1,753,500

All of the foregoing tonnage, with the exception of the Sunnyside and part of the Castle Gate output, which was converted into coke, was marketed for rail-

way, industrial, commercial and domestic purposes. If this had been a normal year the output would have aggregated 2,105,000 tons from all the mines. The cost of producing the ten months' output of 1,753,500 tons was $1,255,000, distributed among 2093 employes, equivalent to 71.5 cents per ton. In addition to 204 coke ovens at Castle Gate and 201 at Sunnyside in operation, the company is building 100 ovens at Sunnyside, which will bring the total number up to 505 ovens. While most of the Utah coal is consumed in Utah, a considerable portion is shipped to Colorado, Nevada, California and other neighboring States. The Southern Pacific railroad is also a large consumer.

Box Elder County.

The Utah Iron & M. Co. has been incorporated at Ogden to develop and work a group of iron veins in Box Elder county by L. W. Shurtliff, P. G. Lamoreaux, T. B. Farr and F. M. Farrell.

Summit County.

The Silver King Con. mine at Park City has put in its pump on the 700-foot level, preparatory to sinkiug for the contact.

Work has been discontinued at the Steamboat mine at Park City.

The output of tho mines of Park City are ostimatod to have reached value of $5,000,000 for the year 1903.

Uinta County.

The Paritte gilsonite miue, near Fort Duchesno, is developing a 3-foot vein on the 300-foot level.

WASHINGTON.

Ferry County.

A strike of gold and copper is reported in the Bryan mine, near Orient, and ownod hy E. F. Graves ot al. of Spokane. The shoot is 14 inches wide and the ledge shows 4 feet wide. The Bryan claim adjoins the Lucky Charlie group and the Abe Lincoln claim, 4 miles north of Orient.

Stevens County.

(Special Corrospondence).—The Molybdenite property, 14 miles east of Bossburg, is under option to Spokane and New York men. The ledge is a flat vein and lies in granite, varying from a few inches to 4 feet in width. The gangue is quartz, the molybdenite being well disseminated. The ore assays 10% molyhdenum. In places where the ore has become oxidized a sulphur residue is loft, which shows the outline of the molybdenite scales. In some specimens are pieces of molyhdenite incrusted with sulphur.

Mulligan Bros. are developing the Pittsburg group on O'Toole mountain. The Pittsburg is said to carry uraninite.——A find is reported made on the Bryan group at Rockcut, showing gold and coppor values in a ledge 4 feet wide.

F. M. Cot rell, superintendent of the Little Giant mine, in Pierre Lake district, is developing the mine hy a diamond drill. Work will he iucreased.

Bossburg, Dec. 26.

T. F. Hertzell, prosident and manager of tho Jay Gould mine at Chewelah, has resumed work on the mine after a temporary suspension of two months.——B. F. Parker, maoager of the Alice G. M. Co., is putting up buildings on thó Juoo and the Echo mines, 2 miles east of Chewelah, after which dovelopment work will he started.

Whatcom County.

Work was again started last week on the Hoosier mine, in Mt. Baker district, east of Whatcom. Whon work was stopped last spring three drifts, totaling 100 feet, had been driven into Church mountaio. The work startod is a crosscut tunnel, which cuts all four ledges on the property and is 400 feet below the drifts. T. Barber is superiotendent.

FOREIGN.

AFRICA.

Transvaal.

The Transvaal Chamber of Minos at Johannesburg, under date of Dec. 10, reports:

Natives distributed to mines during November by Native Labor Association	6,307
Time-expired and other wastage	5,854
Net gain during November	363
Total number employed end of November	69,311

An allotment of 390 natives was made to the railways, otherwise there would be a net gain for Novemher of 743.

The Transvaal Chamber of Mines at Johanneshurg reports the gold output for November, 1903, of the mines which have so far restarted working amounted to 272,107 fino ounces for the Witwatersrand —heing a decrease of 3557 ounces as comparod with the previous month. Tho return for the outside districts is 7706 ounces —a decrease of 1174 ounces as compared with Octoher. The following tahle gives the output in fine ounces for the year, compared with 1902:

	1903. Rand. Ozs.	Outside. Ozs.	Total Ozs.	1902. Total Ozs.
January	192,634	6,345	199,279	70,341
February	187,977	8,536	196,513	81,105
March	208,456	9,009	217,465	104,127
April	218,900	8,971	227,871	119,589
May	224,409	9,710	234,125	138,602
June	228,167	10,153	238,320	142,780
July	242,070	9,573	251,643	149,179
August	262,569	9,349	271,918	162,750
September	267,513	8,684	276,197	170,802
October	275,664	8,880	284,544	181,440
November	272,107	7,706	279,813	187,375
December	.....	....	.....	196,023
Totals	2,580,766	96,922	2,677,688	1,705,113

The output for month of December, estimated at 273,000 ounces for the Witwatersrand and 8500 ounces for outsido camps, brings tho total for 1903 up to 2,959,188 fine ounces of gold.

AUSTRALIA.

Queensland.

The Queonsland gold output for the month of November are as follows:

Camp.	Tons Crushed.	Yield in Ounces.
Charters Towers	23,700	33,700
Croydon	4,100	6,300
Gympie	16,800	14,500
Mount Morgan	30,500	11,900
Raveuswood	2,500	4,100
Other fields	6,500	5,600
Alluvial	....	800
Totals	84,100	76,900

The total output for the year 1903 is expected to reach ahout 900,000 ounces.

Tho New Chillagoe Railway & M. Co., at Chillagoo, reports for November the smelting plant treated; Chillagoe Co., 2761 tons of copper ore and 184 tons lead ore: Mungana Co., 529 tons copper ore and 601 tons lead ore; bought, 428 tons lead ore. Total, 3290 tons of copper ore and 1213 tons of lead ore treated, producing 281 tons of copper matte and 227 tons of lead bullion, containing 145 tons copper, 227 tons lead and 21,019 ounces silver, io the following proportions: Chillagoe Co., 99 tons copper, 8 tons lead and 7465 ounces silver; Mungana Co., 42 tons copper, 101 tons lead and 6751 ounces silver; purchased ores, 118 tons lead and 6228 ounces silver. Total, 141 tons copper, 227 tons lead and 20,444 ounces silver. Balance of product apportioned to matte retreated. The lead furnace was shut down Dec. 7th for repairs for ton days. Railway receipts amounted to £4609, made up as follows: Public traffic, £2007; company's own traffic, £2602, and the working expenses amounted to £2250.

BRITISH COLUMBIA.

Bonndary District.

Diamond drilling at the Volcanic mine, on the North Fork of the Kettle river, near Phœnix, is under way. A. Mead of Marquette, Mich., is engineer for the compaoy that bonded the Volcanic.

Superintendent H. H. Shallenherger has development going ahead on the Dom Pedro claim of the group owoed by the Chicago & British Columhia M. Co., in Skylark camp, and is sinking a shaft farther up the hill than the old shaft.

Manager McVicar, of the E. P. U. and Gold Finch mines, has finished the 1000-foot gravity tramway, which will facilitate sonding out shipments of ore to the smelter at Greenwood.——This month the incline shaft on the Providence mine, which is down 183 feet, will be deepened. This mine is shipping two cars of high-grade ore per month, and has forty-two men on its payroll.

At the Elkhorn mine, adjoining the Providence mine near Midway, fourteen men are on development work and taking out high-grade ore. The balance of $5000 on the hond on this property was paid last week hy McDonald & Sutherland.

Grand Forks reports say a strike of platinum has heen made on the Riverside group, on east side of the North Fork, 1 mile above Smelter lake. Specimens have been sent East for assay.

The shipments of ore from the mines of the Boundary district for the year 1903 are roportod as follows:

	Tons.
January 1 to June 30	265,280
July	58,492
August	69,568
September	61,388
October	73,256
November	74,431
December (estimated)	78,500
Total	680,915

This is an increase of ahout 30% over the output for 1902.

Cassiar District.

The Dry Hill Hydraulic M.Co. of Whatcom, Wash., has suspended operations on its group on Lorne creek, at Lorne Creek camp, until spring. It is intended to start work again io April. There is in process of construction a wooden flume 2½ miles long, of which 4000 foot has heen completed. Included in the route surveyed for tho flume is a wall of rock which will have to be cut through for a distance of 700 feet. Machinory and pipe for the hydraulic plant is on tho ground. When the flume is in place tho system will provide 1500 inches of water. F. E. Holt is manager.

East Kootenay District.

All the new coko ovens of tbe Crow's Nest Pass Coal Co., at Michel, that aro finished (about 200 in all) have been kindled and begun to put out coke.

Montreal men have incorporatod the Imperial Coal & Coke Co., Ltd., to operato coal areas on Fording river, north of the areas owned hy the Crow's Nest Coal Co., and near Michel. The northern limits of tho areas are 40 miles from Michel, and they extend south for 30 miles. The western boundaries aro the property of the Crow's Nest Coal Co., the Canadian Pacific coal lands and 50,000 acres owned by the Dominion Government, and east by the forty-two coal locations on Elk river owned by tho Canadian Pacific Railway Co., says the Fort Steele Prospector. It is intended by the Imperial Coal & Coking Co. to start development work this month, also construction of a branch railway and the building of coke ovens.

Nelson District.

It is reportod the Dundee mine at Ymir has heon sold to C. D. Rand of New Westminster for London, Eng., parties, and $7000 paid down. The work oo tho mine consists of a shaft 250 feet, with laterals running from same. These drifts show ore carrying galena with values of $20 gold, $10 silver and 30% lead. A concentrating mill is proposed.

Slocan District.

The total shipments for the ontire Slocan district of silver-lead and zinc for the year has aggregated 13,000 tons. This is the lowest output of any year in the history of the camp, says the Rossland Miner.

Rossland District.

The shipments of ore from Rossland district mines for the year 1903 were as follows:

	Tons.
January 1 to May 31	147,870
June	36,360
July	31,360
August	36,010
September	39,651
October	38,151
November	38,576
Decemher (estimated)	38,800
Total	406,778

Vanconver Island.

G. E. Graham of Fairhaven, Wash., of the Grihbell Island M. Co., operatiog on Gribbell Island, says two shifts have been worked on the company's property since June 1, and 285 feet of tunnel have heen driven. At the beginning of the summer's work the miners sunk a shaft some distance from the ledge, which showed values, but water prevented them from continuing, so they turned to driving the tunnel to tap the ledge. The compaoy will continue operations during the winter.——Manager Mitchell of the Canadiao-American Co. of Whatcom, Wash., which has holdings on Grihholl island, says several men have heen employed on the Canadiao-American claims. The compaoy made a shipment of oro for trial to the smelter.

Yale District.

The Iron Mask mine, near Kamloops, is to be equipped with a plant to consist of a douhle-drum hoist capable of lifting a four-ton skip 600 feot por minute; a tandem Corliss condensing engine of 250 H. P., with other improvemeuts, including superheatiug of steam hetweeo high and low pressure cylinders; a ten-drill two-stage air compressor; a 300-light electric light plant; a sawmill and timher framing machinery, and two 125 H. P. steam boilers of 150 pounds working pressure. The Iron Mask has two payable veins, says the News-Advertiser, the footwall vein heing a high-grade chalcopyrite, shipments of which to the smelter gave an average of 12% copper. The hanging wall hody is lower grade, and to treat this ore and bring it up to a shipping percentage the company will huild a conceutrating plant capable of treating 200 tons per day.

BRITISH GUIANA.

The gold entered at the Custom House at Georgetown, for export, during 1903, from Jan. 1 to Nov. 17 was.

	Ozs.	dwts.	grs.		
1903	75,602	9	23	at	$1,316,909.56
1902	87,576	4	17	"	1,330,765.79
Decrease	9,973	14	18	"	$213,856.23

Diamonds sent out during same period were.

1903	8,079¾ Carats	..	Value $67,513.49
1902	10,615 "	..	" 104,303.44
Decrease	2,535	..	" $36,789.95

CANADA.

Nova Scotia.

Halifax reports to the Provincial Mines Department say deposits of copper ore have heen found at Cheticamp, Cape Breton. One of tho oro bodies is reported measuring 100 feet wido, and carrying gold and silver values.

Yukon Territory.

The Yukon output for the past year is placed at $10,000,000 in gold.

Recorder Burwash at Whitehorse says 440 claims have been staked on the new creeks since the stampode to Bullion began. Of theso 190 are located on Bullion, 80 on Sheep and 54 on Metalline. He also says 875 claims have been recorded on Ruby, Fourth of July and the other creeks in that district, making an aggregate in Whitehorse district of 1315 locations this season.

MEXICO.

The production of silvor in Mexico for the first ten months of 1903 amounted to $60,198,094.31, as compared with $59,367,241.63 for samo period of 1902. Of gold the production of the first ton mooths was $11,697,160.25, against $8,132,383.39 for 1902. Of copper, $16,142,084.36 was mined, against $1,462,591.

Chihuahua.

The owners of the Colon mino at Terrazas report development work showing improvement in the mine. A hoist has been put in. The owners are F. McDonald, J. A. Nishan, J. D. Moramhert and Krakauer, Zork & Moye.

D. J. M. Botello is planning to start tho mill of the Parral M. Co. at Parral noxt week. It is expected other mills will be started in that camp this month.

A. C. Aiken of San Francisco, Cal., has hought sixteen pertonencias of mining ground near the Pedro Prieto estate, near Parral, the ground including the Sao Juan mine.

The Torreon smelter has bought the Los Adargas mine, near Dolores station, oo the Mexican Central, below Jiminez. The ores are silver-lead, carrying some gold.

A. Garcia, owner of the Refugio mine, noar Parral, has equipped the property with Cornish pumps. The pumps are placed in the mine and the power is a Corliss engine on the surface, operating the pumps by two cables.

R. C. Flower will start operations on the Sunset M. Co.'s mines at Maguarichic this month.

Jalisco.

La Fortuna M. Co. of New York is pushing work on its properties near Ahualulco. Its group includes the Candelaria, San Pedro Viejo and the Patrocinio, which are heing developed by means of two tunnels, with crosscuts and drifts, the total work amounting to 2300 feet. One of the tunoels is 1200 feet in length, and the other 600 feet. Ore is heing stored on the dump, but before putting up a reduction plant the company will make tests of the ores, and will further open up the ore bodios. R. Eames, Jr., consulting engineor, is directing operations.

Mexico.

A heavier electric plant will be put in at Dos Estrellas mino in El Oro camp, the same heing necessitated by recont enlargement of the mill and works, says the Enterprise.

The Guanajuato Power & Light Co. and the Mexican Light & Power Co. are pushing work on their respective power transmission lines into the El Oro-Tlalpujahua field. The fuel supply is said to he decreasing and olectric power is becoming necessary.

At El Oro 10,000 toos of ore are heing milled monthly on tho Esperanza mine. After passing from the mortar of the 120 stamps, the pulp is lifted in bucket elevators to launders aod distributed to fifteen Huntington mills which crush it to No. 50 mosh, and from these it is conveyed to separators and sized to slimes and sand, these in turn heing conveyed to their respective tanks and treated hy cyanidation, says the Mexican Invostor. Development consists of one threo-compartment shaft 1000 feet deep, one four-compartment shaft 1250 feet deep, levels, crosscuts, drifts, etc.

At the Rhenania mine at El Oro sinking tho three-compartment vertical shaft is progressing and the hoist and hoiler are being sot up, says Manager M. Doronherg.——The Maria Teresa is sinking the two-compartment vertical shaft aod at depth will crosscut for the Chihuahua and Doscubridora veins. Assays of the ore from surface outcrops are said to show $6.64 gold and 2 ounces silver to the ton. The shaft is down 100 feet, says Manager W. S. Page.

Manager O. A. Knox is increasing work on the San Ignacio group, in Zacualpan district, near El Oro, and the three-compartment shaft is down 100 feet. Ore which carries gold and silver is hoing shipped to the Hacienda del Calvario.

On the Descubridora mine at El Oro the three-compartment vertical shaft is

down 135 feet. Later crosscuts will he run to the Chihuahua and Descubridora veins. The mine is equipped with steam hoist, pump and two hoilers. J. Devereaux is manager.

Oaxaca.

La Union y Anexas M. Co., recently organized, has taken over and will develop the Union, Santa Rosa, Jacohina, Compadre and San Lucas mines, 12 miles southeast from Ocotlan, in Taviche district. The group lies on the Escuadra mountain, adjoining the Escuadra mine. Assays of ore from surface croppings are said to have given 50 ounces silver and 0.3 ounce gold per ton. Work is progressing under management of W. E. Davenport. J. W. Durst is president.

The Amorican G. M. & M. Co., at Jose de Gracia, has its 10-stamp mill in operation. —— Preliminary work on the 350 H. P. electric plant for La Natividad mine is under way.

San Luis Potosi.

The Victoria Annexas Co., on the San Pedro hranch of the Potosi & Rio Verde Railroad, is making shipments of ore to the smelters at San Luis Potosi. The company is cyaniding its dumps.

The Santa Maria de la Paz M. Co. reports work progressing on its properties in Catorce district, 6 kilometers from Matehuala. The ore runs $100 (Mexican) in gold, silver and lead per ton.

The San Sehastian mine, near San Luis Potosi, has heen sold for $100,000 gold to P. Barronechea et al. Shipments of high-grade copper-silver ore have heen made. ——The Tiro General mine is shipping low-grade ore. Additional machinery will he put in. The line of railroad planned by the National from Las Charcas station is heing huilt.

Sonora.

A half interest in La Higuera group of gold mines, 30 miles southeast of Magdalena and 6 miles from Cucurpe, consisting of five claims, comprising eighty-five pertenencias, has heen sold by the Brady-Levin Co. of Nogales, Ariz., which retains a one-half interest.

La Higuera G. M. Co. has heeu incorporated with R. Gird, R. Brady, R. C. Davis and H. Levin as officers. They will huild a 20-stamp mill in place of the 5-stamp mill in operation. Ahout 2000 feet of development work has heen done on the minos.

The cost of producing copper at the mines and smelters of the Greene Con. C, Co., at Cananea, bas increased from 6 to 6¾ cents per pound within the past year. which President W. C. Greene attrihutes to advanced prices of labor and fuel. The features of lahor cost in Mexico are the higb price of skilled lahor and the low price of unskilled lahor; hut the inefficiency of the latter largely rohs it of its cheapness.

At Cerro Prieto the Nogales C. Co., operating the Cerro Prieto mine, has its 20-stamp mill in steady operation. Manager C. N. Thomas of Nogales, Ariz., says it is proposed to increase tho capacity of tho mill so as to handle 300 tons of ore daily. —— Twelve miles northeast from Cerro Prieto, the Caliche Mountain M. Co., owned by Tener Bros. & Balch of Magdalena, is developing a gold property. There are two shafts 700 feet apart and considerahle drifting.

At Klondyke Camp, near Cerro Prieto, the Loraine M. Co., J. F. Tener manager, reports work progressing. The 10-stamp mill is running steadily, also the cyanide plant. The ore is 3½ feet in width and mills $15 per ton.

O. L. Near of the Transvaal M. Co. says that compauy will connect its mines with the railroad being extended from Cos to Nacozari hy moans of a narrow gauge road 16 miles long. Among the contemplated improvements are a 2500-foot tunnel and an air compressor plant.

Gillian & Thompson of Los Angeles, Cal., last week hought the Mejia mine, in Magdalena district. There are 100,000 tons of silver ore blocked out, averaging $26 per ton. It is an antigua property on which developmont work has been done. Furnaces will he huilt for the reduction of ore.

Zacatecas.

A. J. Smith of Los Angeles, Cal., has hought El Prodigo gold and silver mine near Chalchihuitos. Work is to start within three months from January 1, and a hoisting plant and concentrating mill aro proposed improvements.

NEW ZEALAND.

Tbe Con. Goldfields of New Zealand at Roofton, reports on Dec. 7 the reef struck in the lowest or No. 10 lovel of the Progross mine, giving assay value of 10 dwts., over an avorage thickness of 5 feet. Tho output for month of Novemher was: Progress mine crushod 4630 tons of ore, yielding bullion (including tailings cyanided £493, and sulphurets £784) to ostimated value of £8221. Exponses £3690, or 15s. 11½d. per ton. Expenditure on development not included in above expenses, £564. The Golden Fleece crushed 1137 tons of ore, yielding hullion (including tailings cyanided $271, and sulphurets £70) to estimated value of £1946. Expenses, £1282, or £1 2s. 6½d. per ton. Expenditure on development not included in ahove expenses, £461. The Wealth of Nations mine crushed 975 tons of ore, yielding hullion to estimated value of £1716. Expenses, £793, or 16s. 3½d. per ton.

The following returns show the quantity and value of gold and silver exported from the several ports of New Zealand during month of Octoher, 1903, says tho New Zealand Mines Record:

Port or District.	Quantity.	Value.
GOLD.	Oz.	£
Auckland	20,635	76,225
Nelson	207	830
Westport	.....	.....
Greymouth	7,753	31,012
Hokitika	.....	.....
Dunedin	5,527	21,397
Totals	34,112	129,464
SILVER.		
Auckland	59,907	6,177

The export of gold for first ten months amounted to:

	Oz.	£
1903	435,302	1,659,739
1902	418,457	1,608,598
Increase, ten months, 1903	16,845	51.141

During the past forty-six years there was exported from this colony:

	Oz.	VALUE.
Gold	15,572,507	£61,111,316
Silver	3,299,928	452,807
	18,872,435	£61,564,123

The gold returns of New Zealand for month of Novemher are given at 48,218 ounces of gold, of value of £184,831, as compared with 25,515 ounces of £24,539 value in November, 1902.

The Talisman Con. M. Co. reports returns for month of November: Tons of ore treated, 4350; value of hullion, £7877; cost of mining, milling, cyaniding and general expenses, £5758; other expenditure—mine development, £1456.

SIBERIA.

United States Commercial Agent R. T. Greener, at Vladivostok writes that hoside immense coal heds eastern Asia possesses underground basins of petroleum that will he developed in the near future. Oil springs are found in China, in Manchuria, in the Ussuri district, in Japan, and on Saghalien Island. The latter island not only possesses coal mines, hut also underground petroleum supplies. The oil springs near the river Nootovo, on Saghalien, extend over a considerable area. Notwithstanding the increased output of the Japanese oil industry, Japan must still import foreign oil. In 1900 Japan imported more than 60,000,000 gallons and in 1901 over 51,000,000 gallons. The export from Japan is considerahle, so that Japan promises to become a good market for the Saghalien oil. The development of the oil industry on Saghalien Island will help the river navigation on the Amur and in the Far East generally, says Greener. The Ministry of Agriculture and Imperial Properties has ordered that the 33-mile line along the southeastern coast of Lake Baikal he acknowledged as actual oil producing land. It extends from Kultchuoy to the mouth of the river Chermshan (54° north latitude), to the north from Svyatoy Noss.

TASMANIA.

The Briseis Tin Co., Melbourne office, reports for period ending Oct. 31: Black tin cleaned up, 36 tons 17 cwts. (Sept., 36 tons 12 cwts.); average total sluiceheads of water availahle from all sources 171 (Sept., 194). Rainfall during the month, 502 points (Sept., 379). Overburden removed, 38,490 cubic yards, in addition to No. 1 company, 16,398 cubic yards (Sept., 51,239); drift sluiced, 15,500 cubic yards (Sept., 15,400).

The Mount Lyell M. & R. Co., at Mount Lyell, reports from Oct. 15 to Nov. 11, inclusivo, a total of 28,655 tons of ore treated, heing 22,589 tons from the Mount Lyell mine, and 6066 tons from the North Mount Lyell mine. In addition to the above there were treated 781 tons of purchased ore and metal-hearing fluxes. The converters produced during same period 564 tons of hlister copper, containing copper, 907. tons; silver, 60,942 ounces, and gold, 1578 ounces.

Trade Publications.

"Catalogue No. 16" of the Biguall & Keeler Mfg. Co., Edwardsville, Ill., is of a quality that should inspire confidence in tbe quality of the pipe threading and cuttiug machinery, cutting-off machinery, hand emery surfacers and roller cutters that they build.

Personal.

F. J. NAGEL of Querida, Colo., is spending a few weeks in Denver.

H. SAYRE is manager of the Aspen-Bimetallic M. Co., at Aspen, Colo.

H. P. BENNETT of Virginia City, Mont., is in San Francisco, Cal.

C. W. PURINGTON has returned to Denver, Colo., from Canañea, Mexico.

W. G. EMERSON, interested in Wyoming mines, is in San Francisco, Cal.

J. H. ROBESON of Georgetown, Colo., is at the Whipsaw mine near Briggs, Ariz.

H. B. BOLAND, interested in mines noar La Cananea, Sonora, Mex., is in San Francisco, Cal.

G. N. MCDOW of Susanville, Cal., interested in Lassen county mines, is in San Francisco, Cal.

G. W. PEER of the El Oro mine, near Mayhert, Nevada county, Cal., is in San Francisco, Cal.

HUDSON H. NICHOLSON, E. M., is in the Sumpter district of eastorn Oregon on professional husiness.

W. COOPER, manager of the Capital M. & T. Co., has returned to Georgetown, Colo., from Denver, Colo.

SUPERINTENDENT MASTERS of the United States M. Co. smeltors at Bingham, Utah, is in the East.

G. W. MYERS of San Francisco, Cal., has returned from a tour of the mining counties of central California.

C. C. GROESBECK, manager of the Beartop M. Co., near Murray, Idaho, is in Toledo, Ohio, on a short visit.

R. L. FRARY of Nottawa, Mich., is assistant manager of the Goldon Wizard M. Co., operating near Sumpter, Or.

W. HENNESSEY has resigned as superintendent of the Last Chance M. Co., near Sumpter, Or., and has gone East.

J. L. BRYSON, manager of the El Oro M. Co., at Mayhert, Nevada county, Cal., is in San Francisco, Cal., on husiness.

E. A. SMITH, superintendent of the Struggler mine at Ward, Colo., returned from a trip to Denver, Colo., last week.

SUPERINTENDENT SCOTT of the New York mine on Indian creek, near Yreka, Cal., is in the East on a short husiness trip.

H. C. HOLTHOFF, vice-president of the Holthoff Machinery Co., Milwaukee, Wis., has returnod there from a trip to Donver, Colo.

O. A. ELLIS has returned to San Francisco, Cal., from Searchlight, Nev. He says 1904 will he a lively year for southern Nevada.

L. P. HAMMOND, manager of the Denver office of the Crocker-Wheeler Co., is in the East. He will return to Denver ahout Feh. 1st.

J. J. WARREN, managing director of the White Bear mine, at Rossland, B. C., returned to Toronto, Canada, last week from Rossland.

FRED. G. FARISH of Denver, Colo., has returned from La Cananea, Sonora, Mexico, and is at present examining mines near Telluride, Colo.

L. H. CARVER, of San Francisco, Cal., manager of the Mountain mine near Sierra City, Cal., has returned from a trip to Sierra county.

MANAGER G. W. HULL of the Cleopatra M. Co. returned to Jerome, Ariz., last week from a trip to London, England, on company business.

W. B. BUCKMEISTER of Boston, Mass., manager of the Amalgamated quicksilver mines, and interested in California mines, is in San Francisco, Cal.

J. A. FARWELL, for a numher of years with the Crane Co. of Chicago, is now located in Denver with the J. Geo. Leyner Engineering Works Co.

M. J. LIDSTONE has returned to San Francisco, Cal., having built a 20-stamp mill for tho Gladstone mine near French Gulch, Shasta county, Cal.

R. D. SEYMOUR, manager of the Denver, Colo., office of the Trenton Iron Works, has returned to Denver from New York and other Eastern cities.

E. R. CHILDS of San Diego, Cal., an assistant engineer of the U. S. Geological Survey, has returned to Yuma, Ariz., from a trip to San Francisco, Cal.

WILLIAM SHARWOOD, superintendent and part owner of the Soulsby mino at Soulsbyville, Tuolumne county, Cal., bas returned from a visit to Berkeloy, Cal.

J. W. BENNY, manager of the Shannon C. Co., near Clifton, Ariz., returned from a short trip to Los Angeles, Cal., and has gone to Boston, Mass., on company business.

LEONARD D. SIVYER, mining engineer of Los Angeles, Cal., has heen engaged for examinations on the mother lode, near Carters, Tuolumne county, Cal. Mr. Sivyer was professionally engaged at Globe, Ariz., in the early part of Decemher, and is recallod there for the present.

H. E. WEST, late general manager of the Pacific Northwest Mining Corporation, operating in Lihhy, Mont., has been appointed superintendent of tho Leonesa M. Co., operating gold mines in Matagalpa, Nicaragua, succeeding W. A. Wheeler. The property is owned hy G. D. Emery & Co. of Chelsea, Mass.

E. O'NEILL, associate professor of chemistry, University of California, has returned to Berkeley, Cal., after a six months' ahsence, during which he atteuded the fifth International Cougress of Chemists at Berlin, and also examined the oil fields of Baku, Russia. He also visited the oil fields of Burmah, Sumatra and Japan.

Obituary.

J. W. THOMAS of Leavenworth, Kans., miuing manager for W. P. Dunham of New York, died at Bocoyna, Mexico, Decemher 16, after a short illness.

JAMES GRIFFIN, a mining man of Silver Plume, Colo., died Dec. 22 of miners' consumption in Hamilton, Bermuda. Ho had heen a resident of Silver Plume for many years and was a successful leaser, principally on the Seven-Thirty mine. A wife and child survive him.

L. C. DUBOIS, a mining man of Salida, Colo., died at Salida Dec. 25th, of pneumonia. Deceased was thirty-five years of age; a graduate of Yale University. He took a leading part in the development of Tonopah, Nev. He was also superintendent of a mill at DeLamar, Nev., for soveral years. A widow and ono child survivo him.

W. M. GLASSON, a pioneer mining man of Socorro, N. M., died at Socorro on Dec. 20. Deceased was horn at Fort Carlon, Pa., in 1828. He served in the Mexican war in 1846, also in the civil war in the Confederate army. In 1865 he went to North Carolina, where he engaged in gold mining, and in 1879 to Leadville, Colo. He wont to Socorro, N. M., in 1881 and was engaged in mining from that time until his death. A wife and one daughter survive him.

JAMES B. RANDOL, who was intorested in a numher of California quicksilver and silver mines, died in New York City, N. Y., Dec. 23rd, of heart disease, in his sixty-eighth year. Deceased was horn at Newburgh, N. Y., and weut to California in the late sixties, where he became interested in the New Almaden quicksilver mine, of which he was later manager for twenty-five years. He was also owner of the Mirabel quicksilver mine. He was a memher of the Metropolitan, Engineers' and Lawyers' cluhs and the American Institute of Mining Engineers. He is survivod hy a widow and five children.

Commercial Paragraphs.

A. MIDDLEBROOK of Donver, Colo., manager of the Jeanesville Iron Works Co., Denver branch, has sold the Leyden Coal Co. two mine pumps, 750-foot lift.

MR. HYDE, formerly Denver manager of the Garlock Packing Co., now has charge of tho entire Western business of the company, with office at 537 Mission Street, San Francisco, Cal. The company is now fitting up its new estahlishment at Palmyra, N. Y.

To secure larger space and needed facilities the Sullivan Machinery Co. has removed its Denver, Colo., offico, to a new specially designed building at Nos. 1752-1754 Broadway, opposite the Brown Palace Hotel, where an increased stock of Sullivan air compressors, rock drills, coal mining machines, diamond drill supplies and duplicate parts will ho carried.

THE Denver office of the Trenton Iron Co., Trenton, N. J., reports the sale of a 4000-foot, fifty ton capacity per hour, aerial tramway to the Bradshaw Mountain C. M. & S. Co., at Middleton, Ariz. The Lundherg-Dorr & Wilson aerial tramway, boing erected by tho Trenton Co., is expected to he in operation by Jan. 1, 1904. The ono they huilt for tho San Juan S. & R. Co., at Silverton, Colo., is now finished and in operation.

Books Received.

"Friction and Lost Work in Machinery and Mill Work" is the title of a new volume on this interesting and important subject by Robert H. Thurston. The fact that this is the 7th edition of this valuable treatise is as complimentary a thing as could be said of it. The work treats of the theory of machinery, its action and its efficiency; nature, laws and theory of friction, lubricants, experiments on friction, etc.; the cost of lost work due to friction and recent investigations of the subject; 430 + XII pages; 77 figures; cloth, $3. John Wiley & Sons, New York; Chapman & Hall, London.

"Machine Design," by Forrest R. Jones, is just from the press, being the third edition, revised and enlarged. The book is devoted to bearings and their lubrication, spur and friction gears, belts and ropes for power transmission, screws for power transmission, screw fastenings, shafting and positive shaft couplings, friction couplings and brakes, flywheels and pulleys, and other important data on machine design and construction. It contains 426 + IX pages, with 243 figures. Price $3. John Wiley & Sons, New York. Chapman & Hall, Loudou.

"The Polar Planimeter and Its Uses in Engineering Calculations," by J. Y. Wheatley, C. E., an American authority on these instruments, is a clear and concise description of the polar planimeter and detailed explanatiou of the application of tho instrument to the solution of commonly occurring operations of engineering practice. It includes also complete tables of factors and other data for the immediate adjustment of the planimeter for these operations, thus beiug not only a treatise on the instrumont, hut also an office book for constant uso, for adjusting any sucb instrument at once for any particular problem, without furtber calculation. Largo octavo, cloth, with twelve plates, $3. Puhlished hy Keuffel & Esser Co., 127 Fulton street, New York; 303 Montgomery streot, San Francisco, Cal.

"Gold Mining and Milbng in Western Australia," hy A. G. Charleton, is the latest volume on this interesting section of the mining world. It also contains notes on the treatment of the tellurido ores of that section, with treatment costs, etc., and also a digest of practico in other regions. The work describes the sevoral mining regions of Western Australia, their history, geology and development; tho water problem, systems of mining, and the general milling practice in vogue as well as special treatment by particular processes. For the operator the book is of great value, and for the casual and non-technical reader it is one of absorbing interest. The chaptor on mining methods is illustrated, showing the sovoral systems practiced in Western Australia, and comparisons are made with other regions, both as to methods and as to cost. The book contains 648 pages, 83 figures, besides maps and tables. It is the most complote treatise yot published on the mines of Western Australia. Price $10. Spon & Chamberlain, 123 Liberty street, New York.

Latest Market Reports.

SAN FRANCISCO, December 31, 1903.

METALS.

SILVER.—Per oz., Troy: London, 27⅛d (standard ounce, 925 fino); New York, bar silver, 55⅞c, refined (1000 fine): San Francisco, 55¼c; Moxican dollars, 43@45c San Francisco, 43⅛c New York.

COPPER. — New York: Standard, $12.37½; Lake, 1 to 3 casks, $12.37½; Electrolytic, 1 to 3 casks, $12.25; Casting, 1 to 3 casks, $12.12½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 17s 6d spot per ton.

Copper remains practically unchanged, except for a slight advance in the London market. A recent report in Boston was to the effect that the Amalgamated Co. had placed 100,000,000 pounds of copper, but the price was not stated. A better feeling prevails in the Eastern market, due to increased foreign demand.

LEAD. — New York, $4.37½; Salt Lako City, $3.50; St. Louis, $4.00; San Francisco, $4.50, carload lots; 4¢c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.75. London: £11 3s 9d ₱ long ton.

SPELTER.—New York, $5.00; St. Louis, $5.10; London, £21 7s 6d ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.50 @ 28.90; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32c; bar tin, ₱ lb., 31½@ 35c. London, £130 7s 6d.

PLATINUM. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $46.50@ 47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@44.50 ₱ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6¼c; extra, 17½c; genuino, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c: San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00: sbingles, $2.50 for No. 1 and $2.25 for No. 2: shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wiro, $3.70; Cut, $3.70; 3d, Wiro, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.60 country, $1.75 city ₱ bbl.

CEMENT.—Imported, $2.50@2.75 ₱ bbl.; California carload lots, $2.25 f. o. b. at works; small lots, $2.50 ₱ bbl. in sacks, 4 sacks to hbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.00 @14.35; gray forge, $12.35; San Francisco, bar, 3c ₱ lb., 3¼c in small quantities.

STEEL. — Bessemer billets, Pittshurg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$15 50@16 00
Foundry Northern 1	14 50@15 00
Northern 2	14 00@14 50
Northern 3	14 00@14 50
Southern 1	13 60@——
Southern 2	13 10@——
Southern 3	12 60@——
Forge	11 85@——
Charcoal	16 50@17 00
Billets, Bessemer	24 00@——
Bars, iron	1 35@——
Bars, steel	1 46¼@——
Rails, standard	28 00@30 00
Rails, light	28 00@32 00
Plates, boiler	1 90@ 2 00
Tank	1 75@ 1 80
Sheets, 27 store	2 80@ 2 90
Angles	1 75@——
Beams	1 75@——
Tees	1 80@——
Zees	1 75@——
Channels	1 75@——
Steel melting scrap	10 00@11 00
Relaying rails	21 00@23 00
Dealers forge	9 00@ 9 50
No. 1 railroad wrought	10 25@10 50
No. 1 cast, net ton	10 25@10 50
Iron rails	13 50@14 50
Car wheels	14 50@15 00
Cast borings	3 25@ 3 75
Turnings	6 50@ 7 50

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¼c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8¼c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than ono ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x $8; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, Fronch, 3¼@3½c; alum, $2.00@2.25; California refinod, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, hbl., 45c; cs., 50c; raw, bbl., 43c; cs., 48c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Korosene—Pearl, per gal., 22c; Astral, 22c; Star, 22c; Extra Star, 26c; Eocene, 25c; Elaine, 28c; Water White, in bulk, 15½c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoliuo, hulk, 21c; do., cs., 27½c; 63° Naphtha or Benzino, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., hhl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sporm, crude, 50@55c; Natural White, 70c; Bleached, do., 75c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., por lb., 7c; in 25-lb. tin pails, ¼c ₱ lb. abovo keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ¼c. per lb. ahove keg price. Dry Lead—In hbls., 1 ton and over, 6¼c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 6¼c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., $1.00.

BISMUTH.—Subnitrate, ₱ lb., $1.75.

MERCURY.—Bichloride, ₱ lb., 90c.

MOLYBDENUM.—$2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 75c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittshurg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CANE DISPLAY ATTACHMENT.—No. 746,880. Dec. 15, 1903. Le Roy Robertson, Oakland, Cal. Two-thirds assigned to J. Yule and L. W. Forsting, of same place. This invention consists in the combination with a cane or staff, of an umbrella including independent upper and lower tubes, one movable relative to the other and to which the ribs and braces of the umbrella respectively are pivoted; and a third tube fitting over the ferrule end of the cane or staff and engaging said upper tube, and causing it to slide toward the lower tube to expand the umbrella, said third tube having a socket in its outer end; and means for locking the third tube in position.

DEEP WELL PUMP ATTACHMENT. — No. 747,223. Dec. 15, 1903. G. C. Richards, Oakland, Cal. This invention is especially adapted for operation in deep artesian or cased wells. It consists in a means for removably securing the pump mechanism within the well tube at any depth for operation and in a means for automatically disengaging the locking mechanism so that the pump cylinder and all attached mechanism may he withdrawn or replaced at will and means for preventing and reducing the wear of the parts, and for replacing said worn parts without disturbing the main portion of the pump.

HOISTING AND CONVEYING APPARATUS. — No. 747,113. Dec. 15, 1903. C. J. Allen, San Francisco, Cal. Often it is desired to transfer burdens from one point to another, over a short intervening space, for example the cargo of a ship which is to be removed from the hold to the wharf alongside which the vessel may be lying, or from the wharf to the ship. The ordinary cable equipments require special driving and hoisting mechanism and special tackle which render them unavailable or unsuitable in many instances where a cable conveyor, if easily rigged up, could he used to advantage. The object of this invention is to adapt an ordinary single drum hoist to operate a cableway whereby the load is hoisted and conveyed without the use of the ordinary standing cables.

MEANS FOR COILING PIPES.—No. 746,387. Dec. 8, 1903. C. L. Schalitz, San Francisco, Cal. This invention relates to improvements in means for coiling soft metal pipes of lead, copper, etc., for use as worms or condensers in stills. The object of the invention is to provide a simple method of coiling pipe rapidly and at very small expense, and by which not a mar or sign of a dent will he left in the pipe or other evidence given of the means employed.

PUMPING ENGINE.—No. 746,343. Dec. 8, 1903. G. A. Krohn, Coarse Gold, Cal. This invention relates particularly to that class of reciprocating engines having internally actuated valves and which are employed for pumping and like purposes without cranks or revoluble shafts. It consists in a novel construction of connected valves located at opposite ends of the cylinder and of independently separately actuated plungers hy which the connected valves are alternately moved. It also consists in connections hy which the plungers are alternately actuated to change the valves at the end of each reciprocation of the piston and means for exhausting the propelling medium from the plunger chambers through the main piston to the exhaust passage.

INTERCHANGEABLE CYLINDER PUMPS.—No. 746,314. Dec. 8, 1903. G. A. Krohn, Coarse Gold, Cal. This invention consists in a construction by which the interior portion of the pump within which the plunger reciprocates is made removable and interchangeable. It also consists in a novel construction of the exterior cylinder with waterways and valve chambers arranged with relation to the interchangeable plunger cylinder and other details of construction.

BED OR COUCH BOTTOM.—No. 747,176. Dec. 15, 1903. John Hoey, San Francisco, Cal. This invention relates to improvements in bed and couch bottoms of that class in which a woven wire or equivalent support for the upper mattress is attached to a framework, which framework is supported upon the bedstead. The object of the invention is to stiffen and strengthen such fabric and to maintain the edges in their proper position, and to prevent the undue depression of the bearing surface.

GOLD SAVING DEVICE.—No. 747,268. Dec. 15, 1903. S. C. Szemanski, San Francisco, Cal. This invention relates to improvements in means for treating auriferous sands and gravels. Its object is to provide a washer simple in construction and operation which, among other things, is adapted to bring the finer precious particles into intimate contact with the contained mercury baths, and which will permit of the reuse of the water.

COMBINATION LOCKS.—No. 747,116. Dec. 15, 1903. W. Almstalden, Amador City, Cal. One-half assigned to Irvin Hoxsie, of same place. This invention relates to improvements in safe and vault locks of the type known as "combination locks." Its obj ct is to provide a lock the movable parts of which are so constructed and assembled that no clue as to any one or more of the figures or letters of a combination may be conveyed to any of the senses of the person who may be trying to open the lock; in other words, to provide a lock which can not he picked or opened by experts or others not having the correct combination.

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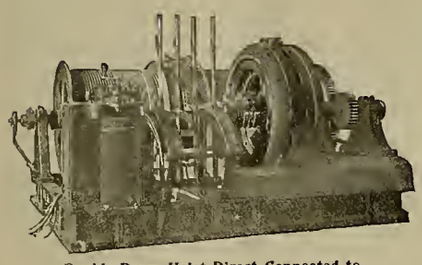

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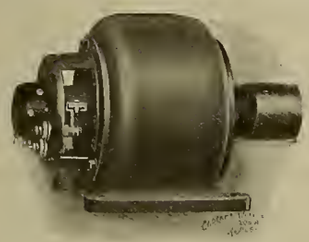

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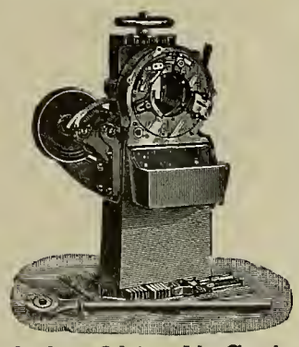

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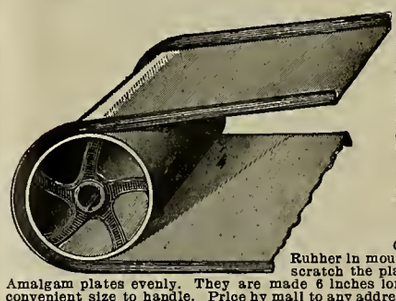

This illustration shows the edge flanging outwardly as it passes over the pulley. This relieves the strain from the top and bottom of the edge by directing the strain automatically to the inside face surface of the edges. Heretofore all belts have been so constructed that when they pass over the pulleys or rolls, a direct strain comes upon the top or at the base of the edges, causing the edges to break away from the body of the belts in a very short time. *We avoid this Mechanical Defect by our Spadone Curved Edge.* Belts made to fit any machine—4, 5 and 6 feet wide. Prices and samples on application.

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Whole No. 2268.—VOLUME LXXXVIII. Number 2. SAN FRANCISCO, CAL., SATURDAY, JANUARY 9, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents

New Tunnel Enterprise in Colorado.

The Mosquito range of mountains of Colorado lies to the east of Leadville and is the dividing line between Lake and Park counties.

The project of tunneling this range has been discussed for a number of years, but nothing definite has been done until a short time since, when the Leadville-Denver M. T. & T. Co. was organized, with James A. Shinn of Leadville, Colo., as president, for the purpose of driving a tunnel through Peerless mountain, a distance of 3869 feet, which will cut the crest of the mountain at a depth of 1500 feet.

This tunnel will start at the Horseshoe (see accompanying illustration), in Park county. The Horseshoe is one-half mile in width and one-half mile deep. The tunnel will terminate in the Amphitheater at the head of Empire gulch, in Lake county. One of the accompanying illustrations was taken from Peerless mountain, at the head of Empire gulch, looking toward Leadville, and shows the Sagauche range west of Leadville and the Arkansas valley, in which Leadville is located.

The tunnel, as mapped out, will pass under the sedimentary beds that contain the ore bodies of Horseshoe district. The formation is the same as that at Leadville district, consisting of porphyries, limestones, quartzites and underlying granite, cut by innumerable porphyry dikes which come up through the granite. It is believed these porpyhry dikes may be mineralized to great depth, and, as at Leadville, may be auriferous. The territory through which this tunnel will pass has produced considerable ore in the past from open cuts and shallow sbafts—none of the shafts being over 100 feet deep.

The tunnel will pass through the veins of the Peerless Maude and Stormy Petrel in Park county side, the surface workings of which are shown in the engraving on page 21.

The Horseshoe, Park Co., Colo.

But a short distance from the Peerless Maude and Stormy Petrel are located the Hilltop and Last Chance mines, in Four Mile gulch, 12 miles from Fairplay. The Last Chance ground is frozen to a depth of 450 feet, and one of their stopes is 40 to 60 feet wide, and in places 200 feet in width, without any timbering whatever. This mine is a steady producer and is now operating a 50-ton mill which was completed the past year. The mine is 12,300 feet above sea level.

For driving this tunnel it is estimated that it will cost $100,000, making it 8x8 feet, or mine size, and $235,000 if it is made 14x18 feet, or railroad size.

The power for the enterprise will probably be taken from Four Mile creek, in Park county. The power will be used for driving the tunnel, operating electric tramway, which the company expect to install, and for lighting purposes.

Arkansas Valley and Saguache Range from Peerless Mountain, Leadville in Middle Ground, Lake Co., Colo.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
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J. F. HALLORAN.....Publisher

SAN FRANCISCO, JANUARY 9, 1904.

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Mine Patent Surveys.

From different parts of the State of Colorado come anxious inquiries as to a recent ruling from that national puzzle department known as the General Land Office at Washington, D. C., which is always jolting the miner somewhere, and probably always will, till squelched by the creation of a Cabinet Department of Mines and Mining.

The recent ukase is in effect that a patented claim shall refer its lines to the lines established by the government land surveys, and affords opportunity for tricksters to annoy holders of mining patents regularly issued. What the late Justice Field termed "the ironclad potency of a United States patent to mining ground" has rarely been successfully attacked when regularly issued, and then only by due process of court. Still it must be confessed that freak rulings of clerks and subordinates can occasionally annoy and at times intimidate men engaged in honest and regular prosecution of their business. In the issue of December 12, 1903, in answer to several requests, the subject was editorially discussed. But since then considerable further correspondence from Colorado asks for more extended notice. Most of our Colorado correspondents say that as the MINING AND SCIENTIFIC PRESS is recognized as authority in those things, it is indicated that further editorial discussion herein would be of value to the mining interests of that great commonwealth and the West in general. Hence the subject is taken up in the spirit invoked by Colorado readers.

Primarily, it may be said that, in locating lines of surveys and grants, the following rules, applied in the order named, have generally been observed by our courts of last resort: First, natural monuments; second, artificial marks; third, adjacent boundaries; fourth, course and distance.

These are postulates which nobody may seriously dispute. The application of this rule is illustrated by simple diagrams on page 26.

The Government issues a patent for mining claim A. (Fig. 1.) The monuments and posts are in position at the corners, 1-2-3-4. The calls for the natural objects, tree and creek, are found as called for by the field notes; but it is disclosed that the tie call connecting corner No. 1 with the section corner of the public surveys is erroneous as to course, or both course and distance. In determining what was granted by this patent, there being a manifest disagreement between the natural and artificial monuments on the ground and the tie call, the latter must yield, as it is resorted to only in the event of uncertainty or absence of the monuments. It is essentially in this case a false call, which the courts ignore. Under this state of facts, the patentee may rest in security. The jurisdiction of the Land Department has been exhausted by the issuance of the patent. The Government can not issue a second grant for anything embraced within A, nor has it the power to recall a patent once issued and delivered, for the purpose of correcting the subsequently discovered and immaterial error in the tie call.

But this error, harmless as it may be, so far as the interest of the patentee is concerned, is productive of some confusion and difficulty in the administrative department of the Government. The surveyor-general who passes upon and plats the work of the deputy mineral surveyor, makes the record on the official map of mineral segregations in that particular section according to the field notes of the deputy. This work in the surveyor-general's office is done regardless of the position of the monuments, natural and artificial, on the ground. It is assumed that they are correctly noted in the field notes. As the departmental regulations require all surveys to be tied to the nearest recognized government section corner, the position assigned to the surveyed claim on the official map of the section is determined solely by reference to the call for course and distance from the initial monument of the survey to the section corner. In the instance illustrated, mining claim A, by reason of the error in the tie call, occupies a different position on the map from its actual position on the ground. This error naturally remains unnoticed and practically harmless until another claim in the same neighborhood is surveyed for patent. Let us assume a case which will illustrate the situation and offer a basis of discussion.

B, another mining claim (see Fig. 2, page 26), adjoins A, the side line and two corners of the two claims being common. There is no conflict on the ground. The deputy surveyor who goes into the field to ascertain this fact finds all of A's monuments, natural and artificial, as called for, but discovers the false tie call. He ties B to the same section corner by correct course and distance. His survey of B in the field creates no conflict with A. But in platting it in the surveyor-general's office, in connection with the previous survey of A, a paper conflict arises, owing to the false tie call in the survey of A, producing the result shown on Fig. 3.

This of course interferes with the Government's system of bookkeeping, and upsets the mathematical equilibrium, as all mathematical errors must necessarily do. What is to be done about it? If the principles of law enunciated at the beginning of this article are sound, A's rights are not affected, and certainly B's should not be. The only difficulty in the situation seems to rest in the method by which B is to be given what belongs to him, and at the same time keep the books straight. If it were a matter between two individuals, there would be no trouble. It is suggested that the Commissioner of the General Land Office proposes to obliterate A altogether and commence over again. As A will not be disposed to voluntarily surrender his title and institute patent proceedings de novo he is to be haled into court in an action in equity to annul his patent. But on what grounds? A's patent taken by its four corners in connection with the monuments on the ground as all courts must take it, leaves no doubt as to what the Government actually granted. There is no mistake as to the thing granted, only a false call in describing it, one which may be readily disregarded without injury to any person or thing except perhaps a disturbance of the system of bookkeeping. It is not a case where the Government granted one tract of land intending to grant another. If a controversy of this kind could be conceived as arising between individuals, the counsel who would suggest that before B could obtain title to his claim, an action in equity would have to be brought to set aside A's deed would not receive much encouragement. In its capacity as a land owner, the Government is bound by the same rules as ordinary individuals. When it becomes a suitor in the courts, it has no greater or higher privileges than its citizens. In the instance cited, which is of course simple, but none the less typical, there has been no mistake in the sense that a court of equity must be called upon to rectify it. Instruments may only be re-formed or annulled (in the absence of fraud) where the intention of the parties cannot be ascertained from the instrument itself, or in case of latent ambiguities by a resort to such extraneous facts as the law permits to be given in evidence in aid of interpretation. It must be lacking in some essential, vital quality before the powers of a court of equity can be invoked to reform or annul it.

We are not unmindful of the fact that the tie call to the public surveys is considered for administrative purposes an important one. The manual and departmental regulations require the survey to be so tied. There is nothing in the mining law itself which insists upon this requirement, but it was undoubtedly devised for the purpose of aiding the Land Department to determine by successive plattings the relative positions of the surveyed claims in the same locality, thus enabling that department to ascertain fractional areas or resultant lottings caused by the mineral segregations, and supplying other data which is useful for administrative purposes.

Yet, an error in this connecting line has never been held by the department to be fatal to the patent application, if in the notice and description taken as a whole, and considered with regard to the situation of the applicant's claim on the ground, the claim is designated with substantial accuracy. This rule has been repeatedly recognized by the department itself, and is in harmony with the legal postulates governing the courts, heretofore stated.

A common sense view of the situation would suggest that, as the error in the call tieing A to the public surveys disturbs only matters of internal administration, the proper course to be pursued would be for the department to ascertain the correct course and distance of the tie call and amend its plats, noting the fact of the original error, giving to A the position on the plat that it occupies on the ground. It would seem to be unwise to refuse to give to B what he has appropriated—inflict punishment upon him for an error for which he is in no sense responsible—and insist upon recognizing a paper conflict, with A, which does not exist on the ground.

We are not fully advised as to the extent to which the Commissioner of the General Land Office now proposes to go with regard to the manner of correcting these erroneous surveys, and the mining regions have an abundance of them. The postulates heretofore referred to were established by the courts for the simple reason that errors in surveying were not only natural, but very frequent, and that some system of rules should be devised which would accomplish substantial justice, without doing violence to the actual intention of the parties. These rules must necessarily control the courts wherever their jurisdiction is invoked in cases of this character, whether in suits brought by the United States or by private parties. If it be true, as it is claimed, that the Land Department now threatens to have suits instituted for the purpose of vacating patents which contain one or more false calls, we are quite sure the courts will decline to follow that department in cases where the property actually intended to be conveyed can be ascertained with reasonable certainty by correlating the description in the patent with the actual physical monuments on the ground, even if some of the calls for course and distance are erroneous. We feel quite certain that there is no occasion for the owner of A in the case illustrated to fear that he will ultimately lose any of his rights. If any suit is actually brought, of course he will have to defend it. The books are full of cases where the Government has brought suits to vacate patents and has been defeated. But it may never be brought. The worst troubles we have are those which never happen. If any such suit should be brought, a test case may be made, and all parties interested may join forces; and if the present attitude of the department is correctly reported by our Colorado correspondents, the best

way out of the difficulty is to encourage the bringing of such a suit. To obviate misunderstanding, it is to be noted that a suit to vacate a patent can only be brought by the federal government itself. The case cited from Colorado by most of our correspondents is an appeal from the ruling of the Land Office to the Secretary of the Interior Department.

Of course, these things are annoying and expensive, but just so long as the mining industry of this nation permits its affairs (so far as Federal connection is concerned) to be administered by inferior subordinates of an inferior government department, so long is it possible for such injustice to continue. The remedy for this and kindred hurts and hindrances is the creation of a cabinet department of mines and mining to wisely conserve and administer governmental requirements concerning the great basic industry of the nation.

The Mint Director's Annual Guess.

The Director of the United States Mint at Washington has issued what purports to be preliminary statistics on the precious metal production of the United States for 1903. The figures are so obviously incorrect for some States that a doubt is created as to the value of the estimates for others. The statement published elsewhere herein, which was issued by the Washington official, credits South Dakota with a production of $2,889,137 gold and $179,965 silver for 1903. The gold and silver mines of South Dakota are all in a limited area in the Black Hills, and never within twenty years has the output been as small as $3,000,000. The Homestake company alone produces more than $4,500,000 yearly, and this amount is being annually increased. Besides this company, the Golden Reward, Penobscot, Spearfish, Standard, Clover Leaf, Hidden Fortune, Wasp No. 1 and No. 2, and a great number of other companies output not less than $1,500,000 annually, which will make South Dakota's output exceed $6,000,000. As to the other States mentioned in the report the errors are less noticeable, but, when the year has only just closed the sum allotted to each State to represent its production is nothing closer than a guess, but the appearance of detail in the output credited to some of the States leads to the belief that the figures are the result of accurate information, when such is not the case.

CONCENTRATES.

WROUGHT-IRON pipe will probably prove satisfactory in well sinking, especially in hard ground.

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IF limestone and some copper ore of good grade are available with the gold and silver bearing pyrite, it is probable that the ore could be worked by pyritic smelting process.

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ONE person may locate as many lode claims as he desires to do assessment work on. They may all be on one vein or on several veins. There is no limit to the number of claims one person may take.

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THE mineral sample from Olalla, B. C., is pyrrhotite (a sub-sulphide of iron), with a small amount of chalcopyrite (copper-iron sulphide). This ore is a frequent accompaniment of sulphide copper ore bodies. It sometimes contains nickel. This can be ascertained by having an assay made.

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ALUM was formerly a name employed to indicate potassium-aluminum sulphate, but the term is now applied to designate a group of minerals analogous to the former, in which aluminum is replaced by iron, chromium and other metals and the potassium by other alkali metals, or by silver, ammonium or thallium.

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THE usual grade for tracks where cars are trammed by men is 5 inches to 100 feet. On curves it should be somewhat more. It pays to keep tracks underground as clean as possible and to lay good tracks with switches which will give the least trouble. More time is lost at poor switches than will pay for making several good ones.

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IN the American Institute of Mining Engineers one-fourth the votes cast must be in the negative to defeat a candidate for admission. In the American Society of Civil Engineers and the American Society of Mechanical Engineers only seven negative votes are necessary to defeat a candidate. In the case of the American Institute of Electrical Engineers elections to membership are not decided by the votes of present members, that matter being entirely in the hands of the board of directors of the Institute. Membership in any one of these technical associations is not a bar to admission in any other or all of them, the question being solely one of personal fitness or qualification. In all such cases professional qualification is assumed to be the controlling factor in the question of admission.

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THE amount of water required to produce a given amount of power depends upon the head available, the kind of wheel used and also upon the volume of water obtainable; 100 inches of water under about 485 feet head will produce about 100 H. P. in a large pipe. In a small pipe the friction increases to such an extent as to reduce the power materially.

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THE percentage of copper sulphide in ore which will pay to mine depends upon the economic conditions surrounding the mine—the size of the deposit, manner of working it, transportation, cost of fuel and the metallurgical process employed. A carbonate ore may be leached, usually, cheaper than a sulphide ore can be concentrated and smelted.

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THE mineral specimen from the vicinity of La Paz, Peru, S. A., is bindheimite, a hydrous antimoniate of lead, with values in gold and silver. The mineral is the result of alteration of antimonial lead ore and is comparatively rare. Hardness, 5.5 to 6. It also occurs as an earthy or incrusting mineral. It occurs also at Horbauson, Germany, in Cornwall and in Arkansas.

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THE rock specimens sent from the Colorado river region are as follows: No. 1 is garnet (the brown crystals) and epidote (the green). These minerals are sometimes found in the region of metamorphic limestone and with copper ores. No. 2 is black limestone, with gray quartz. No. 3 is brecciated quartz cemented with calcium carbonate. No. 4 is porphyry, evidently from a dike. In it occur six-sided quartz crystals. The porphyry contains much calcium carbonate.

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THE mineral specimen from Grants Pass, Or., is marcasite (white iron pyrites), which is essentially the same as pyrite in composition, but differing somewhat in crystallization. The tabular form of the crystals is common in marcasite, also pyramidal forms, which are also present in the specimen sent. The crystals often cross at an angle of about 60°. Marcasite crystallizes in a variety of other forms—globular, stalactitic, etc. Copper is also present in small amount, which accounts for the iridescent tarnish seen on some portions of the mineral. The gangue is partly quartz and partly lime.

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WHERE a co-owner fails to contribute his share of the assessment work on an unpatented mining claim, the Federal statute provides that the one doing the work or making the improvements may, at the expiration of the year, give such delinquent co-owner personal notice in writing, or notice by publication in the newspaper published nearest the claim, for at least once a week for ninety days, and, if at the expiration of ninety days, after such notice in writing or by publication, such delinquent co-owner should fail or refuse to contribute his proportion of the expenditure required by the statute, his interest shall become the property of his co-owners, who have made the required expenditure. The county in which the paper is printed is not material. The statute says the paper nearest the claim.

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COPPER ORES occur in rocks of almost every description. Those of Butte, Mont., are found in granite; those of Cananea, Mex., in porphyry; those of Bisbee, Ariz., largely in limestone; those of Pennington county, S. Dak., in black slate and quartzite; those of Daulton, Cal., in chiastolite schist; those of Green Mountain, Mariposa Co., Cal., in mica schist; those of Fresno Co., Cal., in diorite; those of the Lava beds, San Bernardino Co., and the Iron Mountain, Shasta Co., Cal., in quartz porphyry; those of Amador Co. and Calaveras Co., Cal., in amphibolite schist, and, in part, in serpentine; those of Encampment, Wyo., in schist, and those of Peru in andesite. The Lake Superior copper mines are developed on beds of conglomerate and amygdaloid, and though technically ores are not so considered as related to ore deposits generally, the copper occurs almost wholly in the form of native metal.

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THEORETICALLY nitro powders upon explosion exert their force equally in every direction from the center of the exploding mass, but as the evidence of their explosive force, when placed upon the ground, is only noticeable in a downward direction, where a hole of greater or less size is usually found. The force in an upward or horizontal direction was expended upon the air and no record of it is available. In blasting the powder will break in homogeneous rock at an angle approaching 60° to the line of the drill hole from a point near its bottom. If there are seams or floors it is more likely to break along these lines of lesser resistance. Several sticks of nitro powder were placed upon the level ground in a grassy field and exploded. A hole 2 feet in diameter and about 10 inches deep was the only result observable, except that every vestige of vegetation within a radius of about 8 feet was completely destroyed, showing that the expansive force of the explosion extended to that distance.

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THE rock specimens from Casa Grande, Ariz., are: No. 1 is wholly made up of volcanic material (tuff), and may show lines of stratification in large masses, though none are apparent in the hand specimen. No. 2 is similar to No. 1, being also a tuff, made up of volcanic material. No. 3 is olivine basalt and No. 4 is similar, though finer in grain. No. 5 is a typical quartz porphyry, showing numerous phenocrysts of quartz and orthoclase feldspar; it seems at one time to have also contained either hornblende or mica, but the original mineral has been obliterated by weathering; the occurrence of small crystals and bunches of epidote suggest that the bisilicate was originally hornblende. No. 6 is evidently separate from No. 5 and may be a distinct dike; it is much altered and looks like feldspar porphyry; a rock of somewhat similar appearance from the Contention mine, at Tombstone, Ariz., carries gold. All of the rocks sent are either of volcanic or igneous origin, though they may occur as a portion of formation which is of sedimentary origin. The tuffs may be mistaken for sandstone.

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CALICHE is a Spanish name, used variously to denote several kinds of mineral deposit. In South America it is applied to deposits of crude soda niter (saltpeter). In Arizona the caliche is a calcareous deposit formed beneath the surface sand or soil and in some districts extends over large areas. It is also found in some portions of southern and Lower California, in New Mexico and in the desert region of Western Australia. It generally conforms more closely to the surface contour of the ground than to any stratification of the debris that may be present. In some localities the caliche is gold bearing, the occurrence being similar to gold-bearing conglomerates. The formation of this calcareous deposit beneath the surface is supposed to be due to the precipitation of calcium carbonate from upward-flowing solutions, induced by the rapid evaporation of those arid regions. The infrequent rains leach the calcium carbonate that may be deposited in the upper layers. Calcareous travertine is deposited on the surface from calcareous springs and is different from caliche.

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IN many modern mines electricity is used for signaling on engine planes and in shaft hoisting. It is also used therein for speaking purposes, as in the telephone, and in mines where safety lamps are used it is considered the best means of firing shots. Electricity is also largely employed to do the heavier work of lighting, hauling, pumping, machine coal cutting, rock drilling, hoisting, and driving ventilating apparatus. Electricity for speaking or signaling purposes needs the use of only a feeble current, usually produced by chemical action set up by causing the liquid chloride of ammonium to act upon two distinct metallic substances, usually copper and zinc, in connection with each other by a suitable wire circuit, or by substituting carbon for copper, which is done in the Leclanche cell, commonly used for this purpose in mines, the extent through which the electric energy may be felt depending upon the length of the connecting circuit. Shot firing is usually done by means of a small magneto electric battery, or miniature dynamo, in which case the feeble currents from the electrically excited magnets pass along the cable to the highly sensitive detonating material enclosed in the copper tube, called the detonator. Sufficient resistance is set up in the detonating material to cause a spark to pass in the high tension arrangement, or to heat a very fine strip of platinum in the low tension, either of which is sufficient to detonate the matter and explode the charge.

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IN the construction of concrete mortar blocks in stamp mills, a constructing engineer thus describes a method of securing an even and level top to the block. The block is built of concrete of the best materials obtainable, and surfaced with a layer of sand and cement about 1 inch thick put on immediately the block is finished. The anchor bolts are "eye bolts" secured to railroad iron embedded in the concrete. These are carried to the surface of the block in iron pipes, and extend to the proper height above the surface of the block. A form, exactly the size of the bottom of the mortar, is made by bolting solidly together several 4x6 timbers. These are planed to a true surface on one side and on the opposite (upper) side a strip about 2 inches wide is dressed perfectly true with the under side. This form is provided with bolt holes at the proper places and while the surface of the concrete is still wet the form is placed in the position to be occupied by the mortar on the concrete block. The nuts are then screwed down firmly, the result being that by use of the level the form is made to press the yielding concrete to a true and absolutely horizontal plane. The form is left in this position until the cement has set hard—at least twenty-four hours, when it may be removed and the mortar placed in position when the block is dry enough, a gasket of sheet rubber being placed between the bottom of the mortar and the concrete. The main object when setting a mortar is to have it rigid, so that it will have no tendency to rock. This is of greater importance than to have the mortar set exactly level, though it is desirable to have it as nearly so as possible, but a small fraction of an inch, higher or lower at one end than the other, is unimportant. The bolt holes are filled after the mortar has been lowered so that the bolts enter the holes, either sulphur or cement being run in. This method of setting a mortar obviates the necessity of grouting or shimming up, which usually results in an unsatisfactory block which soonor or later will disintegrate.

Mining Opportunities in Alaska.

Written for the MINING AND SCIENTIFIC PRESS by JNO. D. MCGILLIVRAY.

There are no gold mining fields in the world that to-day offer better opportunities for the investment of capital, properly directed, than Alaska. Yet there is no field where capital has been, until very lately, less inclined to go. The reasons for this are uot difficult to find.

There is a misconception as to the climate and the consequent conditions that would affect mining; transport has beeu difficult, expensive and iusufficient in most districts, and the costs of supplies consequeutly high; many thousands of men, nufitted for frontier life and unacquainted with mining, have gone north during the booms, naturally failed and as naturally condemned the country on their return; the Cauadian governmeut has imposed iniquitous taxes aud framed silly miuing regnlations for the Cauadiau Yukon, there were disgraceful scandals at Nome the first two or three years, owing to the corruptness of officials; the press, particularly of the East, in its ignorance, until very lately, seldom mentioned Alaska or the Canadian Yukon except with a joke or some reference to the supposed terrors of the climate.

All along the pan-handle, and along the southern coast to the Aleutian islauds, from the shore of the Pacific back to the coast ranges, the thermometer seldom registers more than 15° F. below zero, and throughout central Alaska, along the Yukon aud its branches, where are most of the alluvial gravels, the winter climate is never as disagreeable as that of Idaho, Montana, North Dakota or Minnesota, for there are no winds aud the air is dry. The Japan current is to Alaska what the Gulf Stream is to Norway and Sweden. Norway and Sweden are, largely, more thau a degree farther north than Alaska, and yet those countries have a population of about 10,000,000 inhabitants. It should be remembered that from the first of April to the middle of August there is far more daylight, and, consequently, more heat from the sun, than there is farther south. There is no frost, except at nights, occasionally, in April and August. During May, June and July the thermometer seldom registers less than 70°, and during the day runs up to as much as 95°. The result is wonderfully lnxuriant vegetation. As there is considerable rainfall during the summer, there is water in all the small creeks. Washing with water is begnn sometimes as early as the 15th of April, but generally from the 25th to the 30th, and continued until September 20th or 30th. This gives a comparatively long seasou for hydraulicking.

The cost of transport has beeu greatly reduced in the older camps, where roads aud trails have been built. In fact, for this reason alone the cost of miuing has iu cases been rednced to one-half what it was. The Cauadian goverument has bnilt many good wagon roads on its side of the line. I have seen freight from Dawson to the mouth of El Dorado creek as high as $500 a tou, and it was during the first two years, before roads were bnilt, seldom less than $200 per ton. It is now not more than $75 per ton, owiug to the wagon roads. The most important thiug for the Federal Governmeut to consider for Alaska is the question of assisting to build roads.

There is now a very good class of judges, commissioners and other officials in Alaska. This is of particular importance where so many disputes must arise, mainly caused by ignorance of the regulations on the part of locators. The War Department has built telegraph lines to the priucipal camps and next spring will lay a cable from Juuean to Seattle. Postal facilities have been extended to all the camps both for summer and winter. The United States Geological Survey has doue excellent work, and a great deal of it, all over Alaska, and there is probably no district in the United States where this is of more value and made more use of than by the miners in the North.

In most of the new placer fields there is generally a large output during the first few years, while the richest gravel is being worked by crude methods. Then there is a falling off until capital makes use of larger and better methods, and the outpnt becomes more steady. The gravel then worked is of lower grade, bnt because the cost of workiug is so much reduced the profits are larger than were those of the earliest days. This cau well be illustrated by the Nome and Klondike districts. The output of gold as returned by the Director of the Mint for Nome is as follows:

1899	$2,400,000
1900	5,100,000
1901	4,131,686
1902	4,561,869

Returns from the Nome country for 1903 so far indicate a slight decrease.

The returns for the Kloudike country, or Cauadian Yukou, according to the same authority, has beeu:

1897	$ 2,500,000
1898	11,225,819
1899	16,254,018
1900	22,765,005
1901	17,835,745
1902	14,688,988

Peerless Maud and Stormy Petrel Mines, Doran, Park Co., Colo. (See front page.)

The returns for 1903 are not all in, but show so far betweeu $12,000,000 and $13,000,000.

In the Nome country, as well as iu the Canadiau Yukon country, a very large part of the yield of last year was from gravel that would not have paid to work at the costs and under the conditions of three or four years ago. It will be seen that the largest Nome yield was in 1900 and the largest Canadian Yukon yield in the same year. Most of the gold in each case came from very rich claims, which have been worked out. Now larger areas of gravel have been controlled by capital and considerable mouey is beiug expended on ditches to bring on water for hydraulicking, dredgers, steam shovels and other appliauces, which will enable the handling of larger quantities of gravel at greatly redneed costs. As a result, at least 100 acres of the gravels of the north will pay to work now or within a few years where 1 acre wonld pay under the costs and by the methods of a few years ago.

This is well illustrated by many of the creek and bench gravels of the Kloudike district.

El Dorado creek from its month up, over 3 miles, has practically all been worked over, mostly by the drifting method. A dredger was put in to work on Bonauza in 1901 and proved successful. The owners then purchased 17 El Dorado, which had beeu worked over altogether by drifting, for $75,000, and brought in another dredger in 1902 to work this claim. In fact, all El Dorado creek will probably be dredged. Over on Dominion, in 1898 and 1899 a few claims worked by drifting paid profits. The cost of driftiug was generally more than $8 per cubic yard. A majority of the miners on that creek in those years made little or no money, and several ran into debt. At that time only about 3 miles of the creek contained gravel that would pay to work. Nearly 20 miles of lower Dominion is now being worked and better profits are being made. So it is with a large part of Bonauza, Huuker, Sulphur, Quartz and Eureka, the main creeks of that district.

At Nome very large capital is being invested iu ditches to bring in water. The gold yield from the Seward peninsula will in future, as a consequeuce, steadily iucrease and continue for many years, for the extent of the gravel is such that all the available water cannot wash it within the next five decades.

That there are large areas of gravels of high grade iu districts in all the tributaries of the Yukon, the Kuskoquim, the Copper river, and the streams running into the Arctic ocean, has beeu well enough established. They are far greater in area thau were the alluvial gravels of California, exteuding as they do along these streams throughout a territory four times as large as California.

In order to understand that all these gravels may be worked by the ordinary methods in use elsewhere it may be well to mention some of the work that is being doue. At Nome the Wild Goose Co. is conveying water some twenty miles, the Hot Air Co., the Miocene Co. and others are spending large sums to bring on water, all to be used for washing gravel. There are a number of hydraulic elevators in operation, and dredging has been carried on with as much success as in California.

Near Rampart, on the Yukon, Stoel, Ott & Swensen begau work with a hydraulic plant on bench gravels on Hunter creek last year. A contract was lately let in San Fraucisco for hydraulic supplies to cost over $18,000 for mines on Big Minook creek owued by Pittsburg capitalists. They are to work creek gravels with hydraulic elevators aud bench gravels by the plain hydraulic method. Monroe & Lindsay have purchased supplies for two hydraulic elevators to work in Hoosier creek. The Pittsburg people's plant alone will move more gravel in a season thau has been moved in auy previous year by the hundreds of miners in the district. It is estimated that the cost of mining will be from 8 to 20 cents per cubic yard. The cost by the old methods of ground sluicing, shoveling in and drifting has been from $1.80 to $9.00 per cubic yard.

In the Birch Creek country, back of Eagle, a steam shovel has been in operation for two seasons. On the Seventy-Mile river an English company and a New York company are preparing to convey from 3000 to 5000 inches of water to large areas of bench gravels they have acquired aloug that stream. Iu the Forty-Mile district the North American Trading & Transportation Co. last summer built a ditch 15 miles long to couvey water to work with by hyhraulic elevators. In the Klondike district, on the Canadian side, several dredgers have been in operatiou, the first having beeu operated during the snmmer of 1901. An English company operating on benches on Bonanza reports that with 200 inches of water the duty of a miners' inch each 24 honrs was in one case 6½ cubic yards and in another 7½.

These facts should settle the question as to whether the climate deters the use of water to move gravel. The districts named, Nome, Rampart, Birch Creek, Seventy-Mile, Forty-Mile and the Klondike, will show what may be done all over Alaska.

In nearly every district a large proportion of the gravel may be covered with water at high pressure. On the streams along the Yukon the grades are heavy and ditches would cousequently not be long. The summer rains keep up a steady flow of water, except on the smaller streams, which run down dnring the comparatively dry months of Jnly and August. The abnndance of water and frequency of sources is a strikiug feature of the country. The gravels are generally of two classes, those in the stream beds or newer gravels and those on benches or older gravels. The former will generally be worked with hydraulic elevators or dredgers and the latter by hydraulickiug.

Method of Mixing Concrete.

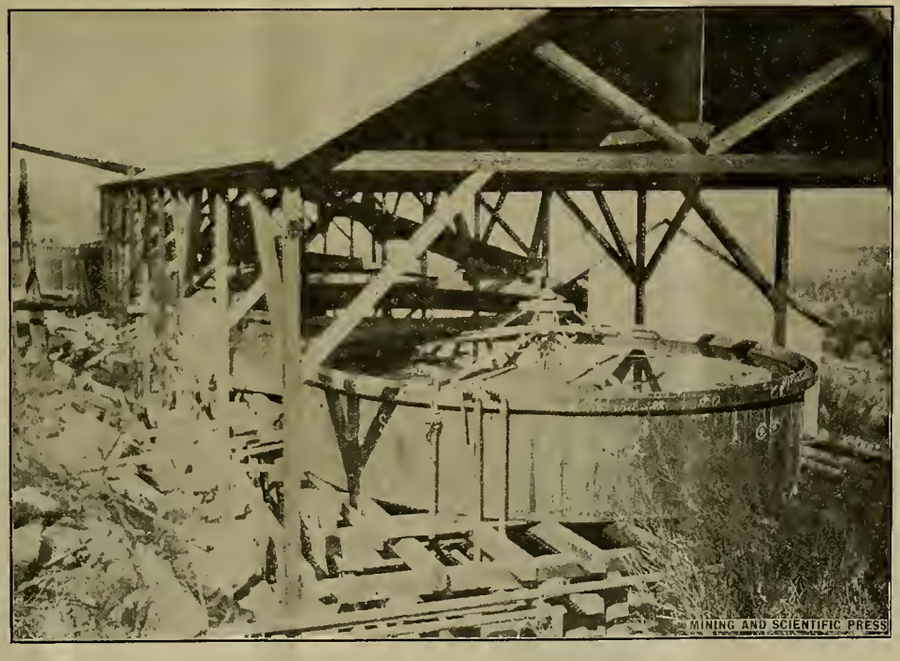
There is much variance of opinion as to the proper method of mixing concrete. The following method, from the Engineeriug News, has been employed with success. First, spread the sand, then upon the sand spread the cemeut aud mix the two thoroughly, dry. Then thoronghly drench the stones and spread them on the prepared dry mortar. Finally turn the mass over aud over, addiug water gradually until the desired degree of moisture is attained. It is of great importance that the sand and cement should be well mixed dry, separately, and should be insisted upon even when the concrete is mixed in a machine. Also, the stones should be wet separately before adding or when added. The use of bottomless boxes, as suggested by Mr. McCullough, is good. Generally, or at least very ofteu, cement barrels are used to measure the saud and stone. This method has the advantage of using the same measuring vessel for all the ingredients, and also that one or two men can be constantly at work filling barrels with sand and stones, and stauding them, handy by, for use as wanted. This makes the work go quicker. As the cement is shaken down in the barrels, it is only fair to the coutractor that the sand and stone barrels should be filled heaping. When cement is furnished in bags, four bags are commonly considered as equal to oue barrel, and the bottomless box theu comes into play, with the open question. How many cubic feet to the barrel? Usually, 3½ cubic feet will not be far out.

ALASKITE is a silicified aplite, occurriug in Alaska, aud sometimes found to be gold bearing. Aplite is au intrusive rock allied to grauite, and occurs as dikes in granite.

Types of Mill Construction.

The details of mill construction are often influenced to a considerable extent by the climatic conditions in the country where the mill is to be built. In a snowy country construction of mill buildings is necessarily more expensive than in those regions where snow is unknown. The interior of the mills may be essentially the same in both regions, but the superstructure will differ materially in design. One of the accompanying illustrations shows the appearance of a mill built in the snowy region of the southern Alaska coast, at Sea Level, the other at the Sultan mine, near Hillside, Arizona. In the former the high pitched roof shows that experience has taught that a roof at any ordinary angle would be crushed by the weight of the snow. It is not an uncommon thing to see the eaves of mine buildings in snowy regions broken down by the weight of the wet snow of late winter. This teaches that eaves must not be allowed to project beyond the side of the building farther than necessary without being supported by a brace beneath. The Arizona mill is a portion of a cyanide plant, open to the air, having only an iron roof to protect the workmen from the direct rays of the sun, and also to reduce evaporation somewhat. The cyanide tanks are of metal, and are calculated to resist shrinkage cracks which are common in the case of wooden tanks in that dry atmosphere, unless constructed with a channel near the top to contain solution or water which prevents shrinkage. These two illustrations may be said to portray the two extreme types, except those plants where no roof at all is provided, as in South Africa, and in Western Australia, which represent a still wider difference, due to climatic conditions.

The Sea Level Mill, Alaska.



Cyanide Plant Sultan Mine, Yavapai County, Arizona.

EXCELLENT TILES can be made with a mixture of Portland cement and sawdust. Nails can be driven through these tiles without causing them to crack. In a recent issue of the Thonindustrie Zeitung (Germany) the following proportions were given as suitable for the manufacture of the tiles: Damp sawdust 100 parts by weight, Portland cement 240 parts, water 48 parts. The sifted sawdust is well moistened and allowed to stand for twenty-four hours before being employed for mixing with the proportions of cement and water mentioned. The sawdust is used in a damp condition to prevent it from absorbing from the mixture the water required for the proper setting of the cement; and during the process of drying after molding, the tiles are repeatedly sprinkled with water with the same object in view. Previous attempts to make durable tiles with a mixture of sawdust and cement are said to have failed owing to the absorbent action of the sawdust.

SYSTEMS of shop cost keeping, says Cassier's Magazine, have been so much harped upon, both in papers before technical societies and in technical periodicals, that it would seem as though pretty nearly everything had been said and printed about them that could be thought of, and in very many instances the only result has been a waste of time and printer's ink. When a system of any kind requires several additional systems and a special staff to keep it going properly, it is safe to conclude that it is not what you want. It is not likely, in that event, to be a time and money-saver, and that is what the right kind of system ought to be.

To determine sulphur in pyrites oxidize with aqua regia, repeatedly evaporate with hydrochloric acid, separate the silica, precipitate iron with ammonia, precipitate sulphur from filtrate by barium chloride.

Testing Ores for Cyanide Treatment.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by R. STUART BROWNE.

CHEMICAL CHARACTER.—To determine acidity, four ounces of the crushed sample are placed in a glass-stoppered bottle with 250 c.c. of standard $\frac{N}{2}$ NaOH, and occasionally shaken. At the end of a couple of hours a portion of the solution is filtered off and titrated with standard acid. The amount of alkali required to neutralize one ton of dry ore is then calculated. As slacked lime is generally used for this purpose, it is best to express the acidity in terms of lime. The acidity may be due to the presence of either soluble or insoluble compounds. A distinction is often made by applying the term "soluble acidity" to that which results from compounds which may be removed by water, and latent acidity to that due to insoluble substances. The distinction is good, but not altogether of practical value. As a general rule, ore should never be subjected to a water wash in a tank wherein cyanide solutions have been. A portion of the cyanide is retained by the filter and wood, and during the process of washing dissolves out some of the values, which are lost. Where water washing is necessary, separate tanks should be provided. Owing to the difficulty of doing this, it is seldom done. If necessary, the soluble acidity may be determined by agitating four ounces of the sample with 250 c.c. of water, filtering, and then titrating a portion of the filtrate with the standard alkali. In such cases it is also well to find the amount of soluble salts present. This is done by thoroughly washing a weighed amount of the sample and reweighing after drying. The latent acidity is the difference between the soluble and total acidity.

A good many text books say that the amount of cyanide lost in treating an ore may be determined by agitating a few grams of the pulp with a standard solution of cyanide for a few minutes and then titrating some of the solution and calculating the loss. Results so obtained are of no value, for the consumption of cyanide is influenced by a great many things of which no account is taken in such a test. If a determination is made it must be done when making the final test and observing the regular working condition as regards alkalinity, time of leaching, strength of solution and ratio of weight of solution to weight of ore.

TESTING.—The most favorable case: In order to systematically determine the conditions most favorable for cyaniding an ore, some knowledge of its behavior with cyanide must be had. This is best obtained by making what I call "The test under the most favorable conditions." This is an experiment made with the ore under conditions more favorable than would be met with in practical work. If the ore does not yield a good extraction, it is evident that the ore is not a cyaniding one, and that fact is discovered at the beginning of the work instead of the end. If the extraction is satisfactory the chemist has some data to work on, and he goes ahead to develop a commercial process. The test consists in taking 250 grams of ore crushed to 100 mesh, 750 c.c. of 1% of KCy, 5 grams of an oxidizing agent, as potassium chlorate or sodium peroxide, alkali to neutralize the acidity, and agitating the whole in a bottle with compressed air for a couple of days. The conditions of the test are, of course, subject to considerable variation. If an ore will not yield to this treatment, it may be taken for granted that straight cyaniding will never give satisfactory results with it. Before proceeding, it may be best to say a few words about calculating results. I have always found it satisfactory to work with the metric system altogether, and to figure the percentage of extraction from the total quantities involved. If, for example, I am working with 500 grams of ore, the total quantity of gold and silver in the 500 grams is determined, and the same is done with the tailings at the end of the experiment. From the total amount of gold and silver before and after, the percentage of extraction is calculated. This is always checked with the solution assays. The amount of solution used is always known. By assaying it, the exact amount of gold dissolved out can be found.

Non-extraction: We will suppose that we have tested an ore under the most favorable conditions and obtained a low extraction. In silver ores the cause is probably due to the existence of the silver in complex forms not affected by cyanide. Silver in any other form than chloride requires fine grinding, strong solution, long contact and a large volume of solution. The ore will probably require a chloridizing roast before cyaniding.

With gold ores the trouble may be:

(1) Lack of time: The ore may be adapted for the treatment, but require a longer contact. Make another test with the ore crushed to 40-mesh, using straight percolation, a weaker solution and giving ten days' treatment.

(2) Coarse gold: If any is found, remove it by amalgamation and repeat the experiment.

(3) Values in sulphurets: If the preliminary ex-

amination showed high-grade sulphurets, the low extraction might be due to their presence. Try amalgamation, concentration, and then cyanide the tailiugs.

(4) Finer grinding: The ore may require finer grinding, but it is hardly possible to do this in a large plant unless the ore is high grade and a good extractiou can be had in a short time.

(5) Autimonial compounds: If the gold is held by antimony, it is not likely that the cyauide process will be suitable for the ore. Roasting may increase the extractiou.

(6) Tellurides, arsenides, etc: Ores coutainiug tellurium, arsenic, sulphur and like substances may be made to yield a high extraction by roasting. Roast some of the ore in a muffle and repeat the experiment.

(7) Solution too strong or too weak: It is hardly likely that this is the cause of the trouble.

(8) Cyanicides: If a large loss of cyanides was shown, and if the sample consisted of tailings, containing much organic matter and the products of decompositiou, repeat the experiment after giving the pulp a water wash and adding alkali.

(9) Selective actiou: In the presence of certain minerals, especially those coutaining copper, cyanide sometimes exhibits a selective action, and will attack other metals in prefereuce to gold. Try another test, usiug pulp crushed to 40-mesh, a 0.15% solution, and giving straight percolation for several days.

It must uot be supposed that these are the only causes of low extractiou. There are a great many things that influence the results, and the chemist must always devote his energies to discovering the root of the trouble. If the cause is known, it is easy to determine if a remedy is possible. A metallurgical report should always go into details explaining the cause of failure.

TESTING.—A commercial process: We will suppose that the preliminary test has shown a good extraction. It is now in order to develop a commercial process, usiug the knowledge already gained as a guide. In the case of an ore it will be necessary to determine the following things:

A. Size of screen the ore must be crushed to pass.
B. Streugth of solutiou.
C. Time of leaching.
D. Ratio of solution to ore.

In the experiments which will be made to obtain this data, it is not necessary that the work be doue ou a large scale. I consider 500 grams of ore as amply large for each experiment. The results are to be used simply for comparison, and a larger sample would not in any way enhance the value of the work.

For the tests, five glass percolators arranged in a row on a suitable stand are necessary. They should be about 14 inches long, and have an internal diameter of 2 inches. In the bottom is placed a perforated rubber cork with a glass tube, and a Hoffman clamp and rubber connection. A filter is uecessary to prevent the pulp from running through. This is made from a small circular piece of wet cambric or muslin stretched across the bottom and on top of which is placed a circular piece of filter paper. A large bottle should be placed beneath each percolator to catch the solution as it drains off. Above each percolator is placed a 2-litre aspirator with a bottom outlet. By attachiug a rubber tube and a Hoffman clamp, solution may be fed from the aspirator into the percolator at any desired speed. This arraugement of apparatus is simple and efficient. No attempt is made to precipitate the gold on zinc. One reason is that it is desirable to determine accurately the amount of gold dissolved, by means of the solution assays.

I might say here that I consider the tests made iu the laboratory ou precipitation by means of zinc shavings of no value whatever, so far as indicating the prccipitating on a large scale. The laboratory deals with pure or comparatively pure solutions, while the mill has to handle solutions that have accumulated deleterious salts from thousauds of tons of ore. What is more, the composition of the solution is continually changing. As I have said elsewhere, it is one problem to dissolve the gold and another to precipitate it. The precipitating room is the place to work out that kind of a problem, not the laboratory. The great problem is to dissolve the gold. If that can be done satisfactorily, the problem of precipitation cau generally bc solved, except where it is due to copper. In such cases it may, and it may not be.

A. To determine the screen size, samples arc taken of the ore crushed respectively to 20, 30, 40, 60 and 80 mesh. Each sample should weigh a little over 500 grams. The material should all pass the given mesh but be retained on the size following, but the 80 mesh should include everything that will pass this sieve. Each sample is now dried, thoroughly mixed on a sampling cloth and sufficient pulp taken for duplicate assays. Five hundred grams are then accurately weighed out, alkali added to ueutralize acidity, and each samplc placed iu a properly marked percolator.

Fifteen huudred cubic ccutimeters of 0.5% KCy are placed in each aspirator and allowed to flow slowly into the percolator until the ore is saturated. After a few hours percolation is started and allowed to continue for three days. The cyauide is then replaced by a measured amount of water aud each sample thoroughly washed. The samples are then dried and assayed. The percentage of extraction is then calculated and checked by the solution assays. The results are uow tabulated and an opinion formed as to the proper size for crushing. It is advisable to select the coarsest size possible cousistent with a good recovery. The fact that a fine product gives a slightly higher recovery than a coarser one should not warrant its selection. Account must be taken of the difference iu cost of crushing to various sizes. A few hours longer coutact may give the same recovery as finer crushing and shorter contact. It will sometimes happen that in the above experiments the value of the heads will vary according to the size it has been crushed to. Whcu this happeus considerable judgment must be exercised in interpreting the results.

If the 20-mesh size has proven satisfactory, other experiments should be made similar to the above with material still coarser.

If it is necessary to crush to 80 mesh, it is quite probable that the ore will have to be slimed and agitation and decantation or filter-pressing adopted. The investigations would, therefore, be carried along on this line.

If the material to be treated consists of tailings, the above tests for screen size would be omitted, for it is hardly likely that regrinding would pay.

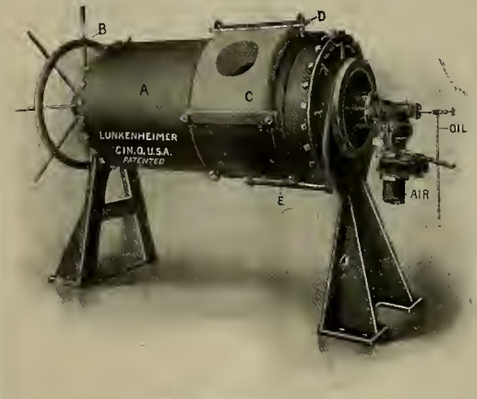
B. STRENGTH OF SOLUTION.—Having determined the most suitable crushiug size, it becomes necessary to find the proper strength of solution to use. We will suppose that we have selected 30 mesh. A little over 2500 grams of ore are crushed to this size, uo attempt beiug made to separate the finer pulp. The ore is then dried, mixed thoroughly, and a sample large euough for duplicate assays taken. Iu each percolator is now placed 500 grams of ore accurately weighed, and with the proper amount of alkali. Five solutions of 1500 c.c. each are prepared, of respectively 0.10%, 0.20%, 0.30%, 0.40% and 0.50% KCy. Each solution is placed in a marked aspirator aud permitted to run into a percolator until the charge is saturated. Percolation is then started and continued for three days. Water is then turned on, and after thorough washing, the ore is dried, sampled and assayed. From the data the solution giving the most satisfactory results is selected. If the weakest solution shows a good extraction, the experiment should be repeated, using still weaker solutions. If the strongest solutiou is necessary repeat with stronger ones. Remember that a weaker solution given a longer contact will do what a strouger one will iu a shorter one. Give preference to the weaker solution, for it means less loss in cyanide.

Generally the proper strength will be found somewhere between 0.10% and 0.50%. It is also advisable after selecting a certain solution to try one that is 0.05% weaker. Another thing to consider is the loss in cyanide, which in this scries of experiments must be calculated. Strong solutions always show a greater loss than weaker ones. If the solution selected shows a high consumption, but is otherwise satisfactory, vary the alkalinity and try a preliminary alkaline wash. If this does not stop it, try weaker solutions aud give longer contact. With some ores a large consumption is unavoidable. It then becomes a question of whether it will pay to use this process. This is a question that must be settled at headquarters after the report goes in.

(TO BE CONTINUED.)

A Metal Melting Furnace.

Herewith is illustrated the Lunkenheimer metal melting furnace, which is stated by the manufacturers to afford an efficient and economical method of melting metals, particularly brasses and bronzes. This type is the result of considerable study on this subject. The furnace consists of a cylindrical sheet-steel drum A, having cast iron heads. The interior



Metal Melting Furnace.

of the drum is lined with fire-proof tile, and there are two openings on opposite sides of the drum. Only one of these openings is in use, the other being closed by a fireclay filling. The object of haviug two openiugs is to increase the life of the linings of the furnace. It has beeu found that the furnace wears out quicker around the filling hole (which also serves as outlet for the flame), than elsewhere. An advantage claimed by the Lunkenheimer metal melting furnace is that when oue filling hole is woru out this can be closed by fireclay filling aud plate, the furnace reversed, and the other hole cut out and put in service. The oil burner is of a special type, designed to give the greatest amount of heat with a minimum consumptiou of oil. The Lunkenheimer Co. write that in their fouudry there are ten of these furnaces in use, and they are able to secure from six to seven heats per working day of ten hours from each furnace. The weight of each heat will average about 550 pounds, and the oil consumption varies from two to two and oue-half gallons of crude oil per 100 pounds of metal melted. The furnace is made and supplied by the Lunkenheimer Co., Cincinnati, Ohio.

Improvements in Cheap Copper Matting for British Columbia.

Written for the MINING AND SCIENTIFIC PRESS by RONALD C. CAMPBELL-JOHNSTON.

British Columbia is rich in immense deposits of pyrites of iron and copper. These can be classed as low-grade, carrying from 1% to 8% copper (though richer deposits also exist here under different conditions); this copper, however, is enhanced with gold and silver values to help pay dividends aud offset cost of production. The tonnage iu sight is abnormally large, but to make the mines pay engineering and metallurgical skill iu the management has to be of the highest, and every labor-saving device must be adopted.

Water power, plentiful timber, abundant fuel and railway facilities are at hand to aid cheap work.

The contour of the ground, in most cases, admits of deep adit tunuels to save pumping and hoisting, and affords an outlet to extensive open cast workings from the surface down. The engineering for mining has been brought to a high state of improvement, but the metallurgical department is not yet so much up to date as it should be.

The object of the writer is to suggest palpable improvements in the smelting, and to do this he has giveu much thought, backed by a long apprenticeship in Swansea. The objects to be attained are first to perfect a furnace into which is fed the raw, unroasted ore at the feed door, and from the tap hole is drawn blister copper of over 90% copper, dispensing with heap or mechanical roasting, and also the use of converters. The second object to be attained is a large tonuage smelted with a low loss of values in the slag, or up the stack.

With 20% to 45% sulphur in the furnace charge the most natural suggestion to be made from experience is the use of hot blast and pyritic smelting, dispensing with the necessity of carbon fuel in the furnace, and utiliziug the sulphur present, so instituting one loug oxidizing process from the top of the charge to the bath of matte at the bottom. This was successfully accomplished in 1889 by A. S. Merry at Sudbury, Ontario.

The cost of heating the blast in "U" pipes in a stove is offset by the less time consumed in the furnace to do the same thing, and the more regular running of the fusions without chilled sows.

If 2100° F. is the temperature kept in the tuyere zone in the furnace, then heating the blast to 800° F. and more in the stove, goes a long way to save time, and allows a larger tonnage to pass through. The increased size of the tuyere pipes and the use of non-radiating lining used on aceount of expanded hot air, so as to still feed the same amount of oxygeu, these are only primary costs, soon paid for.

By having a hot blast, in all smelting, entering the tuyeres, the heat is kept more normal, cold snouts are more easily avoided, a more homogeneous slag forms, and a more thorough oxidization of the whole mass procured, so the use of less flux obtained and a larger tonnage smelted.

We must, however, before looking to our smelting, see to our sampling and feeding, and try to save labor costs here. If the smelter is using ore from its own mine, aud may be only buys from one or two more to flux, then automatic sampling and automatic feeding can be installed. There are many good automatic samplers already devised, and by further improvements for local conditions, can be erected. The railway, therefore, discharges through bottom dumping steel cars its weighed burden in the storage bins. From here the ore passes automatically through the sampler and is bedded into bins systematically built near the furnace feed doors. A regular and well mixed feed into the bosh of a furnace is preferable, instead of dumping a ton or more at once from a car to chill the molten mass, having meu with shovels to mix and fill this car, and a mechanical feeder can be easily devised to keep the height of charge normal, a point so necessary in a stamp mill. Take au ordinary rotating cylinder with projecting shelves fastened on the inside lengthwise to turn over aud mix the ore; build this on an incline to discharge on to an

inclined iron plate protruding into the feed door, this plate having several ribs cast on it radiating from the discharge of the mixer to the full width of the feeding door, like extending fingers on a hand, so that the whole length of furnace is fed evenly. From the bins containing the ores and fluxes individual belt conveyors bring the ores and flux and deposit them in a hopper feeding the mixer. The gates to the bins are cast with cogwheels so that they can be opened to any size and will stay there. The lip to the bins moves back and forward into a sleeve, or rotates, as a circle, in the floor of the bin, and as a straight motion is worked by an eccentric, obviating a man barring the ore as it sticks. The feed to the mixer is regulated by enlarging and diminishing the opening of the gates, and the proportion of fluxes added is obtained by making the different gate openings correspond with the proportions of the charge mixture.

With this feeder installed for a furnace taking only a few kinds of ore, all labor costs are avoided except the one man on each shift to watch the feeding arrangements for two furnaces, and see that they work steadily.

In the construction of the furnace shaft to save fires from being carried off, the bosh well enlarged on all sides, should be carried high past the feed door so that the heated air from the tuyeres, when it has left the fusion zone, may expand and create less draught, as the enlargement of a flume slackens the current of water.

As we mentioned before, with the hot blast and pyritic smelting the process is one long oxidization from feed door to discharge of slag, so that the more blast carrying oxygen that is fed, the more oxidization takes place, the less sulphur and iron deteriorate the percentage of copper in the matte, and instead the sulphur passes off as sulphurous gas, and the iron combines as oxide with the oxides of silicon calcium, alumnium, etc., that make the slags. Forcing a strong blast into the furnace adds probably 50% to to the duty of the furnace and brings down the cost per ton, but by driving the slag out of the furnace rapidly, leaves insufficient time for the specific gravity of the matte to come into play when using an inside hearth instead of a forehearth, and so creates foul slags and a loss of values.

Also, the draught into the dust chamber and up the stack is increased and values, as dust, have too little opportunity to settle.

In smelting a large tonnage it is only a short time before the slag dump near at hand is filled up, and a slag railway has to be installed. This brings into use settlers of from 40 to 60 cubic feet contents.

The forehearth is used as a settler, but soon becomes half chilled and does not do its duty thoroughly, being also overcrowded in its work. These large slag pots will collect a skin of matte on their sides as they cool, and hold a large deposit of metal at the small end that sinks in the cooling. By having detachable pockets to retain this deposit when the pot is dumped, and by having the tilting device under control to pour slowly and gradually, and also sufficient pots in use to cool off, then the truant matte can be saved and resmelted, reducing to a minimum the loss of values in the slags.

How will we insure that the dust will not escape? The best condenser known to the writer is the "Bartlett," in which the fumes from the lead furnace are drawn by an exhaust into long flannel bags. The gaseous fumes alone escape through the material, leaving the solid lead oxides and carbon on the inside of the bags.

By shutting off the entrance of hot air, this leaves the air in the bags to cool and contract, the bags to collapse laterally and precipitate their contents into hoppers at the bottom. Any cooling and so contraction of air in the dust chambers will cause a precipitation of the dust. Alfred Senior Merry (vide "Interstellar Æther") was the first to prove that electricity and heat (thermine) were elements, as oxygen, etc.; that they have a powerful attraction for one another, in fact, always happening in some proportional combination, and as electro-thermine are drawn from the sun. Superabundance of electrity is cold, of thermine is heat. The rarefied air of mountain tops makes them snow clad, as the electro-thermine at that point has not been split up by the full weight and attraction of the earth. An electric discharge, as lightning, combines with and neutralizes the heat of the air on a summer's day, and makes the atmosphere cool.

Sir Oliver Lodge has applied electric discharges to dissipate artificial fogs. Now electric discharges in our condensing chambers will combine with and lower the heat, contract the air and cause precipitation of the dust. These fines can be deposited alternately in parallel dust chambers, one in use at a time, each with an asbestos loosely woven curtain at the far end and the dust automatically drawn by traveling plows.

Till now we have reviewed only the best practices existing for copper matting, proposing how to get clean slags of homogeneous consistency, to obtain a high duty for our furnaces, and to save outgoing values, to dispense with fuel in the furnace, to have an oxidizing field instead of a carbon or reducing field, to save labor in sampling and feeding, and dispense with previous roasting outside of the smelting furnace.

Next we have to discuss the ambition of tapping only blister copper instead of matte, and so doing without converters. To do this no new chemical reactions have to be discovered, but only oxidization has to be carried further than at present and made to come in contact more thoroughly with the molten mass.

The writer has designed a furnace he has called the "Campbell-Johnston" furnace to attain this object. He does not propose to patent it and charge a royalty for its use, but to throw open the invention for general adoption and for improvement by all metallurgists who see where an advance can be made. The only novelties in its construction are a second lower tier of tuyeres below the upper ones, and also a systematic deflection of all the tuyeres to create a more perfect oxidization from motion in slags, as in a wave with its backward undertow. As the wind plays on a sail at a tangent and forces the boat forward on its original course, so by deflecting the tuyere apertures to say 45° out of their present straight impingement, so a motion in the slags can be obtained in the fusion zone; starting from the slag launder with its straight pointing tuyeres above, then passing the upper tier of nozzles deflected away from the slag launder till it meets the downward deflected nozzles at the back end, and is taken forward again by the lower tier of nozzles deflected the opposite way to the upper ones, to rise and discharge at the launder.

This motion to concentrate the metal from the slag gives ample opportunity for the action of specific gravity, and constantly offers a fresh surface in the molten mass for thorough oxidization; the lower tier of tuyeres continues to play on the molten matte in the inside hearth, oxidizes the iron and encourages it to combine with the slag and pass away, leaving metallic copper, which metal, with the precious ones, has less affinity for oxygen than the other bases smelted.

The blister is tapped as usual into a casserole to be raised and tilted by hydraulic power to fill the anode moulds resting on trucks on rails, and is then ready for electrolytic refining. Two men at each shift are only required to attend to the tap holes and pouring for two furnaces.

By perfecting these suggested improvements in copper matting, only first metal as blister from raw ore, and subsequent refining, comprise the required processes of treatment for copper, and the first metal only calls for as actual labor on the furnace the use of three men to two furnaces on each shift, or nine men to smelt 700 tons of ore, and may be 800 tons, in the three eight-hour shifts. The quota of costs for management, assay office, engine driver for stove, boilers and engines, slag railway, sampling and general contingencies as coal for stove, oil, etc., all must be added, but the writer is confident that in the Boundary district of British Columbia $1 for smelting one ton into first metal will amply cover all costs, even depreciation of plant.

Gold Deposits of New Zealand.*

NUMBER II.

Written by ALEXANDER MCKAY.

In the course of three years subsequent to the first discovery of gold at Gabriel's Gully there was scarcely a gully or a mountain ridge from west of Lake Wakatipu to Oamaru that had not been prospected; and the attention of miners was not wholly directed to the finding of alluvial gold, since several reefs were being prospected in 1863. The results were unsatisfactory till the discovery of the reefs in the Carrick Range, several of which gave payable returns so long as the workings were confined to the oxidized portions above water level, below which the reefs were strongly mineralized, and did not pay to work.

More recent discoveries at Bendigo Gully, in the Arrow and Shotover valleys, and on the west slope of the Richardson mountains, though at times giving promise of good returns, have failed to realize what was hoped of them. On Highlay Hill, at Macrae's, and on the Nenthorn field successful working of the reefs has, except in some solitary instances, not been accomplished. Nor has better success attended reef-working in the southern parts over the West Taieri and Tuapeka Goldfields; and after forty years of such experience it may be asked, are reefs in Otago the primal source of the alluvial gold in the country?

The miner of the early days of the Otago Goldfields declared that quartz was "the mother of gold," and nothing could persuade him that it could have a different source; but it now appears that of necessity we must look to a different source.

The abundance of quartz grit scattered as patches over areas of considerable extent throughout the interior and northeastern parts of Otago does, indeed, account for the gold as a secondary deposit; but these must have had their source from somewhere, and an enormous denudation of the caps and upper parts of the reefs would be required to supply not merely the gold, but the quartz also. The reefs and their auriferous contents alike seem insufficient to produce the results that now appear, and it must be asserted of the quartz grits at least that the greater part of what they once were has disappeared in the course of ages by the ordinary process of denudation. At one time these quartz grits seem to have been an almost continuous deposit over all the low grounds and middle heights throughout Otago and Southland, and to have occupied a considerable area of southern Canterbury as well. Subsequent to the close of the Cretaceous period, movements of the land took place, by which portions of the grit formation were elevated to positions 4000 feet to 5000 feet above the sea, and at the same time other parts were deeply involved along lines of fault at unequal elevations, thus exposing in the one case the uplifted area to rapid denudation, and in the other case the upturned edges of the involved part to the same influence. In this manner great destruction of the quartz grits took place, and it is a matter for marvel that so much of them has been preserved to the present time.

Considering the comparative paucity of reef quartz over the whole of Otago and Southland, it is evident that reefs of quartz could not have supplied such a great formation of residual grits, even granting that an enormous denudation, far greater than what is usually supposed, did take place.

The lower schist formation of central and northern Otago is strongly foliated with laminæ of quartz, which, though resembling, can in no sense be regarded as vein quartz, and this is evidently the source whence has been derived the great bulk of the quartz grits at the base of the coal-bearing formation; and as these quartz foliæ are known to carry gold—e. g., at Skipper's Creek, on the Shotover, at Green's Reef, near Ophir, and at other places—such quartz foliæ must be regarded as the principal source of the alluvial gold of Otago.

While much gold has been obtained from the quartz drifts, the larger pieces of quartz in the drifts, varying from 2 inches to 5 inches in diameter, do not contain gold, numberless trials having failed to show its presence. This has been regarded as showing that the country quartz does not contain gold, and could not have yielded the alluvial and cement gold of the quartz drifts. However, it has been shown that the denuded parts of existing reefs were as unlikely as a source of the twenty-three to twenty-four million pounds worth of gold that has been obtained from the goldfields of Otago; and it is an undoubted fact that, whether in the solid parts of the quartz foliæ or no, gold is found in association therewith, and, as is often the case in connection with vein quartz, the easing and friable margins often contain gold, while the solid quartz of the middle part does not. So, also, this may be characteristic of the country quartz occurring as foliæ in the mica-schist. Other sources of gold may be suggested, such as bodies of iron sulphide or of oxide of iron (hematite); but aggregated bodies of these ores are comparatively rare, and the character of the gold in Otago is generally against the assumption. Other sulphide ores, such as copper or antimony, may be suggested, but these also are not likely, on investigation, to prove satisfactory.

The gold of Otago must therefore be regarded as mainly having origin in the schists, and in near association with the quartz foliæ that characterize the middle and lower divisions of the schists, and is but little due to the quartz reefs occurring in the same rocks, as at but few places are the foliated schists rich enough to pay for working.

GOLDFIELDS OF THE MARLBOROUGH DISTRICT.—These have characteristics in common. The southeastern portion of the area is formed of mica-schist, foliated with quartz at many places. These rocks so much resemble the foliated schists of Otago and South Westland that they may fairly be considered in age and the period of their metamorphism as identical. Reefs of vein quartz are common, but few of them seem to be rich enough in gold to pay for working; and in the case of the Mahakipawa field the auriferous reefs bear no proportion to the amount of alluvial gold that has been obtained. Of the Wakamariua field the same may be stated; nor can anything different be said of the whole of the gold-bearing area of the Marlborough district.

The Marlborough goldfields are bounded on the north, south and west by non-productive areas, over which the rocks are not gold-bearing, and towards the northeast pass under the waters of Cook strait; and they have not received alluvia from other gold-bearing sources, so that the problem of the source of the alluvial gold is by no means as complicated as is the case with the goldfields of Central Otago. Nor has the gold-bearing area been subjected to an equal degree of denudation. So that it would seem that we must consider the quartz foliæ of the metamorphic schists as in great part the probable source of the gold over the Mahakipawa field, and the quartzite already mentioned as its probable source on the Wakamarina field.

GOLDFIELDS OF SOUTH WESTLAND.—There can be little doubt that reefs of auriferous quartz occur on the western slopes of the Southern Alps. The strong probability of this is indicated by the occurrence of coarse and specimen gold in the rivers of the district south of Okarito; but, since as yet no reefs are being worked, no comparisons can be instituted.

(TO BE CONTINUED.)

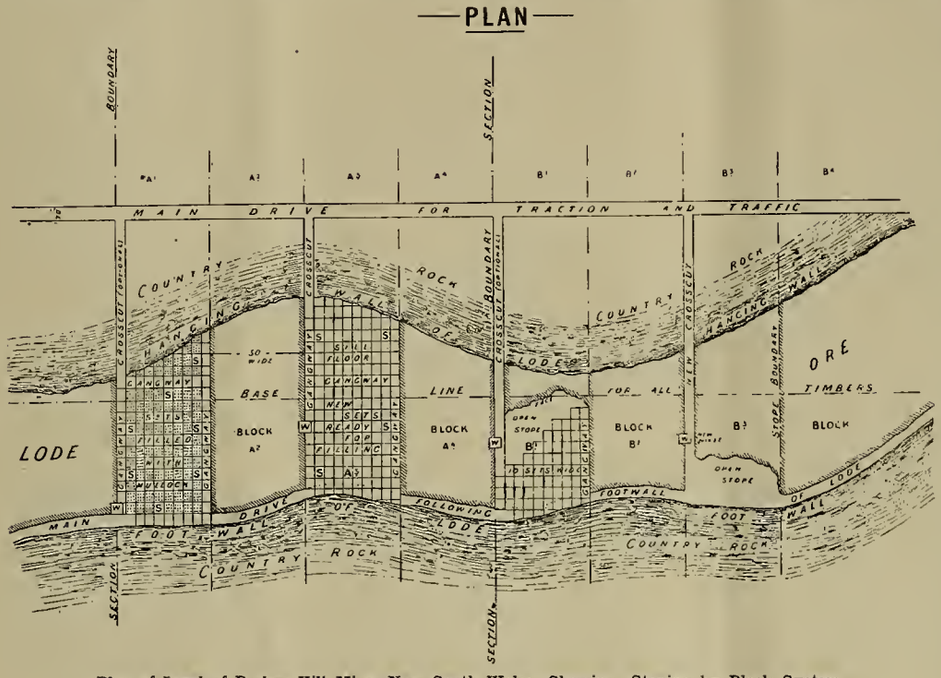
*Abstract Report of Government Geologist.

Development and Operation of a Mine.

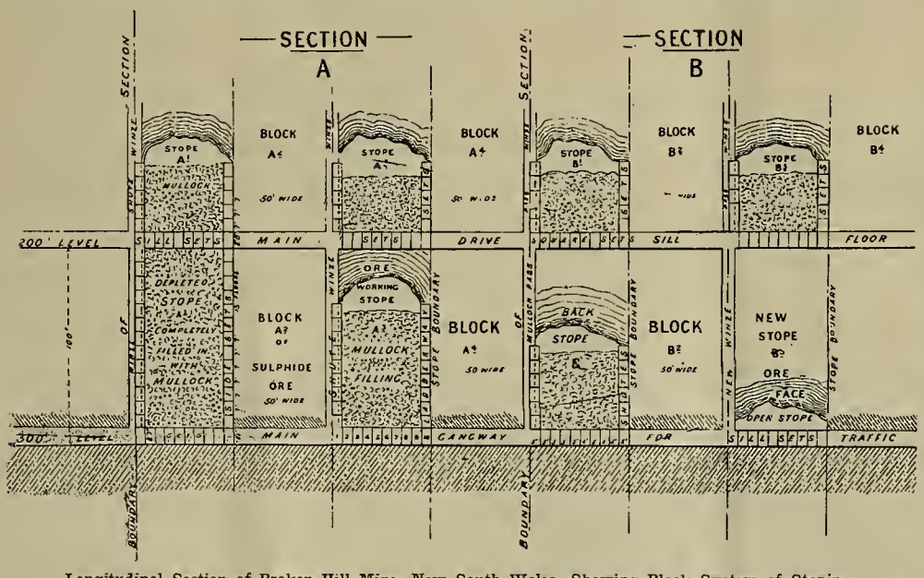
NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

In the former chapters of this article, the subject was treated from a broad and general standpoint, with ideal illustrations. It has beeu the desire and aim to point out the advisability of working a miue iu such a manner that disastrous results are not likely to follow the method of mining. It has also been shown that it is desirable, and even necessary, to fill the stopes with waste, and this filling should be taken wherever possible from the "dead work" of the mine, or from the surface wherever practicable. Where this cauuot be done, filling must be obtained from the walls of the vein. It is preferable to take it wherever possible from surface excavations, for



Plan of Level of Broken Hill Mine, New South Wales, Showing Stoping by Block System.



Longitudinal Section of Broken Hill Mine, New South Wales, Showing Block System of Stoping.

the reason that miuing cau be usually carried on ou the surface cheaper thau uudergrouud. It is not necessary that such excavatiou be adjacent to the vein, as the dip of the vciu or surface coutour may make it advisable to obtaiu filling elsewhere, with separate rock shafts for handling the waste, to be delivered at the various levels by crosscuts, or otherwise.

The geueral method of mining and filliug described in the last paper may be applied in a variety of ways—but to insure safety and the complete removal of all the ore with safety and with no disastrous caves, sucb as usually follow the excavation of large stopes, where filling is not resorted to—it is suggested that the stopiug be carried on by the block system in a manner similar to that followed at the Broken Hill mines of New South Wales, or at the Homestake in South Dakota. The method employed at Broken Hill is illustrated in the accompanying sketches. The mine is divided into blocks, extending 40 to 60 feet along the strike of the vein, as showu. The only material difference betweeu the Brokeu Hill system and that at the Homestake is that at the former the square sets are carried up at the ends of the stope only, the intervening space being filled with waste, while at the Homestake the square set system is carried throughout the full width and length of the stope and as close to the back as practicable, and filling introduced contemporaneously. In the early days of the Homestake development, extensive caves occurred in thc Palmetto, Highland, Goldeu Terra, De Smet and Caledonia mines of the group. All of these stopes were carefully and completely timbered with the square set, but uo filliug was run in and the caves resulted as a uatural consequence.

Within the current week a news dispatch from Pearce, Arizona, reports the Commonwealth mine as about to cave, owing to neglect to fill the stopes. This mine has proven very profitable the past few years, and extraction has been rapid and results have been rcported satisfactory, but now all the workmen have been withdrawn from the mine owing to the threatened cave, which, it is evident, is about to occur, if it has not taken place already.

To recover a caved stope, particularly a large one, is often a difficult, expensive and sometimes a dangerous operation. Such a catastrophe may be avoided by properly arrauging the detail of development and employing foresight.

In workiug by the block system of stoping, which is the only way in which large ore bodies can be entirely removed without incurring great risk, it will be necessary to place sills on the floors of each level, extending from foot to hanging wall. These sills are in sections and should reach the length of at least two sets (three sets are better), to make connection between the levels possible when removing the last slice of ore in the back of a stope beneath a level already stoped out. This can bc accomplished, if the excavation at the point of connection be not made too large. It is important that heavy lagging be laid ou the sills to keep the filling from running into the excavation below, wheu connection is made. If there is a space between the lagging and the rock floor of the level when it is laid, it is well to fill this space with broken ore, then, wheu connecting the level with the stope below, no waste need be mixed with the ore broken at that time, and the lagging has been prevented from breakiug by reason of the great weight of filling above it.

The first step in opening a new level is to run a drift along one wall and from it extend crosscuts from wall to wall of the vein. These may be driven in the center of the blocks, or a crosscut may be driven on either side of a block, as shown in the ground plan in the accompanying illustration. When the entire length of the block has been cut one set high—longitudinally of the vein aud to a width of one and one-half to two sets—the placing of timbers may be commenced if the character of the ground demands it, otherwise a heading may be driven the full leugth of the block as far as is safe without timbering. Where this can be done crosscutting is unnecessary, aud a line of sets may be left open to afford gangway at each end of the block.

If the mine is worked through a shaft sunk at some distance from the vein, then it is well to have a lateral drift outside the vein at each level, from which the crosscuts may be run to and across the vein. These lateral drifts are placed on the same side of the vein as the shaft at each particular level. Crosscuts from these lateral drifts may be run for every second or every fourth section; and, where the distance to the vein is not too great, the crosscut at each alternate block is advisable, as it will facilitate both transportation of the ore and ventilation. Tbe winze (or raise) through which filling is sent into the stopes should be made directly opposite the center of each block, thus affording the most complete and ecouomical means of filling by gravity. The stoping should be commenced next the hanging wall, instead of next the foot wall, as shown in the accompanying plan of work. This was illustratcd iu paper No. 2. As the stope progresses upward the passes for filling may be utilized for lowering timbers to the floor, where they are required from the level above. The ends of the stopc must be lined with heavy lagging as the filliug comes in. Unless this be done, when the adjoining block is stoped the filling in the old stope will run into the new and become a source of much trouble aud expensc. It may be possible to recover more or less timber from time to time, but ordinarily but littlc of the lagging can be removed to advantage. As the stoping progresses upward the ore broken is sent down the mill holes at the ends of the stope, and if the distance be too great, a line of mill holes cau be carried up in the center of the stope. This in a stope 60 feet long (parallel with the walls) where caps set 5 fect apart would reduce the maximum shoveling distance to about 12 or 13 feet. Where the only mill holes are at the euds of a block 60 feet long, too much sboveling of the ore is necessary, not one-half of it being sent below with a single shoveling. This appears to justify the center line of mill holes. These may be made either vertical or inclined as desired. The vertical hole requires the least expense for timber, while the inclined holes may be fewer in number. Iu some mines the work of stoping out a level is so long delayed that in the presence of a humid, hot atmosphere the timbers rot out before the work is accomplished. This occurs where the stopes are made very large and where frequent (and ultimately costly) delays occur because of caving or other trouble. The block system, if properly practiced, will obviate any such difficulty. Where a vein is very wide—more than 150 fcet—a system of prompt and economical distribution of filliug is necessary. This can be best accomplished by the use of cars, when gravity can no longer be economically utilized. The tracks and foot boards cau be removed from place to place as often as required.

The method of running up a single line of sets at each end of a stope, as in Broken Hill, illustrated in the accompanyiug sketch, can only be safely practiced where the ground stauds well. Easy, or caving ground had better be timbered throughout. Doors or aprous can be arranged on each level to send the filling into an adjoining stope, or allow it to continue to a lower level. There arc many details to bc worked out, which will differ more or less in different mines, but the general plau has been made sufficiently clear to make application of the ideas. The excavatiou of a large cut on the surface due to removal of both ore and waste will, of course, form a catchment basin of possibly several thousand square feet, all depending on the extent of operations, but the manager must judge for himself whether ordinary climatic conditions of the region prohibit the employment of the open-cut system of filling. Even though a large volume of water be admitted to the mine owing to occasional heavy rainfall, it is more than probable that by providing abundant bailing capacity it would be cheaper to bail the mine of this additional surface water occasionally than to employ constantly a more expensive method of mining.

The Land Office and Mine Patents.

The Land Department at Washington has created unusual interest in mining patents by promulgating a rule that patents for mining ground shall conform to the descriptions in the patent application, regardless of the position of the location on the ground as determined by the monuments. In Colorado, particularly, where this new order has been applied, it has created trouble and caused a feeling of insecurity. Concerning the whole matter, the same condition found in Colorado exists in every other State and Territory of the mining regions of the West; but there is no reason for alarm where the original position of the monuments can be determined. Regarding the whole question, in general, the situation may be illustrated by the following diagrams:

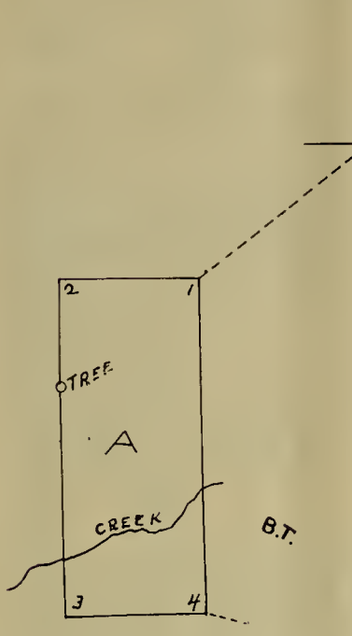


FIG. 1.

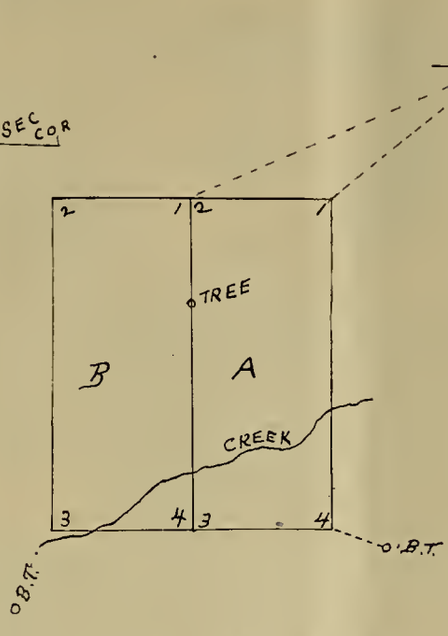


FIG. 2.

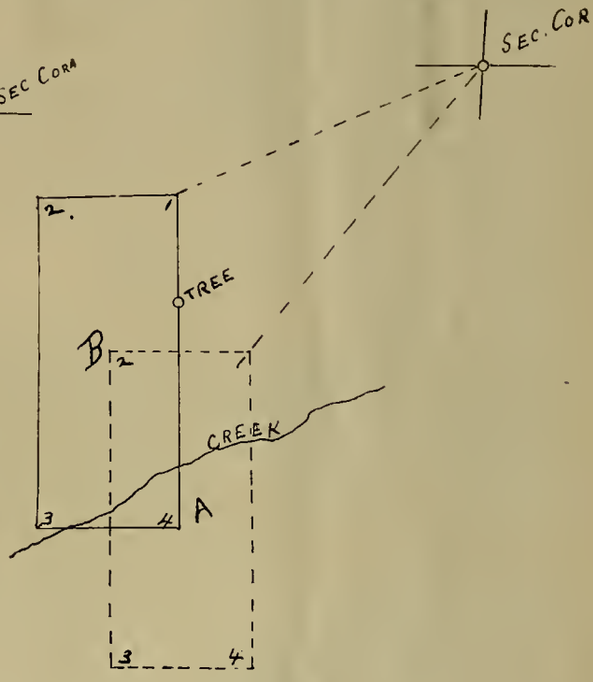


FIG. 3.

An application for patent was made for a lode claim occupying the position of B on Figs. 2 and 3. There was a "paper conflict" with a claim occupying the position on the ground, as shown on Fig. 2, but on paper, as shown on Fig. 3. The Commissioner of the General Land Office, it would seem, insists upon making an actual conflict out of the paper one, and refuses to patent that part of B which conflicts with A on paper. In making this ruling, the commissioner has said that the only way out of the dilemma is to have A's patent vacated and the claim resurveyed and readvertised.

A, the prior Colorado patentee, may feel no anxiety until he is actually attacked. Every mine owner everywhere is liable to threats of this character and others, and life would be extremely burdensome if one had to treat each threat as a serious menace. It is a questionable feature of our laws that any irresponsible person may at any time cause an innocent party annoyance and expense by instituting legal proceedings against him without any just grounds for so doing.

This whole matter is authoritatively discussed on the editorial page of this issue, it being deemed of sufficient importance to warrant such extended notice.

THE precipitation of sulphuric acid as strontium sulphate in alcoholic solution is stated to give accurate results, says the American Manufacturer. The liquid (corresponding to about 0.5 gram of sulphuric acid) in bulk about 50 c.c., is acidified with hydrochloric acid, heated to boiling, and precipitated by 15 c.c. of a 10% alcoholic solution of strontium chloride; 100 c.c. of alcohol are added, the liquid stirred and set aside till cold. It is filtered and the precipitate washed three times by decantation with 100 c.c. of alcohol, then brought on the filter and washed with alcohol till free from chlorine. It is dried, the filter incinerated with the precipitate and the whole ignited. In presence of iron, the slightly acidified solution is precipitated as above, 120 c.c. alcohol added, the whole digested at a gentle heat for an hour, allowed to cool, and the liquid poured off. The precipitate is warmed with two c.c. of hydrochloric acid (two of acid to one of water) and fifty c.c. of alcohol, the liquid filtered after cooling, then the precipitate washed three times with alcohol, and the operation concluded as above. In presence of chromic salts, the digestion of the liquid after precipitation should be continued for three hours. Zinc salts have no influence.

Copper Smelting in Wales.

The ores vary, both in percentage of metal and in composition, according as the supplies of them arrive from various countries, says J. O'Sullivan, in the British Columbia Mining Exchange. Of all it may be said that they are sure to be accompanied by a large amount of gangue (that is, non-metallic mineral, vein-stone), which is commonly siliceous in composition. Five classes are, however, distinguished by the smelter, which must be either treated differently or carefully mixed.

Class 1.—Poor ores, containing a little copper pyrites, and a considerable quantity of iron pyrites; in these the percentage of iron and sulphur (from the two minerals) is large, copper being present only to the extent of from 1½% to 9%. For example, Norwegian pyrites, 1½% to 3½%, Rio Tinto pyrites, 3% to 6%; Seville ore, 4% to 6%; Bett's Cove (Newfoundland) ore, 7% to 9%.

Class 2.—Sulphides, carrying from 10% to 18% copper, such as New Quebrada ore, 10% to 12%; Copiapo ore, 15% to 17%; Libiola ore, 12% to 18%.

Class 3.—Richer sulphide ores, chalcopyrite, bornite, etc., running from 20% to 50% copper, for example: Chili ore, 20% to 28%; Namaqua ore, 30% to 35%; "Cape" ore (peacock), 35% to 45%; and, formerly, Anaconda ore, 40% to 50%.

Class 4.—Oxides and carbonates of copper (cuprite, melaconite, azurite and malachite) with a little of the sulphides; silicates, copper precipitates, native copper ores, that is, ores carrying a native copper (metallic copper) and copper barilla (copper sand).

Class 5.—A product of ores which have already undergone a metallurgical process abroad (fusion), and constitutes a regulus or matte, generally rich in copper, yielding from 45% to 60%, and sometimes 72% of the metal; for example, Chili regulus, 45% to 48%; Columbian matte, 47% to 49%; Montaua matte, 53% to 60%; Boleo matte, 60% to 62%; Anaconda matte, from 62% to 72% copper.

Large lots of Chili bars, assaying from 97% to 98% copper, are also melted and refined at these works; also, argentiferous Anaconda furnace-bottoms have been treated from time to time.

CALCINATION OF THE ORE.—1st Operation.—Note —This operation, the object of which is to expel the large excess of sulphur in the cupreous pyrites, and to oxidize the sulphide of iron into oxide of iron, is dispensed with in the case of the richer sulphide ores of the second and third classes.

The calcination is conducted in reverberatory furnaces, called "calciners," at a very low temperature, with free access of air. The charge, three to four tons, is introduced into the furnace by means of a hopper on the roof. After about two hours it is turned over by the paddles; this is repeated from time to time during the calcination, which is completed in twelve hours, when the charge is withdrawn. The sulphur dioxide produced in this case escapes into the atmosphere; but the poorer "cupreous sulphur" ores of the first class are calcined in automatic calciners, when the sulphur dioxide formed is carried by the air currents into the sulphuric acid chamber, and thus utilized for the manufacture of that acid.

MELTING OF THE CALCINED ORE.—2nd Operation. The charge, 42 to 46 cwts., consists of a mixture of the calcined ore and a proportion of the sulphide ores of the second class, that do not need calcining, metal furnace slag, "sharp slag," containing about 3% copper.

It is melted in a reverberatory furnace, called "ore furnace," for about six hours, whereby a regulus or matte (coarse metal or ore metal) is produced, carrying from 30% to 35% copper; and a slag, "ore furnace slag," composed of silicate of iron and earthly bases, and containing from 1% to $\frac{3}{16}$% of copper.

The metal thus produced should not contain more than 35% copper, since that would mean a small proportion of sulphide of iron (FeS), which would be likely to have oxidized copper in the slag; and not less than 30%, if possible, since that would not be economical.

CALCINATION OF THE COARSE METAL.—3rd Operation.—The charge, four tons of the crushed metal, is calcined for from twenty-four to thirty-six hours at a low heat, in a reverberatory calciner. The object of this is to oxidize the sulphur combined with iron, and the iron itself, leaving cupreous sulphide (Cu_2S) untouched; this point, however, may not be reached, or it may be overreached in actual practice. Some sulphate of copper ($CuSO_4$) is unavoidably formed in this operation. If the calcination be very imperfect, it can be corrected in the fourth operation.

4th Operation.—Melting of the calcined coarse metal in the metal furnace (reverberatory furnace), mixed with certain proportions of rich ores of the second, third and fourth classes, rich copper slag from the fifth and sixth operations (roaster and refinery slag), copper scale and siliceous matter, called "cobbing," that is, old pulverized bricks from furnaces (foul).

Result.—A rich "metal" (matte), whose copper percentage varies according to circumstances, say from 55% to 80%. These products are classified into red, blue, white and pimple metal. Red, from 55% to 65%; blue, from 65% to 72%; white, from 72% to 78%; pimple, from 78% to 80% copper. Of course, there may be every grade of quality between these estimates.

The percentage can be judged, however, by a practiced eye to within 1% to 2%. The slag from this process contains about 3% copper as silicate of copper. It is also rich in oxide of iron, and is charged into the "ore furnace" as mentioned above, when the oxide acts as a flux, and the silicate of copper is reduced to sulphide of copper.

Roasting.—5th Operation.—The pigs of fine metal, red, blue, white or pimple, as the case may be, are piled up loosely in the roaster furnace, and heated with a gradually increasing heat, the current of air rushing through at the same time. The metal, as it melts (called "sweating down") passes through the current of air, and is oxidized; sulphur to sulphur dioxide (SO_2); copper to cupreous oxide (Cu_2O); the oxidation occurs only on the surface of the drips, so when the whole charge is melted we have really a mixture of cupreous sulphide and cupreous oxide, when the reaction occurs, $Cu_2S + 2Cu_2O = 6\,Cu + SO_2$, the gas ($SO_2$) escaping through the melted charge, causing ebullition, thus bringing further quantities of Cu_2S in contact with the air; meanwhile metallic copper collects at the bottom. Metallic copper, however, is able to dissolve limited quantities of the Cu_2S, and therefore, when the whole charge becomes metallic, the same reaction continues, but slower. If tapped at this point, the reaction occurring in the pig before setting produces pimples on the surface, and is known as "pimple copper." If, however, it is

allowed to work a little longer iu the furnace, less Cu_2S will be contained when tapped. Now, the reaction occurring so slowly will not produce pimples, but raise the chilled crust iuto blisters; snch copper is known as "blister copper."

Refiuing.—6th Operation.—About teu tous of either blister or pimple copper is charged into the refinery furnace and sweated dowu; this oxidizes the large exposed surface. When melted down oxidation is continued by flapping; that is, beating the copper with a rabble-like tool, so as to expose fresh surfaces of the copper to the air. The object of this oxidation is to oxidize aud slag off impurities, such as iron, arseuic, antimouy, phosphorns, and sulphur as a gas (SO_2). But in separating these, the copper oxidizes as well, to cupreous oxide, the bath of metallic copper dissolviug it as produced. By and by the points may be reached when metallic copper will dissolve uo more cupreous oxide further oxidatiou of copper would slag copper itself. This pitch of the copper is called the "dry." A ladleful is taken ont and allowed to set, when, if it be "dry," a depression, a furrow of the surface is formed. It is brittle, aud has a brick-red, fine granular fracture. The slag is now removed from the surface, and anthracite coal is thrown upou the charge, and a greeu pole is plnnged beneath the surface. The water of the pole produces steam, causing great distnrbance, thus bringing fresh surfaces to the action of the carbon of the anthracite, as well as the pole itself. This oxide of copper is reduced to metallic copper—$2Cu_2O+C=4Cu+CO_2$.

In reality the impurities are not perfectly removed. The copper, on being perfectly reduced, is not "tough," and malleable in consequence; by an excess of poling this conditiou is brought about; the copper is then said to be "over-poled."

The fractnre of such copper would appear brass-yellow in color and coarsely fibrous.

The presence of certain quantities of cupreous oxide corrects the effect of tbese impnrities, so the poling is carried only to that point where sufficient oxide of copper is present to balance the irou, arsenic, etc., this being now called the "tough pitch."

If that pitch shonld be passed, it is restored by giving a little air. The refiner decides by taking a "test," a small ladleful, which he cools and hammers, then breaking it in a vise. The fracture should be finely fibrons, silky and pale salmon color. There are three qualities of commercial copper, viz.: "Tongh pitch," as produced above; "best select," a pure copper for best brasses, and "tile," a very impure copper, for hard brass. The "best select" is made from a selected regulus, made in this way: Ordinary white metal partially roasted until some metallic copper is formed as a bottom under the reguln, copper having a greater affinity for sulphnr than the other metals present; the metallic copper will contain most of these, leaving the regulus exceptionally pure; this being stripped off from the bottom, is roasted by itself to "blister copper," which, when refined, is "best select." The impure copper being refined, makes the "tile copper."

In addition to extensive reverberatory copper smelting plant, for many years several water-jacket furnaces in full blast have been prodncing copper matte carrying from 50% to 56% copper.

This matte is crushed fine and six-tou charges of it calciued in the modern automatic "revolving calciner," in which a most perfect calcinatiou is effected in about twelve hours. The calcined product is subsequently reduced to metallic copper by a special treatment. They have also in operation two converters, in which very poor "purchasc" matte, carrying 12% to 15% copper is blown into white metal of 75% copper in about fifty minutes—the color of the flame issuing from the converter iudicating the desired pitch of the metal. The total cost of the production of refined copper from the ore is abont £7.10.0 per ton (abont $36.52).

The methods of copper assaying employed are: "Cyanide," "battery," "subsulphide" and "iodide." The old Cornish copper assay (fire assay) is still practiced.

Iron Ore Situation.

At mines everywhere in the Lake Superior regiou stock piles are large, some so big that all available room is exhausted, says the American Manufacturer. At these uo hoisting is under way. Others have far more ore than usual and these are runniug light. There is far more ore on hand in the regiou, comparative to output, than has been the case in auy fall for eight years; probably more, actually, than ever known.

Final returns regardiug irou ore shipments by lake for 1903 show au aggregate of 23,649,550 gross tons. This does not include 203,419 tous shipped from the Lake Superior Consolidated mines on the Michipicoten range in Canada. Neither does it include the shipments by rail to furnaces near the mines, which are estimated at about 450,000 tons. With these two items added, the grand total will be 24,000,000 tons. The graud total of shipments during 1902 was 27,571,121 tons, of which 27,039,169 tons were by lake; therefore the lake shipments this year are 3,389,619 tons less than they were last year. Various causes contributed to this, the principal one beiug that more ore was brought down last year than was needed, and the snrplns had to be added to the available supply for consumption this year. Of the 203,419 tous shipped from the Michipicoten range 170,672 tons went to Lake Erie ports.

In view of the depression iu the iron and steel iudnstry, the stocks of ore on Lake Erie docks is not as discouraging as was expected. The reduction of more than 3,000,000 tons iu the ontput of Lake Superior mines this year as compared with 1902 has been instrumental in keeping down the Lake Erie dock stocks. Reports from all Lake Erie dock stocks show that of the total ontput of 23,649,550 tons of ore by lake, they received 19,681,731 tons and had a balance on dock December 1 of 6,371,085 tous. In 1902 they received 22,649,424 tous and held a balance December 1 of that year of 7,074,254 tons. There are no definite figures as to stocks of ore at the furnaces, but a large snrplus—both at furnaces and Lake Erie docks—mnst be looked for next spring in the absence of decided improvement in the iron business.

There was a falliug off in the shipments to furnaces duriug the navigation season just closed. Shipments to furnaces between May 1 and December 1 of this year aggregate 16,903,013 tons, compared with 18,423,364 tous in 1902, 14,204,596 tons in 1901, 11,613,773 tons in 1900 and 11,765,158 tous in 1899.

Accuracy of Commercial Samples and Assays.*

Written by ERNEST H. SIMONDS.

NUMBER II.—CONCLUDED.

PYRITIC CONCENTRATES.—Whether an umpire assay is necessary depends upon the results of the seller's and buyer's assays, with reference to the richness of the material, and npou the weight of the lot. In general, an umpire assay is not made if the assay valnes given by the two assayers do not vary more than 0.05 ounce of gold per ton of concentrates, provided the value of the lot figured from the results of the two assayers differs by less than $20, or provided the variatiou is less than 1% of the total value of the lot.

Tbe most commou cause of difference between duplicate assays of the same conecntrate pulps is that these pulps often contain particles of amalgam, due to scouring of the plates, or particles of rather coarse gold which have escaped amalgamation. These rich particles are especially common iu concentrates at the present time, as modern practice emphasizes the use of coarser screens thau were formerly nsed, the purpose being to increase the tonnage capacity per stamp. Concentrates are always ground to pass a 100-mesh screen for the assay pulp, but the extremes of results of four careful and correct assays of such conceutrate pulps from some mills will often vary several teuths of an ounce of gold per ton of coucentrates, while those from other mills will give closely agreeing or identical results on repeated assays. But when 100-mesh pulps which do not give uniform results are reground to pass a 150-mesh screen, the differences disappear and the results for gold agree exactly, or at least all lie within one-tenth of an ounce per tou. The following results on different lots of sulphurets from two mines—A and B—will illustrate this point:

	100-Mesh				150-Mesh			
A.....	2 36	2.44	2.30	2.30	2.24	2.96	2.26	
B.....au	1.48	1.22	....	ag 58.20	57.84	au 1.32	1.32	ag 57.74

It is apparent that the present practice of using a 100-mesh screen for concentrates should be changed to the use of a 150-mesh screen—preferably a box screen. Although this would require somewhat more labor iu grinding the pulps, it would lesseu the labor of assaying by reducing the number of assays required to obtain a reliable average. The fiue screen does the averaging of several hundred or thousand grams, while averaging the assay results of the coarse pulps gives an average of only one or two assay tous. More important yet is the close agreement in the results of the two assayers—provided their assays are correct.

SILVER-LEAD ORE AND CONCENTRATES.—This is the easiest of materials to sample and gives perfectly uniform results. The silver is nsually estimated by the scorification and the gold by the crucible assay. The lead is estimated by fire assay at present, although within a few years perhaps the fire assay will be displaced by the molybdate method. However, the fire assay, if skillfully performed on an ore free from other easily reducible metals, will give results checking within ½%, and results only ½% to 1% below the correct percentage as given by the molybdate method. In the following table 1 and 2 are from Idaho and 3 and 4 from Mexico:

No.	SELLER Oz. Ag.	SELLER %Pb.	BUYER Oz. Ag.	BUYER %Pb.
1	67.5	63.2	69.4	62.8
2	72.4	64.5	72.8	64.3
3 ..... Original	311.00	36.3	312.50	36.5
4 ..... Duplicate	230.50	30.2	.....	.....
4 ..... Average	234 90	30.65	235.50	30.75

Iu 3 and 4 the assayers worked on the same pulps, but iu 1 aud 2 the results show the discrepaucies in resampling the whole carload of 25 tons of coarse ore, as well as in assaying.

Let us now turn from the discussion of the accnracy of assays to a discussion of the accnracy of ore samples. It is a commou practice to make duplicate assays, but in only a few cases is the sampling dnplicated or checked iu any way. Results show that carefnl, every-day samples are, on the average, correct within about 2% of the total amount of metal present. The following checks on samples were obtained in the course of regnlar work, where time was an object and no more than ordinary care was taken.

COPPER MATTE.—Five hundred pounds of matte, crushed to pass a 1-inch mesh and well mixed by previous crushing and couing, were quartered ou an iron floor by the nse of a rectaugular iron cross. Two of the quarters were quartered to 50 pounds, crushed to pass 4-mesh, qnartered to 6 pounds, dried, gronud to pass 60-mesh, aud from this ½ pound was taken out by dips from the original pnlp. The other two quarters were worked down in the same way for the duplicate pulp. The two pulps were assayed as separate samples:

	Ounces Gold.	Ounces Silver.	Per Ct. Copper.
Original.....	35.50	342.0	52.72
Duplicate.....	35.64	337.6	52.78

The whole lot, of which these were samples, weighed 22 tons and was worth about $25,000.

PYRITIC CONCENTRATES.—A lot of 30 tons of concentrates, free from coarse gold or amalgam, was sampled in the usual way. The seller, believing this sample to be too low, had the whole 30 tons resampled. The method pnrsned was exactly the same each time and was as follows: The lot was dumped from the sacks onto the sampling floor into a compact heap, 2 to 3 feet high. Every fifth shovelful was taken as a sample and coned. The cones were then flatteued and every third shovelful takeu as the sample and again coned. These cones were flattened, alternate shovels being taken as the sample, and thrown on the center of a rectangular cross, and from this point ou quartered down to a weight of 5 pounds. This 5-pouud sample was steam-dried and ground to pass a 100-mesh sieve. The assay pulps were takeu out by dip samples:

	SELLER Ounces Gold.	SELLER Ounces Silver.	BUYER. Ounces Gold
First sample.....	7.07	27.50	7.17
Re-sample.....	7.29	28.05	7.16

CHECKS ON COMPOSITE PULPS.—Many of the best engineers, after getting the assays of a lot of mine examination samples, direct the assayer to make a mixture of eqnal portions of certain samples, which they have decided upon as lying within the limits of an ore body, for making a laboratory working test. The assay of a pulp of this composite sample, compared with the average assay of the constituent samples, checks the sampling and assays of all the samples. The following table gives checks obtained in this way. All these samples are quartzose ores from the examination of large mines:

No. of Samples	HIGHEST. Ounces Au.....	HIGHEST. Ounces Ag.....	LOWEST. Ounces Au.....	LOWEST. Ounces Ag.....	AVERAGE. Ounces Au.....	AVERAGE. Ounces Ag.....	COMPOSITE. Ounces Au.....	COMPOSITE. Ounces Ag.....
102...1.10	47.40		0.02	0.25	0.213	6.79	0.225	6.70
16...0.40	.....		0.06	....	0.204	....	0.21	....

Eqnally satisfactory agreement may be obtained with composite samples of free gold ores.

In the second a laboratory test showed 22.8% of the gold to be free and 50.4% to be contained in the sulphurets. In the first the ore is typical cyaniding ore, containing very fine gold and less than 1% of sulphnrets.

CHECKS ON ORE TESTS.—In making laboratory mill tests, where the free gold and the percentages and values of concentrates, tailings and slimes are determined, the total valne ought to foot up to within 2% or 3% of the valne given by the assay of the ore pulp.

Althongh the results to be obtained by assays fall short of the accuracy one might wish, this is due largely to the miuute amounts one mnst take for samples. The idea of the gold miuer of the last generation, that the value of the ore standing in the miue could be determined ouly by actually milling it, arose from careless and haphazard sampling and incorrect assayiug. The trained and experienced engineer places absolute and justifiable confideuce, within a proper limit, in his estimate based on his samples and surveys of ore in sight. Smelting works buy hundreds of tons of valuable ore daily on the samples alone, and pay cash for it before they begin to work it. In fact, improvements in sampling and assaying have led the way to, and in some cases eveu made possible, improvemeuts iu working ores. The cyanide method, in its conception and rapid development, affords a conspicuous example of the value of accurate data and knowledge of the control of operations which were furnished by sampling and assaying.

THE occurrence of antimony in an ore of gold or silver renders its treatment by the cyanide process difficult.

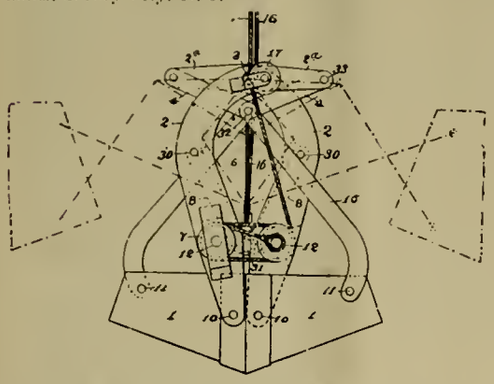
*California Journal Technology.

Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 22, 1903.

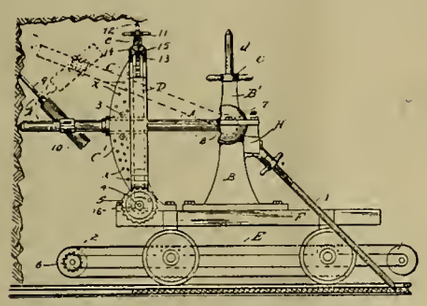
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

EXCAVATING BUCKET.—No. 747,480; H. L. Reynolds, Jersey City, N. J.



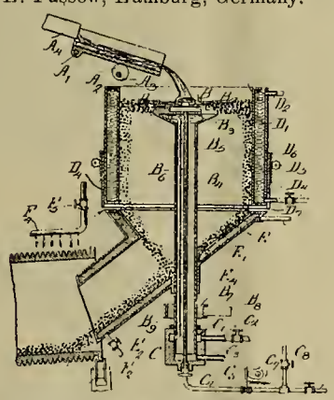
An excavating bucket comprising two opposed scoops, swinging hangers pivoted to scoops, and means controlled by conjoint action of both hangers to control angular position of scoops.

APPARATUS FOR EXCAVATING ROCK.—No. 747,867; C. T. Drake, Chicago, Ill.



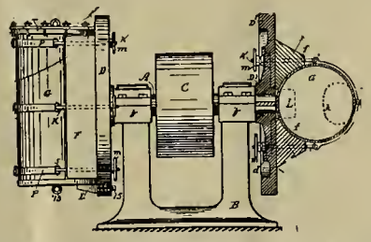
In apparatus for excavating rock, combination of car, F, upright ring support, D, disk, C, open slot through middle of disk, bar, A, extending through slot, means to resist lateral motion of bar lengthwise of slot and means for turning disk and holding same in adjusted positions.

CEMENT AND PROCESS OF PRODUCING SAME.—No. 747,920; H. Passow, Hamburg, Germany.



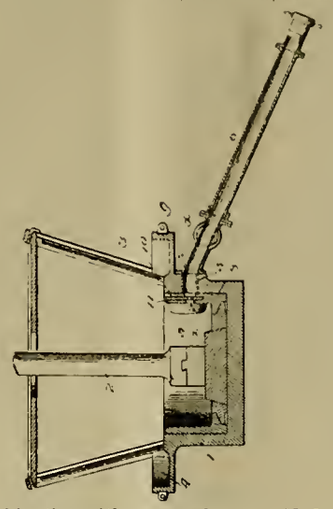
The cement process which consists in disintegrating highly heated furnace slag into particles, in projecting same through cooling fluid into impingement upon surface and in cohering same.

MECHANISM FOR TREATING ORES.—No. 748,528; G. M. Rice, Worcester, Mass.



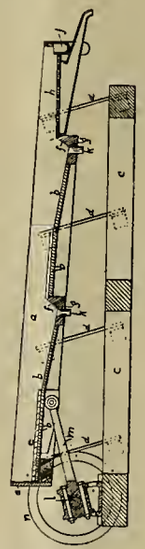
Machine comprising rotatable shaft, supporting bearings therefor, operating wheel or pulley fixed on shaft between bearings, heavy rimmed head wheel mounted on each end of shaft, hollow-faced supporters fixed upon head wheels and adapted for seating ore container cylinder, removable ore container cylinders, clamping devices for respective ends of cylinders, comprising bands that clasp around outer surface thereof and terminate in threaded draw bolt portions confined in wheel rims, and screw nuts on draw bolts for tightening and loosening clamping devices.

DISCHARGE FOR STAMP MACHINES.—No. 747,703; J. L. Harris and J. W. Shields, Hancock, Mich.



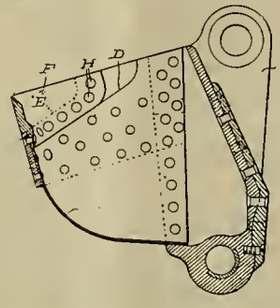
In combination with ore crusher provided with discharge opeuing, straight discharge pipe in line with discharge openiug and having valve casing near upper end, valve of approximately cylindrical form mounted in valve casing and having opening therethrough to aline with and form part of bore or opening through discharge pipe, means for operating valve, controlling means applied to lower portion of discharge pipe for interrupting passage therethrough, and iujection pipe in communication with upper portion of mortar and arranged to deliver jet within mortar across discharge pipe to prevent escape of slimes while permitting free outflow of metal.

MOVABLE SLUICE BOX.—No. 747,692; F. Francois, St. Etieune, France.



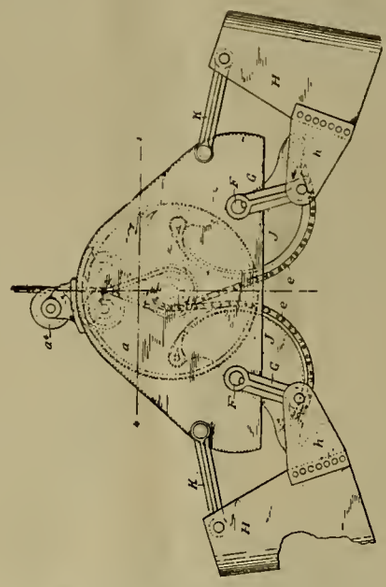
An ore separator, comprisiug rectangular cradle having sections of its bottom carrying bars for breaking up earth, intermediate rectaugular slanting sections leadiug from one section and connected abruptly with next, and means for oscillating cradle and elevating it in horizontal plane during oscillatiou.

DREDGER BUCKET.—No. 747,719; F. Z. Hunt and H. J. Reiling, Elizabethtown, N. M.



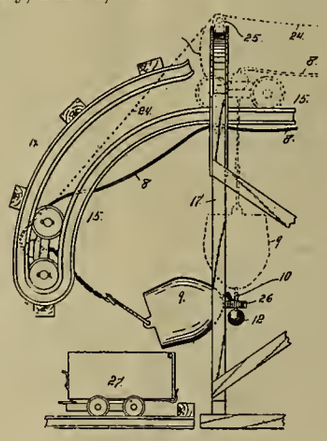
In dredger bucket, combination with bowl and reinforcing member secured thereto and projecting beyond free edge thereof, of recess in reinforcing members, lip fitting recess and offset flange on lip adapted to rest upon edge of bowl and to be secured to inner face of reinforcing member.

CLAM SHELL BUCKET.—No. 747,819; G. H. Williams, South Brooklyn, Ohio.



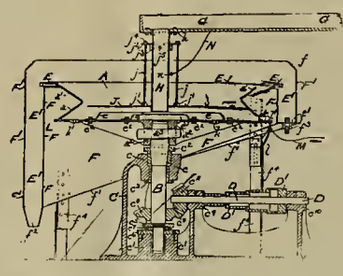
In clam shell bucket, combination of frame, scoop member, power wheel, shaft mounted in frame, rear end of scoop member being movably suspended from frame and front end of member being connected with shaft, power wheel and shaft being operatively connected.

BUCKET DUMPING APPARATUS.—No. 748,558; H. K. McCaughey, Denver, Colo.



In bucket dumping apparatus, combiuation with bucket carrying car, track having curved downwardly-extending loop located at one end, loop members being parallel and adapted to engage car wheels at two diametrically opposite points, bucket connected with car and provided with dependiug part, and means located in rear of track loop for catching depending part and holding same during the bucket-dumping act.

AMALGAMATING MACHINE.—No. 748,456; S. Alford and J. J. R. Smythe, Johannesburg, Transvaal.



In combination, pan A, concentric upwardly and inwardly inclined rings e e′ of less height than rim of pan, lip E round top of pan, two concentric cylinders forming chamber E′ to receive pulp as it leaves pan, adjustable disk J, launder G and pipe H discharging over center of pan beneath disk, metal baud L round base of pan A, stationary bracket l, brush l′ connected with electric wire M and bearing against band L for making electrical conuection with rotating pin, and electric wire N connected with pipe H for passing current electricity through pan and contents.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

The United States Census Bureau last week issued a preliminary report on the mining of quicksilver, flint feldspar and fuller's earth for the calendar year of 1902, and shows 34,291 flasks of quicksilver (each weighing 76½ pounds), valued at $1,467,848, together with 11,727 short tons of cinnabar, valued at $82,642; 36,365 short tons of flint, valued at $144,299; 45,287 short tons of feldspar, valued at $250,424; 11,492 short tons of fuller's earth, valued at $58,144.

The United States Director of the Mint includes the following in his annual statements of the approximate distribution by producing States and Territories of the products of gold and silver of the United States for the calendar year 1903:

State or Territory.	Gold.	(Commercial Value.) Silver.
Alaska	$ 6,921,157	$ 16,540
Arizona	4,784,000	1,932,115
California	16,535,525	497,664
Colorado	22,000,000	7,517,812
Idaho	2,067,183	3,415,000
Montana	4,134,367	5,400,000
Nevada	3,576,227	2,376,000
New Mexico	372,093	151,200
Oregon	1,364,341	67,500
South Dakota	2,889,137	179,965
Utah	5,036,599	8,100,000
Washington	434,109	164,700
Totals (including minor States omitted)	74,425,340	30,520,688

The principal increases and decreases for the year compared with 1902 are shown as follows:

Alaska—Gold, decrease $1,424,000; silver, decrease $32,000. These decreases are due to the season in which running water was available being a month shorter than other recent years.

Colorado—Gold, decrease $6,428,000; silver, decrease $791,000. These decreases were due to the miners' strike, which greatly interfered with production.

Idaho—Gold, increase $592,000; silver, increase $812,000.

Nevada—Gold, increase $681,000; silver, increase $391,000.

Montana—Gold, decrease $245,000; silver, decrease $1,619,000.

Utah—Gold, increase $1,470,000; silver, increase $2,360,000.

Washington—Gold, increase $162,000; silver, decrease $164,000.

South Dakota—Gold, decrease $4,076,000.

Oregon—Gold, decrease $452,000.

A total net decrease is shown in the gold production of $5,575,000, and net increase of $1,100,000 in the production of silver.

ALASKA.

R. Onffroy of the Pacific Alaska Transportation & Coal Co. says they have contracted to deliver at their proposed new coal hunkers on Herendeen bay during the year 1904 a minimum of 40,000 tons of coal from their coal mines on Portage hay. This will necessitate increase of development work at the mines, the completion of tide water improvements and building the proposed coal carrying railroad. By May 1 it is expected to deliver coal at the coal hunkers on Herendeen bay. Materials for the railroad, the wharf and the bunkers are being shipped. The railroad will be 17 miles in length. The route has been surveyed and mapped out.

The Alaska C. Co. will increase development work on the Bonanza copper group in Copper river section, near Valdez, the coming season, says S. Birch, manager. Machinery will be put in. If the ground develops satisfactorily the company will huild a railway to it.

ARIZONA.

Graham County.

C. A. Ross, president of the Standard copper mines, near Clifton, says the Standard Con. C. Co. has been formed for the purpose of merging the Standard copper mines, the San Jose group of mines and those of the Coronado C. Co. C. A. Ross is president of the consolidated company. This merger does away with the litigation pending hetween the Standard C. Co. and W. B. Thompson and I. Cascarelli over ground claimed by hoth parties, and it will also allow the working of the San Jose mine from the underground workings of the Standard, which are nearing the San Jose line. By this arrangement the San Jose mine can he opened at depth without additioual hoisting plants.

Maricopa County.

(Special Correspondence).—Wilson & Baker are developing a group of claims near the Agua Fria river, northwest of Phœnix.——The White Cloud mine, near Hot Springs Junction, has resumed operations.——Walker & Carguile are at work on gold claims in Cave Creek district.——Goldfield reports say development work is in progress on a number of properties in that section of the county.

L. R. Legier will put men to work on a lead property near the Horton mine, northwest of Peoria. Considerahle work has heeu done on this mine and there is a hody of high-grade lead ore opened up.

The Hassayampa M. Co. is working men on its group on the west side of the river near the railroad.——Preparations are being made for cyaniding the tailings at Seymour, on the Hassayampa river, near Morristown.——The Lime Creek C. Co. is working men on several claims at Copper Top, north of Phœnix. Copper ore is being taken out for shipment to the smelter.——More men have been added to the number at work at the Black Hawk mine, in White Tank mountains. Development is progressing.

R. E. Humphries, operating near Morristown, reports that he will put more men to work on his group next week.——Men are at work at the Angel mine, west of Wickenhurg. A hody of copper ore has been opened.——The Michigan G. M. Co., which have heen operating placer machines near Morristown, have suspended operations indefinitely.——C. Hall is working men on claims near Goldfield.

A. S. Mills is getting out shipping ore from his mine in Cave Creek district. The ore contains values in copper, gold and silver.——Moore & Linville are working the Mexican mine, near Cave Creek. Ore is heing ohtained.——The cyanide plant near Wickenhurg is in operation.

Phœnix, Jan. 2.

(Special Correspondence).—The White Cloud mine, near Morristown, is working a force of thirty men,

Phœnix, Jan. 4.

Mohave County.

The mill of forty stamps completed in Decemher hy the Mohave G. M. Co. was started last week, and the full forty stamps are dropping on ore from the Leland mine of the company. The mines of the company are in San Francisco district, near Acme, and in the same section with the Gold Road M. Co. The ore is hauled by the company's railroad from the mine to the mill.

Five hundred cords of wood are heing rafted down the river from Cottonwood island and up river points for the New Comstock M. Co., near Kingman, which will resume operations next week. The 20-stamp mill is heing put in order to handle forty tons of ore per day, the cyanide tanks not being adequate to handle a greater output.——Superintendent W. O'Dea reports opening up a hody of silver-gold ore on the Mariposa mine, of the Oro Plata group, in Todd hasin, near Kingman. He has a carload of the ore on the dump and is preparing it for shipment to the smelter. J. W. Gerritt is owner.

A. J. Doran of Prescott, manager of the Nighthawk mine, has men at work. A tunnel from the gulch below is under consideration to get at least 1800 feet in depth. By running this tunnel a heavy haul over a rough road will he avoided.

G. Q. Adams has an option, for Denver, Colo., men, on the J. F. T. mines, near Stockton hill, and has put men to work on development.

Santa Cruz County.

Concentrates are heing shipped from the Arizona G. & C. Co. mill at Salero with a twelve-horse team. H. L. Vaughn is general superintendent.——W. E. Balcom, superintendent of the Salero M. Co., is preparing to sink shaft No. 2 on the Darwin mine.

CALIFORNIA.

California coal and fuel oil statistics are reported hy the San Francisco Call from the annual fuel review of J. W. Harrison as follows: The quantity of coal reported during the year is 230,044 tons less than 1902. This cannot he accepted as the amount of fuel to fill the requirements of the State, as the quantity of fuel oil which was produced in 1903 has been 60% in excess of the products of 1902. During the early part of the year labor disturhances occurred in the British Columhia collieries. The ahrogation of the duty of 67 cents per ton on Australian and British Columhia coals has proved a marked advantage for their products and has aided in giving large consumers a pronounced henefit. The duty expires Jan. 15, 1904. The varions sources of the coal supplies were as follows:

	1902. Tons.	1903. Tons.
British Columbia	591,732	289,890
Australia	197,328	276,186
English and Welsh	95,621	61,580
Scotch	3,600	3,495
Eastern (Cumberland and Anthracite)	24,133	13,202
Seattle (Washington)	165,237	127,819
Tacoma (Washington)	209,358	256,826
Mount Diablo, Coos Bay and Tesla	111,209	84,277
Japan, and Rocky Mountains, by rail	47,380	102,219
Total	1,445,598	1,215,554

It is estimated the California products of oil for 1903 will foot up hetween 20,000,000 and 21,000,000 harrels, as against 13,000,000 for 1902.——The total deliveries of coke hy water amounted to 68,090 tons, as against 64,916 tons in 1902. Fully 75% of this amount was shipped from England and Germany, the halance principally from Belgium and Australia.

Amador County.

Several placer mines near Volcano are ready to start, hut are waiting till the Debris Commissioners approve the restraining dams, says the Ledger.

At the Kennedy mine at Jackson, at the east shaft the additional twenty stamps to the mill are nearing completion. The mortars are in place, also the concentrators. It is expected these stamps will he started Feh. 1st. A cleanup room is arranged in the central part of the addition, and from this room all the hatteries, plates and concentrators are in view. The sulphurets as they are gathered from the concentrator troughs, are dumped in a loose state through an opening to the floor of the sulphurets building, where they are sacked, loaded on wagons and taken to the chlorination works. Between three and four tons of sulphurets are saved per day at each mill, making seven tons per day with the present milling capacity of eighty stamps. With 100 stamps the output of sulphides is expected to reach ten tons daily.

Butte County.

R. E. Cranston et al., who hought part of the Beeny place, 6 miles east of Marysville, on south side of Yuha river, and have had prospecting drills at work on the land, have a hond on part of the C. J. Hastings land and also a hond on 240 acres owned hy Reynolds & Norton. This gives the Cranston Co. a strip of land 2 miles in length, extending along the levee and channel of Yuha river. It is proposed to work the gravel hy gold dredger.

El Dorado County.

Turney & Co. have made final payment on the Beckman Hill mine, at Pleasant Valley, and it is oxpected work will begin this week. The mine is said to show a 4-foot ledge that assays $4 a ton at the croppings. A mill and hoisting works will he put up in the spring.

Fresno County.

The oil production of the Coalinga fiold for the year 1903 is given at 2,075,000 barrels; numher of producing wells, 115; number of new wells brought in during the year, 46; numher of wells drilling, 30. The production hy months was:

	Barrels.
January	46,500
February	42,000
March	46,500
April	90,000
May	133,000
June	221,000
July	212,000
August	248,000
September	267,000
October	259,000
November	250,000
December (estimated)	260,000
Total	2,075,000

The Bakersfield–Point Richmond pipe line of the Standard Oil Co. is at present carrying only Coalinga oil, and reports indicate there is sufficient of this oil on hand and being produced to keep the line in operation for some time yet. The chief trouhle with the line, says the Oil Reporter, seems to be that it is not large enough to handle the quantity of oil awaiting transportation. While the pipe line is idle from Coalinga south, oil is heing shipped in large quantities hy rail.

Kern County.

Telluride ores are reported found in the La Crosse mine, near Randsburg.——C. H. Snow has put in a gasoline engine in the Kinyon mill.

Nevada County.

The Loutzenbeiser ranch of 220 acres has heen hought hy the North Star M. Co., together with the Loutzenheiser interests in the Lemarque mine, near Grass Valley. The ground adjoins the property already owned hy the North Star Co.

J. F. Waterhouse of the Ethel mine at Gaston Ridge says a drift is heing run on the Ethel to cut the shaft. In the spring operations will he increased and additional machinery put in.

The California mine, near Washington, is employing sixty men. Thirty stamps are dropping regularly and ten more will he added in the spring.

San Bernardino County.

The Pacific Borax Works at Borate have seventy-eight men at work and $2.25 a day and hoard is said to be the scale paid.——The Bartlett Borax Works at Borate expects to start up this month.

San Mateo County.

The Wisconsin Oil Co. will start drilling several additional wells at Half Moon Bay. The company has one well completed, which is producing. The Paxton Oil Co. well is producing. J. E. Kerr of San Francisco is manager of hoth companies.——The Guiherson, Saylee and Haine wells, iu Purissima canyon, northwest of the wells on Tunitas creek, are getting in supplies and materials for drilling additional wells—Nos. 8 and 9—to be located one-fourth of a mile from their present producing wells.——The Pilarcitos Oil Co. is working again, after experiencing difficulty in getting fuel.

Santa Barbara County.

The Union Oil Co. is preparing to ship its product to Alcatraz Landing through the Western Union pipe line via Careaga. A pumping plant is being huilt at Graciosa from which point the oil is forced to Careaga. The Lompoc product will also go hy same route.——The Western Union Co. is sinking 8-inch casing on well No. 18, which is down 520 feet. Preparations are under way for putting in several more rigs.

Santa Clara County.

A body of ochre is reported found on the O. N. Nelson place, 14 miles northwest of Gilroy. It will he developed for use as paint.

Siskiyou County.

Fry & Macaulay are sinking a shaft on the Sheha quartz mine at Patterson creek, near Fort Jones. The shaft is down 100 feet, showing ore.

Cold weather, says the Yreka Journal, has interfered with mining operations, especially in the placer claims, on account of the water supply freezing.

The miners at Hawkinsville on Rocky and other gulches report a good supply of water. Last week the cold weather stopped operations for several days on account of freezing. The water was turned out of the Greenhorn ditch to prevent freezing, hut was turned in again Jan. 2, the weather moderating. Free water is also running again in several gulches, especially Canal and Long gulches. Most of the work is sluicing, hut one claim is worked hy hydraulic giant.——Tho Willard mine at Hamburg Bar has been leased to C. & L. Rasmus.——The two Chinese companies operating placers near the Lowden ranch are working steadily. One of these claims has been in continuous operation for thirty years, says the Journal.—The Portuguese mine, on the Klamath river, owned hy Wood & Cuddihy of Happy Camp, has heen leased to Fort Jones men.——The Pacific Mines Co. of Chicago, Ill., which bought the Fort Goff Bailey placer mines in Seiad district, made the final payment of $5000 last week, giving them title toa body of placer ground, with river frontage of 3 miles, comprising 300 acres. This mine is heing worked at the Fort Goff claim, under Superintendent J. W. Martin.

The Minetti B mine, below Nolton, is heing operated under lease, with E. Feheley as superintendent. A body of blue gravel has heen struck.——Preparatory work is going on at the Van Brunt or Ah Ock placer mine, near Happy Camp. D. I. Jackson of New York is manager.

Tulare County.

(Special Correspondence).—C. B. Rogers, having bought tho Bald Mountain, Richelieu, Eclipse, Eurilda and other claims near White River, has built and equipped a hoisting plant on the Eclipse mine. He is retimhering the old shaft, which is down to depth of 400 feet. On the Bald Mountain a douhle, 4-foot, compartment working shaft is heing sunk. A hoisting plant is heing put up on that mine also.

White River, Jan. 5.

Tuolumne County.

The Tuolumne Chief Con. G. M. Co. has been incorporated, with offices at Los Angeles, hy F. Danford, A. C. Sweet, L. D. Bathwell, A. R. Swett and W. W. Jamison, to operate in Tuolumne county.

A 4-stamp mill is heing built at the Kanig mine, near Columhia, which is heing operated by Superintendent Wilhelm.——S. C. Syndegard has started operations on the Rockwood pocket mine (formerly the Hastings & Kenny), at Yankee Hill, near Columhia.——H. M. and W. Cullers have hought the F. C. Cullers interest in the Little Beauty mine near Arrastraville.

COLORADO.

The past year has shown an increase in the production of Colorado's oil fields of 250 harrels per day. There has been no increase in the oil-producing territory of the State within the year, but both the Florence (Fremont county) and Boulder (Boulder county) fields show larger pumping. Florence district has produced several new wells in the past few months. The output of the Florence field for the year is stated at 1500 harrels of crude oil daily and that of Boulder at 125 harrels per day, or totals for the year of 547,500 harrels from Florence and 45,625 from Boulder, grand total heing 593,125 harrels, worth about $800,000.

Mining machinery was made in Denver during the year to value of $1,500,000 and mining machinery sold in Denver was valued at $9,000,000. Pouuds of pig iron pro-

duced in Colorado, 476,533,363; pounds of steel rails made, 250,519,252.

Colorado bullion operated on at the Denver Mint during 1903 was:

County.	Gold.	Silver.	Total.
Boulder	$ 67,696 19	$ 401 88	$ 68,101 07
Clear Creek	28,851 81	199 98	29,054 79
Chaffee	27,036 23	100 41	27,136 64
Conejos	588 07	8 15	597 12
Dolores	996 85	13 21	1,010 09
Gilpin	237,515 34	1,450 10	238,965 44
Gunnison	409 22	3 27	412 49
Garfield	96 08	1 51	97 59
Lake	11,996 24	134 15	12,130 69
La Plata	18,261 73	131 54	18,393 27
Montezuma	1,466 78	2 27	1,469 05
Ouray	1,635,119 38	18,329 80	1,053,779 18
Park	12,620 25	57 73	12,677 98
Routt	19,289 10	38 57	19,327 67
Saguache	1,178 39	19 55	1,197 94
San Juan	148,591 58	250 77	118,815 35
San Miguel	1,122,581 81	13,227 17	1,135,809 01
Summit	121,151 11	838 09	122,289 20
Teller	7,555,838 48	916 81	7,556,785 29
County unknown	111,439 03	2,398 31	113,837 97
Smelter deposits	1,272,353 71	458 93	1,272,812 64
Totals	$12,725,711 61	$39,015 86	$12,764,730 47

The bullion output of Colorado for 1903 is reported by the Denver Post as follows:

	Gold.	Silver.	Lead.	Copper.	Totals.
American S. & R. Co. (Colorado)	$ 8,828,598 57	$5,990,305 92	$3,939,174 18	$ 909,057 25	$19,175,135 92
Ohio & Colorado Co. (Salida)	258,034 52	419,246 07	592,525 53	33,222 81	1,383,008 93
United States Mint	12,725,714 61	39,015 86	...	...	12,764,730 47
U. S. Smelting Co. (except zinc)	51,675 00	146,877 50	192,870 00	65,200 00	146,622 50
Boston & Colorado Co. (gold in mint returns)	...	234,394 38	...	195,271 43	429,665 81
Colorado ores treated in Utah	9,640 07	129,206 80	2,765 18	...	141,312 05
Gold not included in above	500,000 00	...	...	...	500,000 00
Totals	$21,873,662 77	$6,968,083 53	$4,727,334 89	$1,101,751 49	$34,810,432 68
Total value of zinc (partly estimated)					1,374,600 00
Add to Salida plant estimate for nine days in December not included in general statement					80,000 00
Total					$36,264,943 68

The American S. & R. Co., with its Globe, Grant, Puehlo, Elders, Philadelphia, Arkansas Valley and Durango plants in Colorado reports its total production of metal for year 1903:

SOURCE OF ORES.	Net. Pounds.	Gold. Ounces.	METAL CONTENTS. Silver. Ounces.	Lead. Pounds.	Copper. Pounds.
Colorado	1,510,066,616	402,932	11,252,552	0,907,037	6,580,125
Arizona	143,666	45	15,800	21,089	2,473
Chile	49,809,189	1,310	2,120,223	2,102,898	015,988
California	33,991	41	73	...	67
Idaho	236,275,705	31	3,859,459	123,260,178	204,124
Mexico	11,066	8	533	...	1,065
New Mexico	31,714,823	44	37	101	41,617
South Dakota	31,208,546	16,956	61,808	...	...
Texas	5,216	...	10	...	2,846
Utah	80,121,780	3,743	2,192,065	19,303,577	1,447,269
Central America	127,456	492	54,197	...	...
British Columbia	1,377,614	3	80,982	714,767	...
Totals	1,940,680,110	425,520	19,917,148	257,300,497	0,195,844

The coal production of Colorado for 1903 by counties was:

Name of County.	Total Tons.
Boulder	821,772
Delta	6,000
El Paso	201,289
Fremont	669,650
Garfield	127,951
Gunnison	457,975
Huerfano	1,243,591
Jefferson	17,372
Larimer	1,000
Las Animas	3,512,743
La Plata	140,773
Mesa	19,937
Montezuma	450
Pitkin	344,581
Weld	106,610
Total	7,671,691
Number of mines in operation	169
Tons of lignite coal produced	1,148,493
Tons of semi-bituminous coal produced	1,211,779
Tons of bituminous coal produced	5,261,025
Tons of anthracite coal produced	49,797
Tons of coal estimated from mines not reporting	129,000
Total tonnage of coal produced	7,671,691
Total tons of coke produced	716,125
Number of employes in and at mines	10,290
Number of employes at coke ovens	1,350
Number of fatal accidents	40
Tons of coal lost by strike to Jan. 1, 1904	1,125,000

The coal business of the past year shows an increase over that of 1902, says the Denver Post, notwithstanding the strikes which have cut down the usual tonnage. The Colorado Fuel & Iron Co. produced 4,810,000 tons, which is above its output for 1902. Its coke production, however, shows a small decrease. During the past year the company opened up one new mine—the Quatro, in the Trinidad district. It is now opening up a new mine in Canon City district.——The Northern Coal & Coke Co., whose most extensive properties are in the northern field, produced 839,083 tons, distributed as follows: Boulder county, 647,551 tons: Weld county, 32,522 tons: Huerfano county, 36,306 tons; Las Animas county, 122,704 tons.—— During the past year 100,000 acres of coal land in Routt county have been taken up, preparatory to the Moffat railroad entering that county. No development has been done, for the fields are yet too remote from a railroad.

Clear Creek County.

The Wisconsin mine on Republican mountain, near Georgetown, continues producing a good tonnage and several lessees are steadily at work. The smelting streak which was opened last month is improving, being 18 inches wide. J. J. White & Co. have control. The tunnel is being driven by contract and is in 1050 feet. The ore being taken out carries 175 ounces in silver per ton, with lead values.

Gilpin County.

The list of the stamp mills of Gilpin county is given as follows by the Central City Register-Call:

Mills.	Location.	Stamps. Slow.	Rapid.
Climax	Black Hawk	25	..
Fullerton	"	33	..
Hidden Treasure	"	75	10
Meade	"	40	..
Polar Star	"	40	..
Eagle	"	..	35
Boston & Denver	"	..	80
Gilpin	"	50	..
Rocky Mountain	"	25	..
New York	"	50	20
Randolph	"	50	..
Penn	"	50	..
Iron City	"	..	25
Bonanza	Chase Gulch	25	..
Perigo	Gamble Gulch	..	35
Peterson	Lump Gulch	15	..
Avon	Nevada Gulch	..	90
Mountz & Pal	Pine Creek	..	10
Totals		478	245

This shows a total of 723 stamps, which handle, together with the Rocky Mountain concentrator plant, a total of 1000 tons of ore daily, and most of these stamps have been dropping steadily during the past year. During the year five new plants were built, one on North Clear creek, one at Delmonico mine on Quartz hill, another in Chase gulch, one on King flats, and another at the junction of Rine and Elk creeks, while still another is in course of erection on Beaver creek at Phœnix.——The shipments of ore each month from Dec. 1, 1902, to Dec. 1, 1903, were as follows:

Month.	Tons
December, 1902	6,540
January, 1903	7,220
February	5,400
March	5,960
April	4,620
May	5,300
June	4,700
July	5,520
August	5,120
September	4,520
October	5,000
November	3,980
Total	63,480
Shipments by wagon to Idaho Springs	15,000
Grand total	78,880

These shipments show a falling off from the previous year.

Gunnison County.

Manager Lockwood of the Brooklyn T. Co. is arranging to start his compressor on their tunnel near Crested Butte in the spring. —— D. Harris and H. B. Gillespey expect to start development on their lead and silver group in the spring. The group is in the Cement creek lime belt.

The Congress G. M. & M. Co., with principal office in Hartford, Conn., has started operations on its holdings at White Pine. G. Williams, manager, has let contracts for surface buildings on the Comstock, Jr., group at White Pine, and when this work is completed a 16x16 compressor, with 60 H. P. return tubular boiler will be set up. The workings on the Comstock consist of a tunnel in 160 feet, showing a 5-foot vein with 2-foot pay streak lying between walls of lime and quartzite, says the Pitkin Miner. The ore assays 50 ounces silver, $6 in gold, with zinc and copper. This mine is on Lake hill.

Hinsdale County.

At the Moro mine and mill, near Lake City, owned and operated by the Hanna G. M. & M. Co., operations were started this week. The ore bins at mine and mill are full, containing 1000 tons of dump ore. The stopes in the mine are ready to break down the ore. The aerial tram delivers the ore from the mine to the mill. —— The Pelican mine, 1 mile from Lake City up Henson creek, will be started up again. The company proposes to put on machine drills and run a 1000-foot development tunnel to cut the ore shoot opened in the upper workings. A tunnel 1000 feet long will give them an additional block of stoping ground 400 feet thick.

Lake County.

The total ore tonnage of the mines of Lake county for 1903 reached 1,000,000 tons of a gross value of $12,000,000. This is a larger tonnage than previously produced with smaller average values, says the Carbonate Chronicle. Against these figures the mines were able to produce at least another 200,000 tons of low-grade ores could the smelters have taken it. The following were added to the list of shipping properties during the year: Fryer Hill M. Co., with capacity of 500 tons a day; Coronado M. Co., capacity 250 tons daily; Fitz Hugh mine, capacity of 50 tons daily; Diamond mine, capacity 300 tons daily; Ollie Reed mine, 50 tons daily; Reindeer mine, 50 tons daily; Cloud City M. Co., 50 tons daily; Gilt Edge mine, 50 tons a day; and others with under 50 tons daily capacity.

Saguache County.

The Diorite M. & M. Co. has been incorporated to operate near Cochetopa by W. B. Tuttle, W. H. H. Miller and B. T. Brooks of Denver, the last named being manager. The company's property consists of the Boston, Mayflower, Vulture and Equator lodes, on which gold-bearing veins have been opened.

San Juan County.

The following shipments of ore and concentrates from mines of San Juan county for year 1903 are reported by the Silverton Standard:

Month.	Tons.
January	4,200
February	3,450
March	3,795
April	3,855
May	3,975
June	3,780
July	3,960
August	5,445
September	5,940
October	5,250
November	4,680
December	4,800
Total tons (4-5 concentrates, 1.5 ore)	53,130

The value of the output was: The Iowa-Tiger, North Star (Sultan mountain), North Star group (King Solomon mountain), Highland Mary, Brooklyn, Queen City, Silver Ledge, Negolds, Champion, Red Mountain district, Scotia mines and mills, and others in the upper Animas, Ice Lake, Little Maud, Tempest and single car shipments from twelve others (principally ore)—

*12,100 tons at $58 per ton	$ 701,800
Gold King (concentrates) 15,000 tons at $45 per ton	702,005
Silver Lake (concentrates) 18,660 tons at $51 per ton	951,660
Sunnyside (concentrates) 4,200 tons at $11 per ton	46,200
Esmeralda (ore) 2,500 tons at $60 per ton	150,000
Isolde (ore) 200 tons at $175 per ton	35,000
Amalgam and bullion from mills which by request of owners is compiled and given collectively	658,942
Total	$3,245,607

*1000 tons sent via Ouray and not computed in D. & R. G. shipments.

The output for 1902 was $3,048,170. Machinery and mine and mill building improvements for past year in county, outside of Silverton, valued at $520,000. Number of men employed in mines, mills and prospects in the county, 1360.

Summit County.

(Special Correspondence).—The Quandry Mountain M. & M. Co., owning the Monte Cristo mines at head of Blue river, 8 miles south of Breckenridge, near Hoosier pass, has its 100-ton concentrating mill nearly completed. They are putting in concentrators and steel jigs, and expect to be able to mine and mill the ore for $2.50 per ton. The ore carries considerable lead, with some gold, silver and copper. W. H. Nance is mill superintendent.

Breckenridge, Jan. 3.

Teller County.

The output of Cripple Creek district mines for 1903 is given by the Colorado Springs Gazette as follows:

	Tons.	Value.
January	59,905	$1,943,800
February	51,674	1,651,970
March	54,800	1,859,270
April	50,850	1,702,650
May	48,650	1,695,415
June	51,650	1,763,687
July	56,300	1,966,800
August	29,700	982,555
September	22,150	692,200
October	35,050	963,660
November	42,600	1,290,000
December (approximate)	42,600	1,290,000
Totals	516,079	$17,630,107

The cyanide and chlorination plants at Colorado City, Florence and in Teller county handled 432,935 tons of ore, from which was extracted $11,037,422. The average value of the ore was $25.50 a ton.

The following table gives the record of each plant:

RECORDS OF REDUCTION PLANTS.

Plants.	Tons.	Value.
United States plants	203,000	$5,008,000
Portland	63,575	2,011,350
Dorcas	33,250	1,182,900
Telluride	38,100	1,036,200
Economic	40,030	1,020,950
All Others	24,600	129,022
Total for milling ore	132,935	$11,037,422

The average value of the smelting ore was $45 per ton, and 73% of the total output was handled at the chemical process plants, leaving but 27% for the smelters.

The production by years from the beginning of the camp to date is as follows:

1891	$200,000
1892	600,000
1893	2,400,000
1894	3,600,000
1895	7,200,000
1896	8,000,000
1897	12,500,000
1898	15,000,000
1899	19,543,110
1900	20,338,300
1901	21,503,638
1902	21,177,801
1903 (approximate)	17,630,107
Total for 13 years	$149,782,856

During month of December there were shipped from the Portland mine on Battle mountain, Cripple Creek, a total of 10,667 tons of ore, says Manager Burns. There are 700 men on the payroll.

There are several Cripple Creek properties which will resume on company account this month, among which will be the Wild Horse, Deadwood, Hull City placer lease, Findley and the Isabella lease.

Manager C. Birch says he will continue development on the Ready Cash claim of the Little Johnny Co., in Pony gulch, Cripple Creek. The shaft is 125 deep. A 5-foot vein dipped out of the shaft at depth of 40 feet, and a crosscut will be run 65 feet to catch the vein. A cyanide mill will be built.——Walsh & Co., leasing on the Forest Queen, on Ironclad hill, have cut 18 inches of smelting ore in a drift run from the bottom of the shaft, which is 185 feet deep. Sinking will be resumed. —— The Wright lease on the Thompson of the Elkton Co. shipped during the month of December 2800 tons of ore, which averaged $20 per ton.

In the case of the Stratton Independence Co. of London against the executors of the estate of W. S. Stratton at Cripple Creek, claiming $6,000,000 damages for the alleged salting of the Independence mine before its sale to the English company, Judge Riner, in the United States Court at Denver, on the 5th inst., decided for the defendants.

IDAHO.

Idaho County.

(Special Correspondence).—The Rainhow Mountain G. M. Co. of Joplin, Mo., owning the Gold King group of eight claims and a fraction on east slope of Rainhow mountain, 2 miles southwest from Roosevelt, has a working tunnel being driveu by two shifts and is in 200 feet. The face of the tunnel is in ore. Surface showings indicate the ledge is 40 feet wide, which runs $4 per ton in gold. There is some silver in all of the ore which runs up to fifteen ounces per ton. There are dikes of quartz-porphyry on the claims of the company. C. Mahan is superintendent. ——The Thunder Mountain G. M. Co., L. C. Van Riper of New York owner, C. Mayen superintendent, has the Toronto group of seven claims adjoining the Gold King group to the north. It is on a dike running parallel with the Gold King dike. The ore is mainly free milling. A tunnel is being driven and is in 220 feet.

At the First National group of twelve claims, located on Middle Fork of Trap creek, 2½ miles northwest from Roosevelt, the main vein is in 10 feet wide between walls of diorite and phonolite, and runs northwest and southeast. The ore is quartz-porphyry and carries sulphides. Surface ores assay $10 gold, three ounces silver, with traces of platinum also reported. Work on the tunnel will be continued during the winter. The slope of the mountain is such that at the tunnel site 100 feet of tunnel will gain 90 feet in depth. There is mining and building timber on the property. H. P. Brown is manager.

The Duquesne Dev. Co. of Pittsburg, Pa., M. A. Rice manager, owns eight quartz and six placer claims on Placer creek, a branch of Marble creek, 18 miles south from Roosevelt. A tunnel started

to crosscut the ledge has heen driven 125 feet in diorite and has 200 feet more to go to reach the ore. The upper tunnel is in 75 feet. Assays on this lead taken from the surface gave $3 per ton gold, the width of the ore hody heing 10 to 30 feet. —— The South Dewey T. & M. Co., having a tunnel site on western slope of Thunder mountain, has the tunnel in 195 feet. Operations are suspended for the winter.

The Twentieth Century M. & Dev. Co., W. S. Culp of Cleveland, Ohio, president, has tunnel sites on Rainhow mountain, also placer claims on Monumental creek, 2 miles south from Roosevelt. The company has this season huilt a sawmill of 16,000 feet per day capacity on its ground at mouth of Botha creek. Water ditches have heen extended up Botha and Monumental creeks to furnish the mill with water for power. Work is partially suspended until spring. —— The Empress T. & M. Co. of Chicago, Ill., having a tunnel location on south side of Botha creek, west of the Monumental, 3½ miles southwest from Roosevelt, is driving its tunnel, the face of which is in diorite.

The Pittsburg T. M. Co. of Chicago, Ill., O. F. Gihhs president, has a group on Holy Terror creek slope, north of the Dewey and Sunnyside, adjoining the latter, and consisting of ten claims. About 150 feet of tunnel work has heen done. H. B. Fulton is manager. —— The Gold Standard group of seven claims adjoins the First National on the north and east. J. Tucker of Eugene, Or., manager, says development work will he continued during the winter.

Roosevelt, Jan. 1.

Lemhi County.

The Lemhi Herald says the tin discovery made 3 miles north of Salmon City is undergoing development. The ore is said to assay 10% tin, 20% lead and $4 in gold and silver. Besides this a ledge carrying cassiterite is heing opened up on Panther creek. Nickel prospects are being developed in Blackbird district by Nampa men.

Shoshone County.

The Frisco mine at Gem was hid in at sheriff's sale last week by D. M. Hyman of New York for $108,000. He is owner of a majority of the bonds which were secured hy mortgage. The mine has not been profitable in the past two years, owing to depth of workings, 2000 feet.

MICHIGAN.

The coarse system of stamping practiced at the lake mills has been in use five years and is giving satisfactory results, says the News. In coarse stamping they use mortar grates with openings larger than $\frac{3}{16}$ of an inch, which was formerly the standard. The screen mostly in use is $\frac{1}{8}$, while the revolving screens return to the head all rock over $\frac{1}{16}$. The object is to extract all copper possible before the rock is ground down to fineness of sand. Fully 50% is now taken out before the pulp reaches the first jig—under the old process the amount was 10%. This reduces the amount of water neces sary and results in saving flour copper formerly washed away with the tailings. This system increases the capacity of each head 20%, reduces the water consumption 33% and reduces loss in tailings 25%.

Houghton County.

The Isle Royale mine, near Houghton, is again on same basis as for the eleven months prior to last July, shipping from No. 2 shaft, says the News. No. 1 has been closed down until retimbered. Sixteen drills are in service and 120 men working. Three drills are drifting; remainder stoping. The most northerly point at which operations are resumed is 1500 feet north of No. 2 shaft on the fifteenth level. Extent of damage to No. 1 is as yet undecided. Jams have formed at eleventh and fourteenth levels of hurned timhers and rails from skip track. The mine will ship 500 tons to the mill daily for the present.

The new Calumet mill of the Calumet & Hecla mine of Calumet is enclosed and concentrating tables set up. One head at this mill will he hurried to completion so as to go into commission with the six in the Hecla mill. It is expected to be ready by Feb. 20th.

It is expected to have the compressor of the Champion mine at Painesdale in operation before Feb. 1. The delays in delivery of this equipment have hampered production.——The Tamarack mine, near Calumet, has also been troubled by delays in delivery of heavy machinery. The parts of the 100-drill air compressor and 1000-foot hoist are arriving. When set up, No. 5 Tamarack shaft will have equipment capable of breaking rock from over 5030 feet in vertical depth.

The Centennial M. Co., near Calumet, during last month increased its number of men at work by forty and ten additional drills have also been put in commission.

MONTANA.

Figures for that portion of the gold product of Montana which passed through the Helena assay office during the year are reported as below, compared with the output for 1902. The figures do not represent the total production of gold in the State, as they do not include the statistics from the mines of Butte nor those of the American S. & R. Co.; also, some of the producers in the State ship their product to the mint at Philadelphia, Pa., and still others ship to the assay office at Boise, Idaho, and these figures will not he available until next spring.

Counties.	1902.	1903.
Fergus	$412,317 89	$975,108 06
Lewis and Clarke	466,930 96	265,727 53
Madison	282,424 60	290,682 18
Park	279,942 76	167,404 63
Other counties of State	351,615 59	377,436 28
Total for Montana	$1,793,231 80	$2,076,358 68

Flathead County.

W. D. Wrighter, president of the Rustler M. & M. Co., operating the Snowshoe mine, near Lihhy, says the past season they have turned out seventy-five carloads of concentrates, averaging thirty tons per car. The concentrates run $60 to the ton. The mill continues in operation. At present time there is water enough in the reservoirs to keep the mill running until Feb. 1st., but a freezeup may necessitate a shut-down sooner. Concentrates are heing hauled to Lihhy depot. Wrighter says the mine has heen unwatered to the lowest level reached by their shaft, wbich is 350 feet helow the main working tunnel. They are drifting south on the vein at this level and have gone 100 feet, having done as yet no stoping from that part of the mine. All of the ore mined the past season has come from above the 200-foot level. The company proposes improvements in the mill the coming summer, to consist of additional tables and more sliming capacity, also a Huntington mill to save more of the gold values.

Jefferson County.

The Pennsylvania-Montana M. Co., operating the Hattie Ferguson mine in Cataract district, near Basin, is putting in machinery, and it is expected shipments of ore will begin Feb. 1st.

H. Riley & Co., who have leased the Berytha mine at Corhin, are shipping ore to the smelter.

The McCabe Co. is working men sinking three three-compartment shafts on its three groups between Wickes and Corbin, where they have 200 claims. The shafts are down 60 feet, and that on the Erickson group is in a body of copper ore. It is intended to sink other exploration and working shafts.

Lewis and Clarke County.

The Pittsburg & Montana Co., operating a pyritic smelter, will build a railway spur from the Northern Pacific, near Weed Siding, near Helena, to its Olson group in Greenhorn gulch.

The Big Dick M. Co., owning ten claims 4½ miles south of Helena, adjoining the Big Indian mine on the west, reports development work under way. Considerable work has already heen done on these claims. The Big Indian Co. will sink a shaft on its main lead 1000 feet deep and then run a tunnel to the houndary of the property, giving depth of 1500 feet at the end. S. L. Burbridge is manager.

Work is progressing on the Piegan group of mines near Marysvale. Development has been continuous during the year and 750 feet of tunnels, crosscuts and raises were completed. Two shifts are driving tunnel No. 4 on the vein. This tunnel is in 340 feet and will cut the ore bodies 150 feet deeper than the tunnel above. The vein in the face is 4 feet wide. The company during the year has bought the Early Bird and Norman quartz lodes and has bond and lease on three other claims adjoining. No ore has been stoped or milled. The company proposes to build a 20-stamp mill and cyanide plant in the spring.

Powell County.

W. N. Wolmsley of Philadelphia, Pa., of the Montana Reduction Co., says they are preparing to build 42 miles of railroad the coming season, running from Basin on the Great Northern to Elliston on the Northern Pacific and opening up a mining section heretofore untouched by railroad.

NEVADA.

Esmeralda County.

A. G. Bettles of Salt Lake City, Utah, of the Newhouse Co., has bought a group of claims in the Monte Cristo range, 25 miles northeast from Sodaville. These claims are said to cover a deposit of copper carhonate and oxide ores, together with a percentage of chalcopyrite. The price is reported at $125,000.

Lincoln County.

W. L. Colton of the Searchlight Gold-Copper Co. has put men to work on the company's property at Black mountain, 8 miles east of Searchlight. A 300-foot shaft will be sunk.

Lyon County.

E. Lane, superintendent of the Shaumut-Nevada G. & S. M. Co. of Fay, Lincoln county, says he is preparing with G. P. Smith, M. W. Seymour, H. H. Hunt et al. to reopen the Boston-Nevada copper mines at Yerington. There are seventeen claims in the group. The company has a leaching process to treat the low-grade ores.

Washoe County.

The production of the mines of Olinghouse camp, near Wadsworth, for 1903 is given by the Wadsworth Dispatch as follows, in hullion sent to mint:

Forlorn Hope	$ 1,300
Crown Point	800
Silp and Renegade	2,000
Cabin No. 2	18,000
Hutchinson	1,800
No. 1	1,200
No. 2	1,400
Belcher	200
Butte and Gold Center	6,700
Cabin No. 1 and Gold Ledge	3,300
Emma L	280
Standard	50
Jumper	3,000
Total	$40,030

Considerable development work was done during the year and is continuing.

NEW MEXICO.

Grant County.

C. R. Luton, manager of the Michigan-New Mexico C. Co., owning the Dacotah-Pearl group near Lordsburg, says work on the Dacotah-Pearl mines has been temporarily suspended owing to inability of the pumps to handle the water. A larger pump is being arranged for. Work on the 60-ton smelter for the company will be started Feb. 15. The foundations for the cyanide plant of the International G. M. & M. Co. at Malone have been built and the retaining walls are under way. It is expected to have the plant completed by Feb. 15. Its capacity will be twenty-five tons a day.

The construction of a 60-ton smelter in Burro mining district, 18 miles from Silver City, is proposed by B. Johnson of Beaumont, Tex., who has bought a group of mining properties in that district. W. Clayton is superintendent.

The Aberdeen M. Co., near Lordsburg, has taken out its steam stamp and substituted rolls.

Lincoln County.

J. S. Lenox of Roswell, interested in the Mescalero M. Co. on Eagle creek, says the company proposes to do considerable work on its property during the winter and spring, and expects to huild a reduction plant on the ground.

Socorro County.

At Carthage, near San Antonio station, on the Atchison, Topeka & Santa Fe Railway, there are four producing mines in operation. says the New Mexican. The area of this field as far as developed is 1000 acres; thickness of seam, 50 inches. In addition to this there is a field adjoining Valencia county, amounting to 100 square miles, with an average thickness of one coal seam of 50 inches.

OREGON.

Twenty-three new milling plants were ordered and erected in eastern Oregon during the year 1903, having 166 stamps, and roll mills with capacity equivalent to ninety-six stamps, says the Blue Mountain American. This work was distrihuted over twenty-three separate properties. The increase to the milling capacity of the district by this is ahout 1000 tons of ore daily. At the same time a 150-ton furnace smelter and 750-ton sampling mill was built at Sumpter, a 100-ton furnace and sampling mill is being put up at Homestead, and a 100-ton roasting and leaching plant is being erected at Eureka. ——During the year the deepest Oregon shaft attained an approximate deptb of 1200 feet. One large hoist is being set up, and several small ones were put in during this period.——Three important water power projects were practically completed in Sumpter district, Baker county, during the year 1903, for furnishing electrical power for mining and milling.

Baker County.

Operations will be resumed on the Orleans mine, near Sumpter, says Manager Swiggett. The raise from the working shaft to the surface, which will be the heginning of the shaft, will he first completed. They will then put in a hoist and sink on the ore shoot.

The smelter at Sumpter was blown in last week, and is reported running with satisfactory results.

A sinking plant will be put in on the Potosi group, near Greenhorn, owned hy the United Exploration Co., says Manager W. E. Hurd. The plant will be capable of going to a depth of 2000 feet and will be operated by electricity. Lost creek flows across the company's ground and estimates show it has sufficient volume, with the fall, to generate power for the sinking plant. A shaft, 160 feet deep, has been sunk hy hand, which shows a vein 30 feet wide, in which Hurd says he has a hody of milling ore. This has also heen further opened up by short drifts and crosscuts. On the Silver Crown claim of this group a second ledge has heen cut, showing 4 feet wide. An adit 110 feet long has heen run on the Silver Crown.

At the Victor mine, near Sumpter, the engines and the compressor are on the ground. Superintendent Smith says the property is ready for the development plant. Progress continues in two tunnels. In the main crosscut, 150 feet has been driven hy hand. Another adit has been driven above, having cut a vein 6 feet wide. When the power plant is in position it is intended to put two drills into the crosscut.

The Maxwell mine, Rock Creek district, is making regular shipments of concentrates, says the American. Snow in that hasin is 5 feet deep, and the Maxwell management is hauling concentrates to Haines on sleds. The haul is all down hill.

Grant County.

O. C. Wright, manager of the Blue Bird mine, and also of the Black Butte, near John Day, is resuming operations. A reorganization of the company has heen effected. A hoist will he put up in the spring, the plan being to raise to the surface from the tunnel level, a distance of 80 feet, and in the spring sink the shaft.

The Magnolia mine, near Granite, has been honded to G. J. Barrett of Granite, together with the Golden Star claim, hetween the Magnolia and the Independence mines. Development work will be started next week. The bond includes the seven claims and fraction of the Magnolia group, the Golden Star, the milling equipment of the Magnolia, and houses, machinery, etc., on the group. There are 3000 feet of development on the Magnolia proper.

SOUTH DAKOTA.

Lawrence County.

(Special Correspondeuce).—The Clover Leaf G. M. Co. (the Uncle Sam mine) report having opened up tbe ledge on the 700-foot level in a body of good ore. O. B. Amsden is superintendent.

Roubaix, Jan. 2.

Excavation work has been started by the Homestake M. Co. for enlarging its cyanide mill at Lead, to double the capacity of the plant. This is necessitated by the addition of 100 stamps to the Amicus mill of the company. This cyanide plant will, when enlarged, have capacity for handling 3000 tons of tailings daily.

The Lundberg-Dorr cyanide plant at Terry is in operation. It has one Chilian mill with capacity of eighty tons of ore per day. Some custom ore will be handled in addition to the company's ore. The Northwestern Railway Co. has built a side track to the mill.

Pennington County.

Superintendent Croft, of the Redfern G. M. Co., has resumed work with a few men and is sinking a shaft on the company's ground, north of Hill City.

UTAH.

Beaver County.

The Milford Times, speaking of the Majestic C. Co. smelter's run, says the plant was not worked at full capacity until towards the end of the run, when lt handled over 200 tons of ore per day, the average for the entire run baving been 170 tons. Following are the figures: Smelter in operation, 40 days; total expense, $35,000; value of matte produced, $62,500; copper produced, 246 tons; average contents of ores—copper, 5.1%; silver, 3.8 ounces; gold, .06 ounce; net cost of smelting, $3.75 per ton.

The Copper Mountain group, in Beaver Lake district, has been taken over under lease and bond by W. J. Bowring & Co. The bond runs for two years at $125,000. Men will be put to work this week. The incline shaft, which is 450 feet deep, will be straightened and continued down to develop the sulphide ores that have been struck. Their plans also include building a leaching plant to treat the oxidized ores of the upper workings. The vein, 20 feet wide, is said to average 5% copper. The property is equipped with a gasoline hoist, blacksmith shop, boarding house, etc.

W. Harrison has taken over the Wasatch King group, in Beaver Lake district, near Milford, and will develop it. ——The Lenora M. Co., which bought the Lenora group, in Star district, near Milford, has been incorporated at Salt Lake City by M. L. and W. J. Burns, P. C. Evans, B. H. Smith, and I. D. Carpenter, the last named heing manager.

Box Elder County.

The Giant Copper Queen M. Co. bas been incorporated at Salt Lake City by C. E. Dugger, B. Rose and M. H. Redding. The company owns the Copper

Queen group of claims in Box Elder county.

Grand County.

Manager W. R. Wheat of the Grouse Mountain M. Co.'s mines, in Miners' basin, near Basin, is arranging to build a cyanide plant, and as soon as practicable in the spring will begin breaking ground for the foundation. The mill will be below the Thompson stamp mill and convenient to all the mines of the district. The plant will have a daily capacity of fifty tons at the start.

Juab County.

The South Swansea mine of Tintic, near Eureka, which was temporarily closed down, resumed operations last week with an additional shift.

Superintendent Turner has put in a hoist at the top of the incline shaft at the Yankee mine, near Eureka, and is putting the mine in shape for an increased output. He has bought horses and wagons and hereafter the company will do its own hauling of ores.

The Tintic Miner gives the shipments from Tintic district for the month of December:

	Cars of Ore.
Bullion-Beck	20
Carisa	27
Centennial-Eureka	206
Gemini	25
Grand Central	102
Lower Mammoth	51
Swansea	16
South Swansea	13
Tetro	14
Yankee Con	27
Five other mines, a total of	24

IRON ORES.

	Cars.
Dragon Iron Mine	30

CONCENTRATES.

May Day	3

During the year 1903 there were 6480 cars containing 194,400 tons of ore shipped from Tintic district.

Salt Lake County.

Fires were started last week in the roasters of the Yampa smelters, at Bingham, and the furnaces are being blown in.

Superintendent Rumbaugh of the Galey & Guffey Oil Co. says he expects to have the derricks built ready to begin drilling for oil near Farmington, on shore of Great Salt Lake, by Feb. 1.

San Pete County.

Development work is reported progressing by the Silver Cave M. Co., near Ephraim. The main working tunnel has been driven to 270 feet and an 18-inch shoot of ore is opened, giving assays of $5 gold and 15% copper.

Summit County.

The ore output for 1903 of the mines of Park City was:

Mine.	Tons.
Daly-West	83,208
Silver King	48,672
Ontario	2,308
Daly-Judge	625
Comstock	440
California	164
Crescent	157
Scotch Chief	99
Creole	90
Barnes Bros.	166
Sundries	433
Total	136,362

The Kearns-Keith mill at Park City is being run at its full capacity with one shift and is averaging sixty tons per day. Shipments of concentrates have begun. The road to the mill is in a bad condition, says Foreman Kescol.

The Cougar G. & S. M. Co. has been incorporated at Park City, to develop holdings on the Smith & Morehouse Fork of the Weber river, 22 miles east of Park City. The ledge carries gold and silver values. The officers of the company are R. W. McDonald, G. F. and A. M. Martin.

At the King Con. mine, at Park City, the sinking pump is in operation. The shaft is down 690 feet, and when the 700-foot level is reached a station will be cut and a heavier pump put in, says Superintendent Keetly.

Tooele County.

The Sacramento G. M. Co., at Mercur, is shipping quicksilver to New York, sending out last week 350 flasks, on which a value of $15,050 was placed. The retorts are reducing 3000 pounds of mercurial gold ore daily.

WASHINGTON.

Ferry County.

(Special Correspondence).—During 1903 46,000 tons of ore have been shipped to smelters with profit over cost of mining, transportation and smelter charges. The mines have been undergoing systematic development during this period.

The output of Republic mines for 1903 was, approximately:

Mines.	Tons.
Quilp	27,000
California	1,000
Lone Pine	4,500
Mountain Lion	10,000
North San Poil	560
Knob Hill	930
San Poil	180
Trade Dollar	460
Tom Thumb	27
Morning Glory	300
Little Cove	270
Zala M	900
American Flag	60

Men are driving the tunnel on the Belcher. The Wauconda is again in operation. The Golden Eagle is sinking and is down 300 feet.

Republic, Jan. 3.

Work is expected to be resumed on the Tom Thumb mine at Republic, owned by the Tom Thumb M. Co. of Walla Walla. It is proposed to build a mill and to resume development by Feb. 1.

C. T. Porter, superintendent of the Golden Lion-Little Four M. Co., has resumed work on the mine at Republic. Last summer a body of quartz was cut on the west side of Granite creek and a shaft sunk. The company will sink a prospecting shaft for 100 feet on the east side of the creek to catch the vein on its dip. The Golden Lion tunnel, which is in several hundred feet eastward from the east side of the creek, will be cleaned out and retimbered.

At the Mountain Lion mine at Republic, a plant is being built for treatment of their ores by electro-cyanide process. The dynamos and other electrical equipment, as well as the agitator, are all on the ground. The agitator will be 16 feet in diameter, with 9 feet vertical sides, and 8 feet on the slope of the conical bottom. The pump well will be 2 feet in diameter. It is intended to crush the ore to eighty mesh, first reducing it with twenty stamps and then crushing to the required fineness with four Huntington mills. From the latter the pulp will be automatically conveyed to a series of five storage tanks and thence to the agitator. The agitator will be charged four times every twenty-four hours, requiring six hours' agitation for an extraction of 80% of the gold and silver contents of the ore. Each charge will consist of forty tons of ore, and sixty tons of KCN solution. The gold and silver dissolved by the cyanide will be deposited on copper plates by electric current and the pulp discharged into settling tanks. From the settling tanks the solution will be decanted into a sump tank and thence pumped to the battery tank to be reused. The tailings will be sluiced into launders and delivered by gravity to a tailings pit.

Stevens County.

The United States Copper-Gold Co. is preparing to develop its holdings near Chewelah. A 200-foot tunnel will be run on the vein.——J. B. Tuttle, superintendent of the King mine, says he has struck a body of ore on the lower level that carries values in copper and silver.

WYOMING.

State Coal Mine Inspector N. Young of the Eastern district has completed his report for the year 1903, but no returns have yet been received from Inspector Bradbury of the Western district. Young's report shows as follows:

Mine—	Tons Mined.	Men employed.
Dietz mines, near Sheridan	457,493	500
Cambria	419,586	665
Glenrock	90,543	75
Coal Creek	14,000	25
Black Hills mine at Alladin	10,468	35
Casper, Thermopolis, Douglas, Meeteetse, Sheridan and Cody mines, estimated	30,000	50
Totals	1,022,090	1,350

It is estimated the total output of coal for the entire State will be 4,500,000 tons.

Carbon County.

A flow of oil is reported struck last week east of Rawlins by J. H. Anderson and N. Johnson. Drilling has been going on in the Fort Steele district, 16 miles east of Rawlins, for some time. The discovery is said to have been made on land included in the railroad grant.

FOREIGN.

AFRICA.

Cape Colony.

The annual report of the De Beers Con. Mines, Ltd., operating the diamond mines at Kimberly, for the year ending June 30, 1903, includes a summary of loss in connection with the South African war. The total was £272,904. It charged the imperial government £75,477 for expenditures in connection with the siege of Kimberly, of which only £50,836 was allowed. There were direct losses of £147,395, for which no charge was made to the government, besides other losses. Among other charges were those for putting up barbed wire fences, building forts, digging trenches, supplying horses, oxen and mules, making shells and providing other things and performing acts which show that the De Beers was an active party in prosecuting the war. One item shows that £41,286 cash wages was paid to non-combatants, white and black, for work on town roads to enable them to keep their families from starving. The company bore this expense.

AUSTRALIA.

Western Australia.

The annual report of the Lake View Consols, Ltd., at Kalgoorlie, for the year ending June 30, 1903, has been issued, shewing the total expenditure on buildings, plant and mine development amounted to £575,202. The manager's report shows a further reduction in working costs. The average Australian working costs per ton of ore treated, including royalty, but excluding expenditure on development, buildings and plant, for the last three years, have been as follows: 1901, £2 16s 8d; 1902, £2 9s 5d; 1903, £1 13s 11d. The tonnage of ore reserves has been increased during the year. This increase, however, has been accompanied by a fall in the average value per ton. In addition to the stated reserves, it is estimated there is another year's supply of ore of a lower grade between the 1000-foot and 1200-foot levels not yet sufficiently developed to be measured. In view of the reduced average value of the reserves and the continual increase in the proved quantity of low-grade ore, it has been decided to improve and increase the equipment to obtain the largest possible profit from this low-grade ore. The most important of the renewals and improvements consist of installation of electric power for a large part of the machinery now driven by steam, rebuilding and improvement of the old 50-stamp battery, introduction of a belt conveyor for residues, introduction of self-dumping skips, putting in condensers in connection with the new plant, replacing present condensing apparatus and placing pumps or other machinery to take the place of the tailings wheel. This, it is expected, will involve expenditure of £25,000, which, it is thought, will be regained in increased economy within the first eighteen months. As soon as these alterations are sufficiently advanced, the whole battery of seventy-five stamps will be worked. Ore bodies recently located in the lower levels have been sparingly included in the estimated reserves. Development in these ore bodies is slow, on account of their great distance from the main shaft. For economy, the levels are only opened at intervals of 200 feet, the levels in every case being driven to the ore bodies and connected through and ventilated by raises and winzes before anything but necessary exploratory work is done.

BRITISH COLUMBIA.

Cassiar District.

J. Stables of Atlin reports locating near the Tooya river a deposit of coal. He says the coal is bituminous and lies between sandstone. Access to the section is not difficult, it being only 10 miles from the Dease lake trail and 40 miles from Telegraph creek.

East Kootenay District.

The Laborers' M. Co. smelter was blown in last week at Golden.

Rossland District.

The Le Roi mine at Rossland is producing from its 1350-foot workings, the deepest level opened up on a practical scale in Rossland camp, says Manager Parrish. Shipments are being sent out regularly.

Slocan District.

Manager Zwickey of the Rambler mine, in McGuigan basin, says they shipped 2500 tons of ore the past year, and the mine is in shape to double that amount in 1904.——The Payne mine at Sandon is receiving 500 tons of coal per month. —— The Washington mine is working under the contract system.

The output of Slocan district for 1903 is the lowest of any year yet, says the Rossland Miner, being 14,000 tons of galena and 2000 tons of zinc, about 50% only of its normal shipment. The reason for the small output is partly due to the low price of silver and lead which prevailed the forepart of the year, coupled with the fact that four of the largest shippers have been curtailing their output on account of lawsuits. The production of zinc this year has marked a new industry for the district. Manager Garde of the Payne mine built a zinc magnetic separator and roaster. It handles twenty tons per day, raising the percentage of the zinc to 60% after it has been concentrated. It is thought the coming year other similar plants will be erected. What is needed in the province is a zinc smelter, which would save the freight of $11 per ton now paid to the United States.——There have been 500 men working in the mines adjacent to Sandon. Considerable leasing has been done.

The Payne zinc plant at Sandon is working successfully turning out ten to twelve tons daily of zinc concentrates. The grade of the magnetized concentrates is now higher than when the plant first started up, the increase being from 42.43% to 57.58%. There are between 1000 and 1300 tons on hand at the mill concentrated, and awaiting magnetization, besides a large tonnage at the mine. The electric process followed at the Payne is as follows: The 42% product is charged, after it has been through the concentrator, into a combination drying and roasting furnace, whereby the spathic iron associated with the zinc is changed into a magnetic product. After cooling the roasted ore is sized on vibrating screens and passed over a magnetic separating machine, the iron being retained. The whole plant is arranged to work automatically.

FRANCE.

Auriferous depesits are reported found in the antimony mines at Bas Coudray and Haut Coudray, in the Department of Mayenne, by M. Herrenschmidt, a French engineer. He says the deposits, extending several miles in quartz strata at 20 metres under the surface, give sixty grammes (1.92 ounces) a ton in gold values.

INDIA.

The output of the gold mines of India for 1903 to Dec. 1, as compared with 1902, was as follows:

	1903. Ozs.	1902. Ozs.
January	48,080	41,612
February	46,268	40,053
March	48,327	41,575
April	48,271	38,329
May	48,628	28,003
June	48,980	37,466
July	50,571	43,847
August	50,286	49,628
September	51,352	49,420
October	52,274	47,858
November	56,533	48332
December		48,078
Totals	550,120	514,291

MEXICO.

President Diaz, in his last message to Congress, shows the mining industry continues to prosper in spite of the depreciation and fluctuation of silver, which is the chief product. During the last fiscal year 4132 title deeds to mining properties were issued, embracing 61,396 hectares, which is an increase of 524 title deeds and 736 hectares as compared with the previous year. The exploitation of other ores than those containing gold, silver, lead, copper and iron is being undertaken, including cobalt, nickel, tin, bismuth and antimony. Referring to antimony, the treatment of 5357 tons of ore yielding 2159 tons of antimony in the Wadley smelter at San Luis Potosi is mentioned.

Chihuahua.

At Candemania, J. Rival is working a silver mine. Ocampo (Jesus Maria) and the neighboring mines of Sahuayacan, Concheno, Pinos Altos, etc., sections, are shipping $100,000 worth of bullion per month, says the Chihuahua Enterprise. Plans are being drawn for a 40-stamp mill for Dios de Guie mine.

At the Sangre de Cristo group, in Arteaga district, 28 miles east of Chinipas, owned and operated by the Guazapares M. & M. Co., development consists of one single-compartment shaft, down 880 feet, two tunnels driven a total of 1672 feet, with crosscuts, drifts, etc., a total of 1780 feet. Equipment consists of a roll mill, one hoist, two engines, four hoilers, an electric generator for lighting mine, mill and camp, one air compressor and a 35-ton-per-day hyposulphite of sodium leaching plant. The company proposes putting in an aerial tramway from the mine to the mill, a distance of 1900 feet, the angle of inclination being 8°, says Manager J. R. Harbottle.

At the San Francisco and Dolores mines, owned and operated by the Naica M. Co., 16 miles west from Concho station on the Mexican Central railroad in the Camargo district, the ore is said to carry silver, lead and gold, averaging $40 per ton. Development consists of three vertical two-compartment shafts, down a total of 662 feet, two tunnels driven a total of 769 feet, and from 150 to 200 feet of crosscuts, drifts, etc. They have a gasoline hoist. The company proposes putting in an additional 40 H. P. gasoline hoist, power drills, air compressor and one boiler. Work is progressing, says Superintendent J. E. Garrett.

Durango.

It is reported the Quebradilla mines of Nombre de Dios will resume operations this month. The mines have been shut down for six months, and operations were stopped in the development stage. They are owned by M. Damm of Mexico City, and Detroit, Mich., men.

Mexico.

At El Oro the Victoria y Anexas, three-compartment vertical shaft is down to the second level, or 403 feet, and crosscutting to the east started. The east crosscut on the first, or 305-foot level, is in 15 meters, and driving is going ahead. The west crosscut on the first level has been driven to the company's boundary line; and, as nothing was cut by this, and as the veins that cut the property to the west of the

shaft dip out of the property on this side, the company will confine its work to the east of the present shaft.

The Esperanza mine at El Oro is equipped with two underground ore bins, each having a capacity of 2700 tons, and each equipped with a 13x24-inch Blake type rock crusher operated by a 40 H. P. direct current 500-volt motor. The ore bins are built one at each shaft, and the ore is run from them through the rock crushers before going to the 120-stamp mill and the thirteen Huntington mills. The two shafts, the main or south shaft and the north shaft are 448 meters apart, being connected by underground workings.

At El Oro the El Oro mine cyanide plant equipment consists of ten sand-settling tanks, twenty-four slime-settling tanks, six preliminary slimes-treatment tanks, five final slimes-treatment tanks, fifty-four sand-treatment tanks, three storage tanks, three gold-solution tanks, three filter tanks, twelve wooden precipitating boxes 18x2x2 feet, nine steel precipitation boxes 23x30x30 inches, each of the twenty-one boxes having nine compartments and one sump tank. Three strengths of solution of KCN are used.

El Oro mine at El Oro is being developed through four shafts and one tunnel, besides crosscuts, drifts, etc. The main shaft, three-compartment incline, is down 745 feet; the north, two-compartment vertical, is down 630 feet; the Somera, three-compartment vertical, is down 1050 feet, and the Providencia, the first shaft sunk in El Oro district, two-compartment vertical, is down 650 feet. The San Juan tunnel (through which the water from the workings that is lifted by means of the Cornish pump through the Providencia shaft is conveyed to a tank at the foot of the hill) is 1675 feet in length; from the tank the water is pumped to the main plant and used in the mills, boilers, and for cyanidation. Progress is being made on the foundations for the 100-stamp mill.

Work is progressing on the Playedes mine, 1 mile south of El Oro. A three-compartment vertical shaft is going down, and equipment consists of engine, 30-light electric generator, air compressor, boilers, and double hoist, says Superintendent N. F. Morton.

Hidalgo.

El Almaden and La Providencia properties, consisting of 100 pertenencias, 10 kilometers east by south from Tulancingo, in district of same name, have been bonded by J. M. Erskine of the City of Mexico for thirteen months for $100,000 gold. These mines have been worked by Mexican methods for twenty years, and the total development work—tunnels, drifts and one shaft—amounts to 1500 feet. This work was done by the natives in search of cinnabar, of which there is said to be a deposit on the group, and, in sinking the shaft, ore carrying gold and silver was cut.

J. M. Erskine of El Paso, Tex., is reported to have bought El Almaden mines, 2 miles from Ahuechuetes station and near Tulancingo, for $100,000 gold. The mines were opened twenty years ago and heen worked only intermittently. The ores are of gold and silver. Cinnabar is said to occur on the property. Erskine has made other locations amounting to eighty pertenencias, in addition to the original 100. Timher is at hand. The ore is said to he adapted to milling and a stamp mill is proposed.

Sonora.

W. E. Pomeroy, superintendent of the Yaqui C. Co. properties in Sahuaripa district, says it is intention of the company to build a 1000-ton smelter at Campo Santo Nino in the spring.

At San Ricardo G. Charters, manager for the American-Mexican M. & Dev. Co., reports work progressing. G. Phillips is superintendent. Machinery for a 20-stamp mill is on the ground and five stamps are set up and in operation. The water from the mine is sufficient to run the five stamps. To run more they will pump water from the San Miguel river, distance of 1¼ mile. A pipe line and pumping station will ho put in. The American-Mexican M. & Dev. Co. has a group of seven properties, embracing sixty pertenencias of ground, which is said to include seven gold hearing ledges. They show ancient workings.

PHILIPPINE ISLANDS.

J. D. Hartwell, writing from Manila, says he is building a 3-stamp gold mill for his claims in Benguot province. The oro is free milling, avoraging on tho surface $20 per ton in gold.

TASMANIA.

The Mount Lyell Mining & Railway Co., operating at Mount Lyell, reports for Nov. 12 to Dec. 9, inclusive, a total quantity of 26,727 tons of ore treated, heing 20,167 tons from the Mount Lyell mine and 6560 tons from the North Mount Lyell mine. In addition to this there were treated 249 tons of metal-bearing fluxes. The converters produced during same period 538 tons of blister copper, containing: Copper, 531 tons; silver, 58,644 ounces; gold, 1208 ounces. Reduced tonnage due to accumulation of ore being made to tide over any cessation of mining operations during the Christmas holidays.

Personal.

G. G. MERRICK, of Denver, Colo., is in New York on business.

EMIL MELZER has returned from San Fraucisco, Cal., to Sumpter, Or.

E. J. MORRISON of Lewistown, Mont., is in New York on mining business.

W. I. HUPP of Folsom, Cal., is in San Francisco, Cal., on mining business.

J. S. CUNNINGHAM, JR., of Salt Lake City, Utah, is in San Francisco, Cal.

H. DOBSON, interested in tin mines near Teller, Alaska, is in San Francisco, Cal.

H. K. WHEELER of Los Angeles, Cal., is examining mining property in southern Nevada.

J. W. TREPP of Pittsburg, Pa., interested in California miues, is in San Francisco, Cal.

C. C. FIFE of Los Angeles, Cal., interested in Nevada mines, is in San Francisco, Cal.

E. ENGEL is superintendent of the Bismarck and Ida Florence mines, near Keystone, S. D.

DR. O. B. DAWSON of New York is in La Cananea, en route to New York, via Denver, Colo.

W. F. COPELAND of Alameda, Cal., is in El Dorado county, Cal., making mine examinations.

M. W. HOYLE bas returned to Breckenridge, Colo., from New York and other Eastern cities.

E. COLLINS is manager of the Combination group of mines at Goldfield, near Tonopah, Nev.

JOHN LAWLER, a mine owner of Prescott, Ariz., is in San Francisco, Cal., on mining business.

W. H. CHILD of Salt Lake City, Utab, of the Sheba M. Co., is in tbe East on mining business.

H. CALVIN is superintendent of tbe Bamberger-DeLamar mines, at DeLamar, Lincoln county, Nev.

W. H. NANCE is mill superintendent of the Quandary Mountain M. & M. Co., near Breckenridge, Colo.

J. F. WATERHOUSE of the Etbel mine, at Gaston, Nevada county, Cal., is in the East on mining business.

S. U. WATSON, who has heen building a cyanide mill near Chloride, Ariz., has returned to Denver, Colo.

P. P. BUSH, Western manager of the Canton Steel Co., has returned to Denver, Colo., from Canton, O.

L. H. STEVENS, manager of the Batopilas mines at Batopilas, Chihuahua, Mexico, is in Washington, D. C.

G. L. MOATS, manager of the Four Metals M. Co., returned to Salt Lake City, Utah, from a trip East.

ISAAC COPELAND of Alameda. Cal., bas gone to Columhia, Tuolumne county, Cal., to make mine examinations.

R. E. TOWNSEND, operating mines at Gilt Edge, Fergus county, Mont., is in New York on mining business.

C. A. HOLLAND, manager of the Altadena mine, near Columhia, Tuolumne county, Cal., is in Boston, Mass.

N. S. CLARKE, representing the Northwestern S. & R. Co. of Crofton, B. C., has returned from Hermosillo, Mexico.

A. J. MCCONE of the firm of Harron, Rickard & McCone has returned to San Francisco, Cal., from Tonopah, Nev.

W. W. MERRIAM AND D. GOODALE, interested in Siskiyou county, Cal., mines, are in San Francisco, Cal., from Etna.

W. MCCORNICK returned to Salt Lake City, Utah, last week from the placers of the Siborian Exploration Co. in Siheria.

K. M. JACKSON has returned to San Francisco, Cal., from a visit to mines at Tonopah, Nev., in which he is interested.

J. C. BROOKS of Chihuahua City, Mexico, is superintendent of the Braden mines at Cerro Almaloya, Chihuahua Mexico.

G. H. DERN, manager of the Con. Mercur G. M. Co. of Mercur, Utah, returned to Salt Lake City, Utah, last week from a trip East.

J. W. VAN METER of the Van Meter-Boss Oil Concentrating Co. has gone from San Francisco, Cal., to Los Angeles, Cal., on business.

L. W. ALDRICH, Denver, Colo., has returned there from Old Mexico, wbere he bas been for several weeks looking after mining interests.

W. E. HURD of Portland, Or., manager of tbe United Exploration Co., operating in tbe Greenhorn mountains, Baker county, Or., is in the East on business.

F. W. MITCHELL returned to Salt Lake City, Utah, last week, from California, from the properties of the Shasta G. & C. M. Co., of which he is superintendent.

CHAS. THOMAS of Fairbanks, Morse & Co., who has been installing a complete mine and mill plant at Sumpter, Or., has returned, via Portland and San Francisco.

W. L. WILSON, secretary of the Thunder Mountain Gold King mine, has returned to Denver, Colo., from New York, where he has been on company business.

COLIN MCINTOSH, for tbe past three years manager of the Big Indian M. Co., near Helena, Mont., bas accepted a position with a company operating in South Africa.

R. SWAIN, for the past three years representative of the Willfley concentrator in Arizona and Mexico, with headquarters in El Paso, Texas, is now located in Denver, Colo.

C. J. BUSH, assistant Western manager of the Canton Steel Co., with office in Denver, Colo., has resigned to accept a position with tbe Crucible Steel Co. of America.

A. H. STOW has removed from Hunter to Switchback, W. Va., where he has engineering charge of the six Elkhorn plants, of which J. E. Jones is general manager.

W. E. THORNE returned to San Francisco, Cal., from the mines of Butte county, Cal., for the State Mining Bureau, and has gone to Denver, Colo., in which State be will make mine examinations.

W. HENDERSON, formerly manager of the Queen Margaret G. M. Co.'s mines at Bulong and the Gippsland leases at Vasperton, Western Australia, is manager of the Princess Royal Central mines at Norseman, Western Australia.

M. D. DRAPER, lately superintendent of the Town Topics M. Co., Central City, Colo., bas gone to Hedges, Cal., to assume charge of the mines operated by the American Exploration Co. of Colorado Springs, Colo.

S. A. PARNALL is suporintendent of the Calumet & Arizona mine, near Bisbee, Ariz., vice L. L. Merrill. Mr. Parnall will also have charge of work at the Calumet & Pittshurg, Lake Superior & Pittsburg and tbe Pittsburg & Dulutb properties which are under management of Lake Superior, Mich., interests.

Trade Treatises.

THE Smooth-On Manufacturing Co. of Jersey City, N. J., have issued a booklet telling ahout Smooth-On, its different combinations, and their applications. The latest combination is Smooth-On with ruhher, which tbey say makes a sbeet packing tbat will withstand high temperatures and pressures. The company will he pleased to send the catalogue to anyone asking for it. Either the home office or the Western Repair & Supply Co., 61-63 Steuart street, San Francisco, Cal.

The second edition of Catalogue No. 5, "Hydraulic Mining Machinery," issued hy Harron, Rickard & McCone, 21-23 Fremont St., San Francisco, Cal., is of commensurate value with their series of similar treatises on gold mills, mine and mill supplies, etc. It describes and illustrates the Camphell hydraulic gravel elevator, douhle-jointed ball-bearing giants, water gates, doflectors, etc., and gives several valuable tahles and tabulated information—tbe whole in compact form. A copy will he mailed to any designated address.

Dividends.

North Star M. Co., California, $125,000; Jan. 1.

Bunker Hill & Sullivan M. & C. Co., Idaho, $30,000; Jan 5.

Obituary.

J. POWNING, a pioneer miner of Nevada county, Cal., and on the Comstock lode in Nevada, died at Nevada City, Cal., on the 5th inst. Deceased was a native of England.

J. MUSTO, a pioneer miner of Calaveras county, Cal., and later an importer of Carrara marble, died at San Francisco, Cal., on the 3rd inst. Deceased was a native of Italy, 74 years of age. He is survived by a widow, four daughters and two sons.

JACOB HOUGHTON of Detroit, Mich., formerly managing director of the Iron Silver M. Co. of Leadville, Colo., died in Detroit, Mich., on the 29th ult. Deceased was born in Fredonia, N. Y., in 1837, and was educated at the University of Michigan as a civil and mining engineer. His elder brother, Douglas Houghton, was a geologist and made the first geological survey of tbe copper and iron district of the upper peninsula of Michigan in 1844. Deceased was division engineer in charge of the Michigan Central Railroad from Jackson, Mich., to Detroit, and was also engineer in charge of the Detroit city water works. After completion of this work he engaged in mining in the Lake Superior region and was for several years general manager of the Iron & Copper Co. In 1872 he moved to tbe iron districts of Marquette county and became manager of the Michigan Iron Co. In 1878 he removed to Colorado and took charge of tbe Moose mine in Park county, and later became interested in the Iron Silver Co. of Leadville. At his death he owned interests in California gulch, Leadville, consisting of the Garden City, Star of the West and Satellite properties (tbe Houghton M. Co.), and was also interested in Lake Superior iron properties. He leaves two sons and two daughters.

Commercial Paragraphs.

R. D. HUNTER, manager Denver, Colo., office of the Sullivan Macbinery Co., bas moved his office from 431 Seventeenth St. to 1748 Broadway, where be will bave a room 25x100 feet, with basement. The office is next door to the Metropole Hotel and across the street from the Brown Palace.

THE Loomis-Pettibone Gas Macbinery Co. has been merged with the Holthoff Machinery Co. of Milwaukee, Wis., under the new corporate name of Power & Mining Machinery Co. They are making extensive improvements and additions to the Milwaukee plant to supply the American Crossley gas engines, Loomis-Pettibone gas apparatus and Holthoff mining machinery. They will continue, under Mr. Holthoff's personal supervision, the manufacture of mining, smelting and milling plants and machinery.

THE W. S. Tyler Co. of Cleveland, Ohio, manufacturers of wire cloth, have completed their new power plant. Tbe boiler house is 70x37 feet and contains three 400 H. P. water-tube boilers, one 1500 H. P. water heater and two boiler feed pumps. The fires are operated hy the induced-draft system, coal handling apparatus conveying the coal from the cars to the coal hunkers of 800-ton capacity. From there the coal passes through the weighing machine to coal hoppers at the front of the boilers and is burned on cbain grates. The engine room is 47x48 feet, finished inside with red tile floor and marble white glazed brick sides. A 500 H. P. Allis-Chalmers Corliss single-cylinder horizontal engine is direct-connocted to a 300 K. W. 110-volt generator. Thero is also an 800 H. P. vertical compound Corliss engine, direct-connected to a 500 K. W. 110-volt generator. These improvements and additions were made necessary by the constantly increasing business of this concern. All the machines used in the manufacture of wire cloth are made by the company in their own shops, and, with the equipment now installed, they will he ahle to handle their growing business.

Books Received.

"Reinforced Concrete" is the title of a volume on this important and comparatively new subject, by Armand Considere. Concreto as a structural matcrial is valuahle and has been used for ages. No other material except solid masonry will endure tho ravages of time as well. In modern engineering practice concrete is

being built reinforced with steel. This material has a very wide range of application in building, and these are fully set forth and explained in the book. It treats of its bonding, tensile resistance and compressive resistance. The volume will be valuable in the hands of engineers employing reinforced concrete. 188 pages. Price $2. McGraw Publishing Co., 114 Liberty St., New York.

"American Meter Practice," by Lyman C. Reed, is a new treatise devoted to meters used in the measurement of electrical energy consumed. It treats of the various types of electrical meter, and is illustrated with half-tones and engravings. The volume is interesting to both the technical and non-technical reader, and to the latter, particularly, that chapter entitled, "How to Read a Meter." 196 pages. Price $2. The McGraw Publishing Co., 114 Liberty St., New York City.

Latest Market Reports.

SAN FRANCISCO, January 8, 1904.

METALS.

SILVER.—Por oz., Troy: London, 27¼d (standard ounce, 925 fine); New York, bar silver, 57¾c, refined (1000 fine); San Francisco, 57¾c; Mexican dollars, 43@45c San Francisco, 43¼c New York.

Within the week silver has advanced nearly 2c per ounce, but no particular significance can be attached to it.

COPPER. — Now York: Standard, $12.37½; Lake, 1 to 3 casks, $12.37½; Electrolytic, 1 to 3 casks, $12.25; Casting, 1 to 3 casks, $12.12½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £58 2s 6d spot per ton.

No material change is noted in the copper market, except a slight advance in London. It is said that the foreign buyers are about to stock up for the season and an advance in price is anticipated. It is said there is no considerable surplus stock on hand in this country, and stocks in consumers' hands are small.

LEAD. — New York, $4.37½; Salt Lake City, $3.50; St. Louis, $4.00; San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.75. London: £11 7s 6d ₱ long ton.

SPELTER.—New York, $5.20; St. Louis, $5.10; London, £21 15s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.50 @ 29.00; San Francisco, ton lots, 31c; 500 lbs., 31½c; 200 lbs., 32c; less, 32½c; bar tin, ₱ lb., 35@37½c. London, £130 12s 6d.

PLATINUM. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@44.50 ₱ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.20c; San Francisco, Plumbers', 100-lb. lots, 16.80c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; sbingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.60 country, $1.75 city ₱ bbl.

CEMENT.—Imported, $2.25@2.50 ₱ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ₱ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.00 @14.35; gray forge, $12.35; San Francisco, bar, 3c ₱ lb., 3¼c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@15 00
Northern 2	14 75@15 50
Northern 3	13 75@14 50
Southern 1	13 85@——
Southern 2	13 35@——
Southern 3	12 85@——
Forge	12 10@——
Charcoal	16 50@17 00
Billets, Bessemer	24 00@——
Bars, iron	1 30@——
Bars, steel	1 46¼@——
Rails, standard	28 00@30 00
Rails, light	26 00@32 00
Plates, boiler	1 90@ 2 01
Tank	1 76@ 1 80
Sheets, 27 store	2 80@ 2 90
Angles	1 76@——
Beams	1 75@——
Tees	1 81@——
Zees	1 76@——
Channels	1 75@——
Stool melting scrap	10 00@11 00
Car wheels	13 50@14 00
Cast borings	3 00@ 3 50
Turnings	7 00@ 8 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¼c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11¼c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulpbate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Soattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 45c; cs., 50c; raw, bbl., 43c; cs., 48c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 15c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@55c; Natural White, 70c; Bleached, do., 75c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., $1.00.

BISMUTH.—Subnitrate, ₱ lb., $1.75.

MERCURY.—Bichloride, ₱ lb., 90c.

MOLYBDENUM.—$2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 75c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING DECEMBER 22, 1903.

747,672.—BRAKE—G. E. Babcock, Coronado, Cal.

747,575.—DRILLING BIT—R. C. Baker, Coalinga, Cal.

747,847.—RAILROAD SWITCH—W. J. Bell, Los Angeles, Cal.

747,578.—CAN BODY MACHINE—H. C. Black, S. F.

747,582.—PERFORATING CYLINDERS—Boyle & Brett, Los Angeles, Cal.

747,583.—CYLINDER MACHINE—Boyle & Brett, Los Angeles, Cal.

747,536.—CLOD CRUSHER—F. E. Caton, San Jose, Cal.

747,373.—CLOSURE—E. E. Chapman, Los Angeles, Cal.

747,872.—TRACK GAUGE—Ellis & Purvis, Lester, Wash.

747,053.—BUCKLE—J. A. Gavitt, Pendletou, Or.

747,420.—BOILER ALARM—W. S. G. Harris, San Luis Obispo, Cal.

747,711.—EDUCATIONAL APPLIANCE—L. M. Hollingsworth, Fresno, Cal.

747,732.—DECOY DUCK—A. Kremer, Sacramento, Cal.

747,560.—CARGO DISCHARGER—H. A. Middaugh, Seattle, Wash.

747,567.—LEMON SQUEEZER—W. H. Ostrander, S. F.

747,656.—VALVE — F. P. Skeffington, Spokane, Wash.

747,502.—GAS GENERATOR — H. Symonds, Long Beach, Cal.

747,504.—PIPE WRENCH—L. Tarbell, Los Angeles, Cal.

747,522.—PLOTTING TOOL—L. E. Wilkes, Hillshoro, Or.

FOR WEEK ENDING DECEMBER 29, 1903.

748,342.—VAPOR BURNER—G. A. Bonelli, Kingman, Ariz.

748,472.—STOVES—L. & A. F. Brandt, Spokane, Wash.

748,046.—FLUSHING APPARATUS—J. H. Byers, S. F.

748,162.—SPLITTING MACHINE—O. E. Cheesebrough, Anaheim, Cal.

748,485.—WINDMILL—W. Curtis, Sacramento, Cal.

747,950.—BOX FRONT—F. Davis, Salem, Or.

748,267.—OIL BURNER—J. H. Davis, Oakland, Cal.

748,487.—SAFETY GAS COCK—H. J. Doll, S. F.

748,054.—UNDER-REAMER — E. Double, Los Angeles, Cal.

748,177.—OIL BURNER—E. A. Edwards, Los Angeles, Cal.

748,368.—CAN MACHINE—C. H. Hanford, Seattle, Wash.

748,071.—SAFETY PIN—B. P. Herndon, Florence, Ariz.

748,288.—KNAPSACK, HAMMOCK, ETC.—G. Klein, S. F.

748,193.—PAINT BRUSH—J. P. Kneuhmann, Sumas, Wash.

748,081.—HEAD REST—L. Larrimore, Los Angeles, Cal.

748,082.—UMBRELLA TIP—J. M. Lauhe, Whatcom, Wash.

748,209.—MAIL BAG—D. G. McClay, Santa Ana, Cal.

748,087.—MUSICAL TOP—Mighels & Ellis, Berkeley, Cal.

748,298.—INDOOR GAME—S. B. Monson, S. F.

748,204.—HARNESS SADDLE—T. I. Morrish, S. F.

748,211.—CURTAIN HOLDER—F. E. Naumann, Los Angeles, Cal.

748,094.—MEASURE—H. C. Parker, Los Angeles, Cal.

748,008.—HAT HOLDER—P. P. Rahin, Colma, Cal.

748,010.—WEIGHING MACHINE—S. G. Reed, Portland, Or.

748,309.—ELECTRIC PAD—W. Rickards, Los Angeles, Cal.

748,561.—FURNACE—E. Riveroll, Los Angeles, Cal.

748,227.—ATOMIZER—F. A. Smith, Los Angeles, Cal.

748,232.—PHOTO MOUNTS—P. J. Stuparich, S. F.

748,324.—REGISTER—C. Wamsley, Tacoma, Wash.

748,123.—ELECTRIC SWITCH — I. G. Waterman, Santa Barbara, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

PROCESS OF MANUFACTURING PHOTOGRAPHIC MOUNTS.—No. 748,232. Dec. 29, 1903. P. J. Stuparich, San Francisco, Cal. Assigned to the Stuparich Mfg. Co. of same place, a corporation. This invention consists in a means for imprinting designs of any description upon the outer portion of the card which forms the mount and at the same time the formation of an interior smooth and unmarked portion of the size and shape designed to receive the picture which is to be mounted upon the card.

MUSICAL TOYS.—748,087. Dec. 29, 1003. P. W. Mighels of Oakland, Cal., and C. Z. Ellis of Berkeley, Cal. This invention relates to improvements in mechanical and musical toys, and particularly to that class in which musical tones are produced by a spinning top. An endless variety of tunes may be played by the same operating means, since it is possible to remove a cylinder and replace it with one for a different tune. The device is neat, simple, entertaining, and in external appearance does not differ from ordinary tops.

INDOOR GAMES.—No. 748,298. Dec. 29, 1903. S. B. Monson, San Francisco, Cal. One-third assigned to J. H. Cadogan of Oakland, Cal. This invention consists in the combination of a flexible sheet having a numbered diagram upon its surface near one end, a roller secured to the sheet and upon which the latter may be wound, said sheet projecting beyond the roller, and said roller serving as a stop for limiting the movement of playing pieces, and clamps engaging both ends of the sheet. The object of the invention is to provide a small and conveniently manipulated game to be played indoors.

SAFETY GAS COCKS.—No, 748,487. Dec. 29, 1903. H. J. Doll, San Francisco, Cal. The object of this invention is to furnish a simple device which will insure the complete shutting off of the gas when the key is turned and which will also provide means for regulating the flow of gas independent of the key.

CONVERTIBLE KNAPSACKS, HAMMOCKS AND SLEEPING-BAGS.—No. 748,288. Dec. 29, 1903. G. Klein, San Francisco, Cal. This invention relates to an improved article of manufacture which is convertible on occasion into either a knapsack, a hammock, a sleeping-bag or a section of a tent.

WINDMILL.—No. 748,485. Dec. 29, 1903. W. Curtis, Sacramento, Cal. One-half assigned to E. F. May of same place. This invention consists in a novel means of transmitting power from the wind wheel shaft to the counter-shaft by which pumping or other mechanism is driven, a means for turnably supporting the wind wheel and connected mechanism, and arrangement of a pair of pumps and their connection with the mechanism of the mill, so that they may both be disposed within the well and its casing. The invention is especially designed to avoid the use of oil or lubricants and to transmit power without the use of gearing, belts, sprocket chains or the like.

OIL BURNER.—No. 748,267. J. H. Davis, Oakland, Cal. The object of this invention is to provide a burner particularly adapted for use in stoves which is simple, cheap, clean and safe and from which there is absent the usual disagreeable and alarming noises of puffing and muffled explosions noticeable in many of the burners of this class.

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A COMPETENT MILLMAN OF 10 YEARS' EXperience would like to take charge of a mill in any part of the country, understanding cyaniding thoroughly. Wife would like to take charge of boarding house at same place. Address W. G., care of Mining and Scientific Press.

AS ELECTRICIAN WITH MININC COMPANY; nine years of experience operating polyphase, hydro-electric power plants and direct current machinery; can make all repairs; age 26 years. First-class references; will go anywhere. F. P., this office.

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WANTED—POSITION BY EXPERIENCED ASsayer and Surveyor. Thorough knowledge of bookkeeping and Spanish. S. C. H., this office.

WANTED, POSITION BY MACHINIST AND Engineer; efficient in steam, electricity and compressed air; seven years' experience at mines; good references. Address Box 54, care of Mining and Scientific Press.

WANTED—POSITION AS SUPERINTENDENT or assistant of copper mines and smelters; competent all round man, good assayer, analyst and draughtsman; can handle labor; speaks Spanish. Address "Smelter," care this office.

YOUNG MAN WITH SOME EXPERIENCE and training in chemistry, metallurgy and general engineering, wants work at mine or any place where he can get additional experience and training. Address "Espanol," care of this office.

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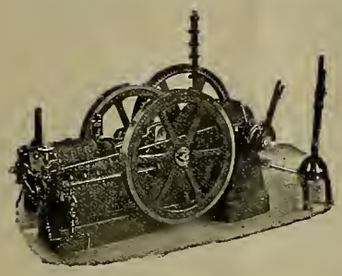

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ASSESSMENT NOTICES.

MAYDAY GOLD MINING COMPANY.—LOCATION of principal place of business, San Francisco, California; location of works, Calaveras County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 9th day of November, 1903, an assessment (No. 1) of three cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, at Heald's Business College, No. 24 Post street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 14th day of December, 1903, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on MONDAY, the 18th day of January, 1904, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.

Office of the Company, Heald's Business College, No. 24 Post street, San Francisco, California.

POSTPONEMENT.

The day of delinquency in the above assessment has been postponed to January 11th, 1904, and the day of sale to Wednesday, February 17th, 1904.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.

Office of the Company, Heald's Business College, No. 24 Post street, San Francisco, California.

TANANA MINING COMPANY—LOCATION OF principal place of business, San Francisco, California.

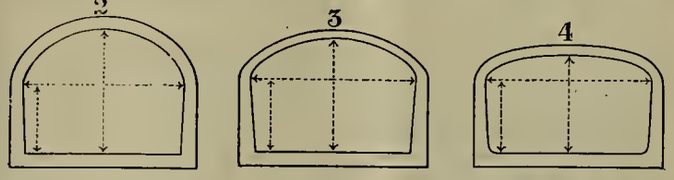
Notice is hereby given, that at a meeting of the Board of Directors, held on the 11th day of December, 1903, an assessment (No. 7) of four (4) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at his office, Rooms 404-405 of the Call Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 18th day of January, 1904, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on MONDAY, the 29th day of February, 1904, to pay the delinquent assessment, together with costs of advertising and expenses of sale.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.

Office—Rooms 404-405, Call Building, San Francisco, California.



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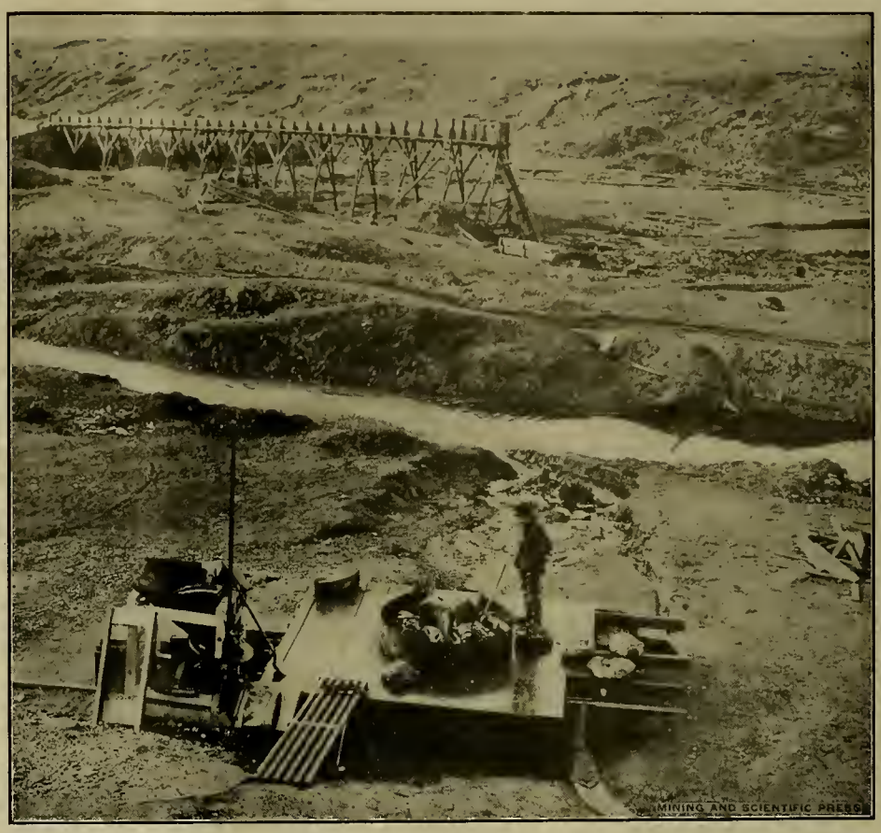
Valuing a Mine.

When a mine is sampled throughout for the purpose of ascertaining its value, the miner or engineer can determine this quantity with approximate accuracy, if proper methods be pursued. The most important thing is to take samples which actually represent the vein or ore deposit. This is a more or less difficult thing to do, but by exercising the necessary care it can be done. Samples should be taken entirely across the vein from wall to wall, and if the vein be very wide, they may be taken in sections. Each sample should be assayed separately, and assumed to represent the value of the width sampled at that point. The taking of a dozen or twenty or more samples along the level, mixing the whole together, cutting down and calling this a representative sample of that portion of the level is an unsatisfactory and dangerous method of ascertaining values, for all the values represented by the so-called sample may have come from a rich spot in the vein, a few inches in width, and as it has no considerable extent a much greater value is credited to that portion of the mine than it is actually entitled to. A third essential is the development of the mine to an extent which divides the ore into a series of blocks which expose ore on three or four sides. The day is past when large blocks of ground are admitted by engineers as an equal in value and volume to that exposed along the faces. The blocks must be comparatively small and accessible to the sampling process. Occasionally novices in mine examination permit shrewd promoters to select their samples for them, or take them themselves from piles of ore already broken in the mine. Such instances are, however, becoming fewer.



A Sand Grinder in Operation at Nome, Alaska. (See page 38.)

Placer Mining in Nome District, Alaska; Hydraulic Elevator in the Background. (See page 38.)

THERE are mining methods possible in a country where labor is cheap that are not commercially applicable in one where wages are comparatively high, unless the ore be unusually high grade. The copper mines of Cabazas del Pasto, Spain, were worked by a system of crosscutting and filling by hand, no smalls being employed. By this means very large masses of ore were extracted without danger to the workmen, but while the method of mining is applicable to many mines in America and elsewhere, the cost of handling the filling in the same manner as practiced at the Spanish mine referred to is commercially impossible. The method of working a mine is usually, if not always, a question of expediency, determined by the cost or influenced by the physical conditions present.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, JANUARY 16, 1904.

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The Copper Situation.

Duriug 1903 copper had an interesting career, and it promises no less interesting features for the year 1904. About one year ago New York quotations for Lake copper were $11.62½ per hundred. Early in February the price had advanced to $12.75, going to $13.75 the first week in March, and before the end of that month Lake copper found a ready market at $14.50 to $15. This was the highest price reached during the year, though the price was maintained at $14.50 to $15 until June. In July a slight decline was noticeable, and, with more or less fluctnation, the price fell throughout the summer and fall, going as low as $13.12½; but ou November 1 it rallied to $14. During December the quotations fell to $12.50, and at present the quotation is $12.75 to $13. The rise in price in the carly part of 1903 was due to a large and steady demand for the metal, and the falling off in the latter part of the year is attributable to a constantly decreasing demand until the latter part of the year, when it seemed to be a game of waiting ou the part of both seller and consumer. The seller waited for large stocking-up orders, and the buyers held back in the expectancy of a lower price. The market is at present more active, and the prospect of war in the Far East has also had a material influeuce ou the price. Should war actually be declared, a strong aud materially higher market may be looked for. It is also said that, although industrial activity is less pronounced in America than a year ago, the foreign demand for copper has constantly increased. The methods of mining and treating copper ores are being simplified each year, making it possible to produce copper under giveu conditions at a lower cost than ever before. On the whole, the outlook for the copper mining industry for 1904 is encouraging, and a price at least cqual to that prevailing throughout the greater part of 1903 may be anticipated.

Relation of Placer to Quartz Veins.

In many regions producing placer gold there is noticed a marked discrepancy between the production of the placer deposits and that of the veins. In some districts this difference is more noticeable than in others. It is usually found that a relatively greater placer output than seems justified by the veins of the district is due to the character of the veins or other deposits in situ carrying gold. A series of interesting articles on the occurreuce of gold in the placers as related to vein deposits in New Zealand has been published elsewhere herein, the last chapter appearing in the current issue. From a study of the conditions in that region it would seem that the placer gold obtained is far in excess of what might have been anticipated from the occurrence of gold in veins.

In some portions of California placer gold has been mined in large amount where as far as known there are no gold bearing veins of sufficient importance tributary to the district to have afforded a tenth part of the gold found in the placer deposits. This is notably the case on the Forest Hill divide in Placer county, where a number of large and rich ancieut channels have been worked for years, making an aggregate production of many millions of dollars, while a few hundred thousand would cover all that has been mined from quartz in the same region. It is generally believed that the gold was largely derived from pockets and small rich seams of gold occurring in the foliations of the schistose and slaty country rock, and that in that region defined gold bearing veins of great coutinuity are of relatively uncommon occurrence, though there are several veins known which are being worked. In the southern Black Hills of South Dakota is an extensive placer field in which are numerous large quartz veins bearing gold. In addition to this, gold is also found in the chlorite schists accompanying the quartz veins, as at the old Queen Bee, and on Wheeler hill, near Lookout Mills on Castle creek; near Rochford, and elsewhere. While this region has produced a large amount of placer gold, there are local occurrences of gold in small gulches, where no direct connection can be traced between the placer gold and a gold bearing vein.

The occurrence of washed pebbles of iron rock, flint and other hard rocks with this gold, indicates that the gold may have been derived from some other than a local source, as the rocks constituting the bedrock of the placers contains no iron ore similar to that found in the placers and no flint nodules, both of these having undoubtedly been derived from the limestone, the uearest occurrence of which is several miles distant, although at one time, prior to the uplift of the Hills and before the great denudation had removed the sedimentary strata, the limestone, with the accompanyiug beds, extended over this entire region. Still there appears to be no doubt that the placer gold of the Castle creek region came originally from the Algonkian schists and included quartz veins, and the occurrence of foreign washed pebbles is merely coincident.

In Arizona, a few miles south of Prescott, placer gold has been found the source of which is in doubt, but in one instauce, that of English gulch, 3 miles south of Prescott, the gold was no doubt derived from iron seams in the porphyry which crosses near the head of the gulch. There are numerous instances of nuggets of gold being found in various parts of Arizona, where typical quartz veins are wanting, but in almost every case the gold has come from seams in massive rocks, usually quartz porphyry, or some other acid eruptive rock.

In some regions the formation is reticulated with small veins and veinlets of quartz carrying gold, and a rich placer field has resulted; but on following the seams and veins downward the gold gradually disappears, and the zone being too poor to pay is not developed further, though the values may reoccur in greater depth. In a district of this kind the output from vein mines is likely to fall far below that of the alluvial deposits. On the other hand, large gold-bearing deposits are known which produce little or no placer gold at all. Among the ore deposits of this class are the gold-bearing telluride ores of Lawrence county, South Dakota. In Western Australia, in Colorado and in California the districts noted as producers of rich telluride ores are also producers of rich placers in which the gold undoubtedly was derived from the telluride-bearing gold ores.

Security in Mining Investment.

The year 1903 has taught some wholesome lessons to the people of the United States. Never before in its history has there been a year similar to that of 1903. Prominent industrial stocks depreciated from 50% to 100%, and still the real prosperity of the country continued. Those concerns which were floated at greatly inflated valuation depreciated to a point somewhere near their normal value, and although the investing class lost heavily as a result of buying stocks, promising returns so large in many cases as to give rise to a suspiciou that the investment was unsound, still the great industries of the country which were founded on a conservative and busiuess-like basis, continued to prosper. With all of the euormous shrinkage in stock values, it is noticeable that there have been comparatively few failures among large firms doing business on conservative lines. It has been the middle class that has lost heavily. It was their money that helped to boom such concerns as United States Steel and the United States Shipbuilding Co.—these being two notable examples of that class of so-called securities. As a natural result of this collapse of inflated industrials, investors who are not contented with a small percentage on their money, are looking toward the mining industry as furnishing the most promising field for legitimate investment. Engineering and science have taken mining out of the realm of the speculative and placed it where it properly belongs—in the class with the best investments which the development of America affords.

Lodes Within Placers.

The Federal statute coucerning veins within placer claims is generally well understood, bnt Congressman Dixou proposes to remedy what he evidently considers a defect in the existing statute by introducing a bill providing that United States mineral surveyors when snrveying a placer location for pateut shall make an examination and report whether or not a lode or veiu exists within the boundaries of the location seeking patent. A placer is presumed to be a deposit of gravel or other debris containing gold or other valuable mineral. Ordinarily this deposit is several feet deep and often many feet in depth from surface to bedrock. What may exist beneath this mass of debris, in the form of a vein, no one can determiue until the debris be removed and the bedrock exposed. Such being the case, it is difficult to understand how the United States deputy mineral surveyor is going to arrive at a satisfactory determination of the problem—vcin or no veiu. Unless the law can be bettered by amendment, it were better to leave it as it is. If the placer claimant knows of the existence of a vein within his location, it is reasonable to presume that he will claim it as well as the placer.

THE Colorado Mine Operators' Association has perfected its orgauization, with a view of making it of permanent benefit in the development and operation of Colorado's mineral resources. It is said to be the inteution of the Association to annually appropriate $30,000, to be raised by apportionment pro rata of output among the mines represented in the organization. The objects of the assessment are stated to be to enable the Association to prosecute ore thieves; to maintain peaceful and prosperous relatious between employers and employes; to secure, as far as possible, the election of the proper men to important public offices, and bring about legislatiou beneficial to the mining industry in that State.

THE discovery of a rich mass of gold ore in a mine on Ironclad Hill in Cripple Creek district, Colorado, has stimulated mine development iu that camp. It also clearly shows that there are still many good opportunities there, eveu in the upper portions of the ore zones. It is true the future of the district depeuds, to a great extent, upon deep mining, and in this direction the mines are meeting with most encouraging results, but the rich strike referred to indicates that the upper portions of the veius should not be ueglected until thoroughly explored.

CONCENTRATES.

MICA sheets 6 to 10 inches square, "clear and perfect," are worth from $3 to $10 per pound.

✣✣✣✣

THE rock specimen from Marin county, Cal., is glaucophane schist. Glaucophane is a blue variety of hornblende, and is of common occurrence in the Coast Range of California.

✣✣✣✣

THE mineral specimens from Gilpin, Colo., one of which was marked "No. 1," are crystalline-granular quartz with epidote. There is no material difference in the several pieces, excepting that one of them contains considerable iron oxide.

✣✣✣✣

THE mineral specimen from Ashwood, Or., is stibnite (sulphide of antimony) in a quartz gangue. There is also a small amount of iron sulphide (pyrite) in the quartz. The stibnite is characteristic, showing a distinct radiated structure.

✣✣✣✣

A SMALL MINE with free water power should be worked very cheaply. How cheaply, depends upon the management and, to some extent, upon the surrounding conditions. A large vein should be mined at lower cost per ton than a small vein.

✣✣✣✣

THE mineral specimens from Liscum, Arizona, are fine-grained silica, probably an altered rock. The ores are malachite (copper carbonate), chrysocholla (copper silicate), chalcocite (copper glance). Epidote is also present in small quantity.

✣✣✣✣

THE rock specimens from Mokelumne Hill, Cal., are grano-diorite. That marked "hanging wall" is of the normal type, though much decayed. That from the foot wall is evidently a separate intrusion or dike. It is much more siliceous than the hanging wall rock.

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NOVACULITE is a fine-grained siliceous rock used for whetstones. It is supposed to be calcareous ooze, in which the calcite of the original mineral has been replaced by silica. The novaculite of Arkansas is an aggregate of micro-crystalline grains of quartz sand.

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ONE of the largest "inverted syphons" for carrying water across a canyon for mining use was that built in Butte county, Cal., in 1870. It consisted of a wrought iron pipe 30 inches in diameter, 14,000 feet long, and at the lowest point of the line sustained a pressure of 1000 feet.

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A FAULT in a vein sometimes produces a local enrichment of the vein above the plane of the fault. Some cases of this character have been observed where the displacement was scarcely noticeable, being merely a floor which reached across the vein and extended into the walls.

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STEAM being discharged from a boiler at 85 pounds pressure into a tank having 7.5 pounds pressure, 57 pounds of steam would pass per minute through an orifice of 1 square inch. A boiler with grate area 60 square feet; heating surface 1800 square feet; steam pressure 85 pounds per square inch, would require a steam pipe 6¾ inches diameter.

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THE duty of the miners' inch in placer mining depends upon the volume of water used, character of material washed, grade and width of sluices, and in hydraulicking also upon the pressure employed. An average duty is stated to be about 3.6 cubic yards per inch, though at different mines ranging from about 2 yards to over 4.

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DETAILED COSTS of aerial wire ropeways have been frequently given. The one at the Camp Bird mine, Ouray, Colo., is 2 miles long. It carries about 300 tons per day at a total cost, including maintenance, of 20 cents per ton. It has a daily capacity of 450 tons, and if run to its limit the cost would be about 12 cents per ton of material carried.

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POWDERED CRYOLITE is used at the United States Mint to make thick, pasty slags more liquid. Its chief use is in melting the screenings and pot-scrapings where boneash is likely to be present, probably forming a fluoride with the phospborus in the boneash. It is claimed that cryolite is also useful in making siliceous slags more liquid, forming fluosilicates.

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ALMOST every mine contains more or less ore too low grade to pay the expenses of mining and milling, but which would pay to mill were it on the surface. In such cases, if it becomes necessary to break down the ore and to hoist it to the surface, it should be milled: for, while not profitable as a whole, it pays more than the expense of milling and reduces the cost of mining it.

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IN sampling the floor of a level, the only way in which even approximate accuracy may be attained is by cleaning away all loose debris from the ore to be sampled, and cutting good-sized trenches entirely across the ore body or vein. These channels should be not less than 2 feet wide and a foot deep. In a trench of this size each 7 feet of the crosscutting trench will produce about a ton of ore, in ordinary quartz rock, all of which should be taken. The difficulties of sampling the floor of a level or drift are numerous, and are multiplied where it is wet; but by taking large samples, as above suggested, a fair idea of the values present may be obtained. If the rock has to be blasted and flies badly, even larger cuttings should be made.

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THE output of gold of the Saskatchewan region has been small in the past. Possibly the gold commissioner of Canada could furnish data on the subject. The fact that dredgers are operating near Edmonton is indicative of the presence of gold. That country should be a good one in which to prospect for gold gravels on the benches and for quartz near the stream sources.

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WHERE an agent or an administrator fails to do assessment work on an unpatented mining claim, the location becomes subject to relocation, the same as when the principal neglects to conform to the requirements of the mining law. A claim located in 1902, upon which no assessment work was done in 1903, is now subject to relocation, unless the owners have begun work on the claim.

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ALL duties on all grades of coal were rebated during 1903. On Jan. 15, 1904, the duty of 67 cents per ton on bituminous coal was restored. In the first nine months of 1901 1,456,074 tons coal were imported into the United States, paying a 67 cents per ton duty: in the corresponding months of 1902 there were imported 1,533,042 tons; in the first nine months of 1903, with all duties rebated, 2,867,061 tons were imported.

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GOLD dredging in California is mostly confined to the Sacramento valley field, situated at an elevation only a few feet above sea level, but in San Bernardino county, at Holcomb valley, a steam shovel was employed some years ago to work a dry placer deposit at an altitude of 7500 feet. The quantity of water obtainable for washing the gravel curtailed the extent of operations there. Dredgers are also operated at Breckenridge, Colo., at an altitude of 9500 feet.

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REPLYING to a query from Socorro, N. M.: The deposit on the zinc, thought to be gold, is probably not gold, but bright metallic copper, having the color and luster of gold. The company referred to still receive royalty for the use of the zinc precipitation box patented by them. The several hooks on cyanide process are all compilations and contain essentially nearly the same material. Those of Bosqui, Parks, James and Eisler are about equally good. The latest hook is that of Carleton on the practice in Western Australia.

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REPLYING to a query in re—a mill site on a placer claim: It might depend somewhat on the nature of the deed executed by A to B. At all events, under the circumstances stated, the court will doubtless find some satisfactory method of preventing A from acquiring B's mill built upon land purchased from A, even if it be driven to the necessity of finding as a matter of fact that the land was sufficiently non-mineral to justify the location as a mill site. Moral equities frequently outweigh technical points in adjudicating lawsuits.

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THERE is often a slight difference between the nominal and actual inside diameter in inches in the dimensions of standard wrought iron and steel pipe. Where the nominal inside diameter would be ¼ inch the actual inside diameter would be .27 inch. The actual outside diameter of that size would be .68 inch, and the weight per foot .24 pound. In the case of pipe with nominal inside diameter of 1 inch the actual inside diameter would be 1.048 inch, the actual outside diameter 1.315 inch; thickness, .134 inch; weight per foot, 1.67 pounds.

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THE amount of evaporation in the open air is difficult of determination, depending on many and frequently changing factors. Among these the most important are humidity of the atmosphere, velocity of the wind and heat of the sun. Evaporation proceeds much more rapidly in the dry desert regions than in humid regions. The amount of evaporation varies greatly in the same district at different seasons of the year, and also in different years. The average amount of daily evaporation for the entire United States has been stated to be 0.4 inch per twenty-four hours, or 146 inches annually, but the range is far greater than this as between a humid region and a dry one.

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IN the concentration of ores it is inadvisable to return a middlings product to the same machine over which it has once passed, for the reason that if a complete separation was not effected on the first passage it is not likely to be effected on a second or a third. This process will result in the accumulation of a middle product which goes neither into the tailings nor to concentrates, but continues in circulation with a constant addition of like material from the headings, until the machine is overloaded, and inferior work is the result. The fact that a middle product occurs at all is sufficient proof of the necessity of sizing and classification before attempting concentration on any machine.

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A JIG consists practically of a screen or sieve set in a box and immersed in water. The sieve is given a rapid up and down short motion and the particles of mineral of high specific gravity settle through the lighter material to the screen. There are many types of jigs. The plunger jig differs from that above described. In the latter the screen is stationary, and a plunger or piston is placed in a compartment adjoining that in which the screen is fixed. The rapid rise and fall of the plunger imparts a pulsating movement of the water which causes a separation of the heavy and light particles in the screen box, in a manner similar to that previously described. Jigs generally treat a coarser ore than is treated on other classes of concentrating machines.

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A SECURE and water-tight dam can be made in a mine, in a drift or crosscut, by selecting a place where there is a rock projection, or a channel can be cut in the rocks, to give the dam a secure foundation. Planks should then be set on edge to the height of the dam. A second line of plank should then be placed from 15 to 20 inches from the first, held in position by a post set on either side of the drift and on the farther side of the dam. If the dam is only temporary, the space between the walls should be filled with clay. If for permanent use, concrete may be substituted for clay. During construction a pipe may be laid in the dam extending through to the inside, and provided on the outside with a valve to control the flow of water. A disused crosscut or drift may be utilized in this way as a tank or reservoir to catch up and hold the mine water that may be conducted to it. The water may be pumped from this tank or sent out in skips at any time when it becomes convenient, and the expense of cutting a tank below a level is obviated.

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IN the determination of minerals, the hardness is always one of the first things consulted. The relative hardness of minerals is as follows, and is used for comparison: Talc 1, gypsum or halite (crystals of salt) 2, calcite 3, fluorite 4, apatite (crystallized) 5, feldspar (adularia) 6, quartz 7, topaz 8, corundum 9, diamond 10. Color, streak (color of powdered mineral); crystalline form, gravity and fusibility are other physical characteristics. There are three grades of fusibility: Those minerals which fuse to a bead, those which fuse only on the edges and those which are infusible. Several minerals are recognized as characteristic of fusibility: 1. Stibnite (antimony sulphide), fusible in flame of a candle in coarse splinters. 2. Natrolite (a silicate of alumina), fusible in candle flame in fine splinters, before the blowpipe easily fused in coarse fragments. 3. Almandite (iron alumina garnet), infusible in candle flame, easily fusible before blowpipe. 4. Actinolite, less easily fusible than almandite, but fusible in coarse splinters. 5. Orthoclase, fusible in fine splinters. 6. Very difficultly fusible; only rounded on the edges in very fine splinters.

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SOME ROCKS appear to swell upon becoming decayed by meteoric agencies. In some grano-diorite this is particularly noticeable, where the rock encloses quartz veins. The veins are found fractured from wall to wall at regular intervals, the distance depending apparently on the width of the vein. The floors occur at a greater distance apart in large than in small veins. These floors separate the vein into blocks which have been drawn apart, apparently, by the swelling of the enclosing rock, which has lifted the blocks by a stretching process. Still, the country rock does not appear to encroach upon the spaces between the blocks, for the spaces are usually more or less completely filled with clay-like mineral and quartz sand, and where the vein is gold bearing, this clay and sand is found to be gold bearing also, and generally to a greater extent than the vein quartz itself. When in depth, the granite or grano-diorite is found unaltered, these floors may still be found, but the vein is not divided into separate blocks, as nearer the surface. Many quartz veins are found fractured transversely from wall to wall at right angles to the dip, and this has in some instances led to the mistaken belief in some large veins, prior to their development, that the vein dipped in a direction opposite to that which it really had. This is a structural feature of no economic importance.

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SOME stamp mills have a series of mercury traps in the line of plates. These traps are arranged to extend entirely across the plates, and consist of a slot 3 inches wide. In the center of this slot is placed an inch board which also extends entirely across the width of the plate. The lower section of the plate at each trap is placed at least 2 inches lower than the section immediately above it. The pulp passing over the plate next the mortar falls into the first slot or trap, and flows beneath the center board rising on the opposite side and flows over the second section of plate, at the lower end of which is arranged a second similar trap. In addition to this the plates are sometimes arranged in a series of low steps with a fall of ½ to ¾ inch. This, some mill men believe, facilitates amalgamation. A low drop with some ores is undoubtedly beneficial, but if too high a drop be given the plate will be scoured by the falling sand and water. It is good to run the head of the plate table as nearly normal as possible or a trifle "dry," the central section "wet" and the lower end dry. The theory upon which this practice is based is that a normal plate (one in the best possible condition) is supposed to catch a large percentage of the free gold present. The middle section is run wet to catch any particles of gold or amalgam that may be scoured or in any other way escape from the upper section, while the dry lower portion will catch any globules of quicksilver that may be carried down from the soft middle section. The traps above described are put in as a precautionary measure.

Mining Progress in Alaska.

Written for the MINING AND SCIENTIFIC PRESS.

The goldfields of Alaska are as yet comparativcly little kuown. The Seward peninsula, which embraces the extreme northwestern portiou of Alaska, herctofore known as Nome, is bnt little developed outside of the immediate vicinity of the Nome and Council districts, which are about 75 miles apart. The introductiou of capital and enterprise duriug the last two years has resnlted in the building of railroads, construction of water ditches and the introduction of the latest and most improved hydraulic mining machinery. Every available water snpply within the above-named districts has been appropriated and the work of constructing ditches has made rapid strides. Among the first to nndertake the making of extensive ditches was the Miocene Ditch Co. of San Francisco, Cal. This company began the constructiou of their ditch in 1901, but the system was not completed until midsummer of 1903. This water system takes its main supply from Nome river and the tributaries along the lines of the ditch. The main ditch is 30 milcs long, with branches which aggregate over 40 miles of ditch, the capacity beiug 3000 inches. This supply of water covers a district embracing Dexter, Anvil, Glacier and Dry creeks and their tributaries. A great part of the gravel deposits covered by the Miocene Ditch Co., in fact, most of the entire district, lies low and flat, requiring hydraulic elevators to successfully work them. In order to demonstrate the efficiency of the hydraulic elcvator, the Miocene Ditch Co. installed four of these plants during last season on Glacier and Anvil creeks and operated them successfully.

Hydraulic Elevator Lifting Gravel 45 Feet From Pit; Raising Upper Sluice to Secure More Dump, Nome, Alaska.

On Ophir creek, in Council district, the Wild Goose Co. began the construction of a large ditch system iu the season of 1903, aud they also installed three elevator plants. The operators of these two companies have demonstrated what operations can be done with hydranlic elevators wherc water is available. Numerous other companies have begun the construction of ditches and will next season put in similar plants. Where water for operating elevators is not available, dredgers are being built and will be used along the rivers and other low-lying deposits. So it is expected that a large increase in the yield of gold from the Nome aud Council districts will result in the near future.

In the Kugarok, Iumuchuk, Kobuk and other outlying districts little has been doue except what the single-handed prospector has done, which has proven that extensive areas of gold-beariug country only await the coming of capital and railroads to open them up and make them large gold producers. On the Arctic side of the Seward peninsula lies an extensive system of crecks known to contain gold, but as yet very little is known of their richness.

The elevators operated by the Miocene Ditch Co. on Anvil and Glacier creeks during the season of 1903 worked under different conditions, iu some cases elevatiug the material a vertical height of 48 feet and discharging over 1000 cubic yards of gravel in twenty-four hours. This was accomplished with 400 inches of water. The situation and method of working these elevators are shown iu the engravings.

The fact that gold-bearing gravels can be thus successfully operated in a region uutil recently supposed to be perpctually icc-bound is interestiug to miuers, particularly to those eugaged in similar mining elsewhere.

Gaseous Fuels for Power and Heating.

Written for the MINING AND SCIENTIFIC PRESS by H. SHERWOOD, C. E.

This paper is iutended as a digest of recent knowledge of the use and production of gaseous fuels, viz: The natural carbonaceons fuels converted by generators into gaseous form, and employed to obtain motive power through their explosion and expansion in gas engines, or as fuel in industries where high heat is required to act upon metals, minerals, etc.

All admit the importance to industrial works of an economical source of motive power. Whatever cheapens it, goes far toward allowing many operatious to be profitably conducted, and even allowing dividends to be paid on capital. Motive power is so largely needed in such works as orc mills, electric smelting, electrolytic refining, metal working, etc., as to be a primary cousideration in establishing the works. For example, stamp mills for gold ores: In most of these wcst of the Rocky mountains, the average mill, with its accompanyiug ueeds for power, requires not far from 1 H. P. for each ton of ore treated in the 24 hours. Taking 100 tous, the cost of power by steam pcr horse per 24 hours in inland districts caunot be assured to average less thau 16 cents per horse power per 24 hours. Suppose the possibility of reducing this by 50%—the economy reaches an annual sum equal to a dividend of over 7% on $40,000 capital. Take electrolytic refiniug as a further example—needing 30 H. P. per ton by cupric salts. In an output of ten tons a day, taking motivc power at 14 cents a horse powcr for 24 hours, the economy of 50% would enable an anuual dividend of 6½% on $120,000. No other illustration of the importance of the subject is needed, nor of the help to large industrics if the supposed economy can in practice be assnred, even in cases where large motive powers are used, to justify a change from existing practice to the more economical system, seeing that the change would be more thau recouped during the first twelve months.

We know that the power possible from heat by combustion of fuel in forming steam is not yet able to be sufficiently utilized; heat cannot rapidly enough pass through boiler plates to water within. Steam is, therefore, a partially effective agent of power. The hot air engine on Ericson's type involves insnfferable cost of engines in proportion to their power. The gas engine is a hot air engine and for large powers seems to be at present the only satisfactory meaus of employing heated gases. Considcring that the explosion of combustible gases iu an enginc cylinder may reach a heat of 1700° C., which gives an expansive power to air, and most gases, of about seveu atmospheres—close upon $\frac{1}{100}$ pressure per square inch—(expansive power being about $\frac{1}{2\frac{1}{3}}$ of volume for each degree Centigrade of heat attained) heated air justifies the assigning to it of a uew phase of usefulness which cannot be wisely neglected, seeing that water gas is so convenient a source of heat. And, thc improvemcnts which are coutinually growiug upou an already satisfactory agent in the form of easily obtaining gases of higher heating power up to 2700° C., and of engines adaptcd to make the most of the resnlting power, add to the value of these gaseous fuels, and their iucreasing importance now and iu future years.

Comparison of economy of motive power is limited to steam, gaseous fnel and electric cnrrent got by use of large water powers. To compare requires to see how mnch of gaseous fuel is cousumed to produce power, and at what prices they can be produced from various natural fuels.

Water gas is the result of a train of reactions effected by heat whereby the carbon of the natural fuel is made gaseous, combustible carbon mouoxide, throngh the carbon combining with the oxygen of watcr setting free its hydrogen. This pure water gas contains as much as half its volume of hydrogen, which gives out on combustion with oxygen the highest heat of any gaseous combustion. Water gas is therefore an artificial store of caloric, which, being thus concentratcd, cau be given out at any point or moment where intense heat is needed. This property is heightened by the fact of the carbou being monoxidc, as the water gas needs for explosion with air much less cold air thau does gas distilled from coal—the former needing 2½ to 3 parts of air for explosion in place of 5 to 8 parts of air for the latter. This allows the full effect of the heat of explosiou without waste.

The first gaseous fucl thus employed was uot water gas, but what was known as "producer" gas, which

Elevator at Specimen Beach, Anvil Creek, Nome District, Alaska.

is a carbon monoxide with the nitrogen contained in the air which burned the carbon to monoxide. This gaseous fuel is becoming largely employed as a source of power in iron smelting works, being a product of smelting. Gas engines of large cylinder are being run by these gases, formerly wasted into the air—as much as 700 H. P. being run by one iron working establishment. The report from them is that 200 H. P. engines are being run along steadily year after year with little or no stoppage, insuring a very large economy.

For smaller powers a richer gas than this is needed to insure complete quick explosion. There was, therefore, brought into use the same gas mixed with pure water gas, both gases being produced simultaneously in the same generator. This is the Dawson "poor" water gas of England and the Lencanchez gas of France. The former is employed in most of the Otto gas engines and the latter in most of the Simplex engines. Both are very effective and regular in action and extremely economical. In addition to the constituents of pure water gas, these working gases are half their volume inert nitrogen. They therefore require but 1½ to 1¾ volumes of air for their explosion in place of double that amount for pure water gas, or quadruple or sextuple that amount for rich gases. The inert gas in this poor water gas being half the volume, the smaller amount of nitrogen required to be added with the oxygen of the air, makes the total inert gas in the volume compressed in the gas engine to be about 5 as compared with 4 in pure water gas. This "poor" gas requires about one-fourth more consumed to give out the same power. The increase in volume allows of stronger compression in the cylinder before explosion, which is advantageous in expansion when heated. The volume of this gas from the same fuel being double that made into pure water gas, economy is decidedly found in the gas. It has become the standard gas in use for power—running probably 90% of all the engines in use, except the small engines in cities, which, for convenience, use gas from the city gas mains. Recent improvements in making water gas aim at substituting hydrogen for inert nitrogen in the gas, thus obtaining higher heating power from the same original fuel. These efforts have found much success, which will be noticed in discussing the various fuels, but no improvements have lessened the carbonic oxide by bringing hydrogen into union with carbon in place of oxygen with carbon, a most desirable and almost impossible problem.

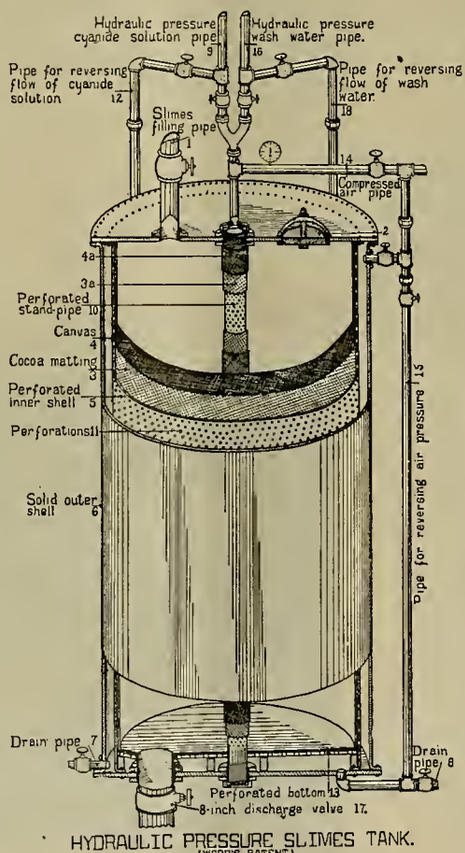
A primary consideration of cost of power needs its present cost by steam boiler and engine to be shown. In very large powers—say 800 H. P. and upwards—the splendid Corliss compound engines, fed by the most economical steam boilers, leave little to be hoped for in further economy of steam. Some of these are producing power by an expenditure of 1.2 pound of best steam coal per indicated horse power per hour—a generation ago considered impossible. It is not with these we have to deal for comparison with gas engines for popular needs. The quality of fuel used for these engines is debarred by costs and freight for use inland on the Pacific slope. Most engines there produce power by an expenditure of 2 to 2.5 pounds of fair coal per horse power per hour. In inland mills even this is debarred by freighting distance. Air-dried pine wood is employed in its place. Of this, 2½ tons equal in steam producing 1 ton of fair coal. The ordinary cost of such wood at the mills is about $4.50 per cord, weighing 1¾ ton. This makes a cost of 16 cents per horse power per 24 hours for fuel. Petroleum has been used for some time past in place of wood. By the consensus of users' experience 3½ barrels, or about ½ ton, produces steam equal to 1 ton of fair coal—being a value of $5.85 for petroleum against $7 for coal. These prices are high through rates of freighting. The cost of petroleum for steam is also about 16 cents per horse power per hour. It must here be borne in mind that the use of petroleum is conducted with steam sufficient to literally convert it into water gas at the time of its combustion. Thus nothing is lost in smoke nor in distilling hydrocarbons. We may, therefore, take 16 cents per horse power per 24 hours as the cost of fuel in producing steam in inland California, with a similar average elsewhere on the Pacific slope, and with this we may compare the cost of power by gas. A second calculation is of importance, viz: the relation between the use of gaseous fuel employed under a steam boiler to produce power by steam and the same gaseous fuel used to produce power in a gas engine. This comparison has rarely been made. It was made conclusively by the Westinghouse Engineering Co., of Pittsburg, Pa. In this test it was found that there was required 52 cubic feet of the rich gas employed to produce each horse power by steam generated by it under a good multitubular boiler during 1 hour. The same amount of power was obtained from 18 cubic feet of the same gas exploded within the cylinder of a gas engine—a ratio of 1 to 3. Recently a similar test was made in North London, with the result that the power obtained by the gas engine was equal to that obtained by 2½ times the amount of the same gas employed in generating steam.

At first water gas was produced from coke or anthracite. In Europe these fuels have generally to be freighted long distances, and therefore many improvements have adapted the generators to local fuels—lignites, low-class bituminous coal, wood, peat, astitki (i. e., refuse from distilling petroleum), shales, etc. All these contain hydrocarbon gases, with tarry matter, oils, resins, etc., which all need converting into fixed gases, and recent improvements accomplish this effectively. Other improvements effect the production of a much larger quantity of pure water gas than before from the same expenditure of fuel and time, whilst others are fitted to act on petroleum and petroleum waste and on heavy shale oils. Every engineer will notice at first glance that in every case the constituents of the fuels are different from those formerly employed; and, therefore, bringing into play further reactions. In some of these fuels hydrocarbons form a large percentage. This is in favor of forming a water gas rich in caloric. Either the hydrocarbon becomes fixed gas, as such, or else the H is set free by the C uniting with the O of the water to form CO, setting the H of the water free. In either case the water gas becomes richer by the addition of H and C, and this without adding U. This last reaction is plainly what takes place with petroleum and its waste and heavy shale oils. When petroleum was first shown in San Francisco, Cal., as burning with steam (in about 1875 in Messrs. Garratt's brass foundry by Dr. Ireland, then of Watsonville, and in London by Professor Rankin, before the United Service Institution), it was declared impossible to use so intense a heat under a steam boiler. Now, no fuel furnishes steam so well, and it constitutes a water gas containing over 60% hydrogen—of immense value to the metal smelter as a reducing gas. The volatile hydrocarbons of the fuels quoted above, when used in the improved water gas generators, are conducted through the incandescent carbon to be converted into fixed gases along with the vapor of water—the carbonized or charred fuel continuously reinforcing the incandescent carbon as it wastes, but in some cases, notably in employing wood as fuel, there is found in water gas considerable hydrocarbons in the form of marsh gas and methane. It may be due to a lowered temperature of the carbon. In every case the water gas is richer in hydrogen, which is the object desired.

(TO BE CONTINUED.)

Hydraulic Cyanide Tank.

Herewith is illustrated a hydraulic cyanide tank, designed by the Hydraulic Cyanide Tank Co., 306 Boston building, Denver, Colo., as a method of extracting the values held in the slimes by forcing the cyanide solution and wash water through them by



HYDRAULIC PRESSURE SLIMES TANK.
(WEBB'S PATENT)

hydraulic pressure and without packing them into an impervious mass.

Mr. Jean F. Webb, the president of the company, says that this tank can be used in dry crushing mills where the dust or slimes are collected by sizing screens or baghouses; in wet crushing mills where the ore is amalgamated and concentrated and the tailings and slimes treated by cyanide; and that it is valuable in cyanide mills where is adopted the practice of wet crushing with stamps, using the cyanide solution as battery water and separating the sands from the slimes before treatment.

The accompanying engraving is a front view of the tank, showing the construction of both the outer and inner shells (parts of which are broken away), and the perforated central pressure standpipe, connected with which are the hydraulic pressure pipes for the cyanide solution and the wash water, as well as the pipe for the compressed air; the arrangement of pipes and valves for reversing the flow of solution, wash water and compressed air from the central pressure standpipe into the annular space; the arrangement of the filters on sides, bottom and central pressure standpipe; the bottom discharge valve, etc., every part being numbered in accordance with the following description of its use in wet crushing cyanide mills where the solution is used as battery water, viz.: The slimes are run into the drainage and leaching tank through the filling pipe No. 1; the liquid contained in them drains out through the filtering materials No. 3 and No. 4 and the perforated inner shell No. 5, and is caught and held in the annular space between the inner shell No. 5 and the solid outside shell No. 6, from whence it runs out through the drainage pipes No. 7 and No. 8, and is conducted through the precipitation boxes.

Filters No. 3 and No. 4 are designed to prevent the slimes from running through with the solution, it being intended that they gradually settle on the bottom of the tank and accumulate until there is a sufficient amount for treatment, the supply then to be cut off by closing the valve in the filling pipe No. 1. The manhole No. 2 is then closed, the valve in the solution pipe No. 9 is opened, and fresh cyanide solution is admitted into the central pressure standpipe No. 10, which is surrounded by the filtering materials No. 3a and No. 4a. The hydraulic pressure of the column of cyanide solution is designed to force it continuously through the pulp and out through the filtering materials No. 3 and No. 4 and the perforations No. 11 of the inner shell No. 5, to drain into the annular space between the outer solid shell No. 6 and the perforated inner shell No. 5, thence to be carried off through drainage pipes No. 7 and No. 8, passing through the precipitation boxes into a sump, there to be standardized and pumped to the top of the solution column again, this operation to be continued until the values are all dissolved, when the supply of solution is to be cut off.

"If," say the manufacturers, "during the leaching process the pressure radiating outwardly from the central standpipe No. 10 should pack the pulp on the side filters and interfere with the drainage, the flow of the solution can be reversed by conducting it through the branch pipe No. 12 into the annular space between the two walls, thus forcing it inwardly through perforations No. 11 and filters No. 3 and No. 4, freeing and cleansing them, and draining off through the perforated bottom No. 13 and the drainage pipe No. 8. This cleansing may be supplemented by introducing compressed air into the annular space through the air-reversing pipe No. 15, which will thoroughly open the pores of the filters. Should the filters on the perforated bottom No. 13 become clogged, the solution can be introduced between the solid and perforated bottoms through the lower portion of the pipe No. 12, so that it will rise upwardly through the perforations and filters, freeing and cleansing them, and drain off through the side filters and out through the drainage pipe No. 7; and this may also be supplemented by introducing compressed air under the perforated bottom No. 13 through the lower portion of the air-reversing pipe No. 15."

When the leaching is completed, compressed air is admitted into the pressure standpipe No. 10 through the air pipe No. 14, the intent being to compress the pulp and squeeze out the gold solution held therein, this pressure of the compressed air to be alternately reversed through the pipe No. 15 until the pulp is as dry as desired. Wash water is then admitted into the pressure standpipe No. 10 by opening the valve in the hydraulic water column No. 16, and, forced by its own pressure through the leached mass to wash out the remaining values, is caught in the annular space and discharged through the drainage pipes No. 7 and No. 8.

After being thus washed, the leached and worthless pulp is designed to be discharged from the tank by opening the bottom discharge valve No. 17 and turning on the pressure of the water column No. 16, alternating the flow of water through the pressure standpipe No. 10 and the reversing water pipe No. 18 until the tank is empty and the filters clean.

TURQUOISE has been discovered in a new and hitherto unsuspected region, says the American Jeweler, in the middle-eastern part of Alabama, at several points near Idaho, Clay county, about 95 miles due east of Birmingham, in the region of the Talledega mountains. Some copper mines were previously located in this vicinity. The turquoise seems to be of two distinct varieties—one yellowish-green, occurring in veins from ⅛ to ¾ inch in thickness, and resembling the New Mexican material, which frequently improves in color at a greater depth; the other is a bluish variety penetrating a gray matrix in all directions in seams spreading out from ⅛ inch thick to the thinness of paper. The color, however, is more blue and the occurrence more distinctly resembles that of

the Persian mineral. One of the localities has been mined somewhat. The mine was discovered accidentally by the finding of a piece of turquoise on the surface. Then an opening was made and a considerable quantity was obtained, but no regular mining has yet been done.

Development and Operation of a Mine.

NUMBER IV.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

There are many mines in operation where the management employs a clerical staff in the office to keep the records of the mine's operation, and each month this staff, comprising one or more men, makes out the pay roll, records all supplies received and charges the various departments with the materials consumed, crediting "stock," etc. A cost sheet is made up from these books, together with tags handed in by the heads of the various departments. This cost sheet is more or less elaborate, according as the manager desires to keep advised of the detail of work under his direction. In some instances the deductions and refined division of costs are little better than a guess, made on averages, and are not as accurate as the number of decimal places carried out would seem to indicate.

A system of cost keeping is valuable, and should be adopted at every mine, large or small; but to render such sheets as accurate as possible, the several departments of the mine must keep separate sheets, which in themselves form a daily record of work, the results accomplished and the expense entailed. No department of mining work is more interesting nor more worthy of careful attention than that of shaft sinking. The accompanying tabulated chart of work performed at a mine will illustrate the idea. It is assumed that a three-compartment vertical shaft is being sunk, two machine drills being in use. The record is for a single month, of which the operations of the first three days and the last day of the month are recorded. The situation is ideal and the figures given represent what may be assumed to be an average condition. There is comparatively little water to handle, and fair progress is made by a small crew in a shaft of moderate dimensions in fairly hard rock. The sheet does not deal with costs; these items, comprising cost of supplies and materials used, and cost of labor, including its apportioned expense of hoisting, etc., are worked out in the office from tags supplied daily or weekly by the foremen or superintendent. The working sheet affords an excellent check for the use of the superintendent, who can not always be present, he trusting in his foremen to faithfully report the progress of work in its detail from shift to shift. A daily or semi-daily visit of the superintendent should be sufficient to keep him thoroughly posted as to conditions and the progress of work. It serves as a check against any irregularity, and any unusual occurrence is noted on the sheet. It also serves a useful purpose in keeping a record of missed holes and their cause as nearly as can be ascertained. A sort of friendly competition also results between the several shifts, and the outcome is a better average of work. This may be further increased by a system of premiums for work accomplished over a maximun result required. After a record has been established, it acts as a constant check upon the men themselves, for they can not lag without the tell-tale sheet making the fact known to the superintendent, who is likely to investigate the cause of the falling off in results. A study of the sheet may show where, under other conditions, further columns may be added to advantage, as, for instance, if sinking on a vein, the size of the vein can be recorded each day, or every 5 feet. The tonnage of ore hoisted is also recorded, and its net value is credited to the cost of shaft sinking.

RECORD OF SHAFT SINKING AT NO. 1 SHAFT OF SKY LINE MINE, JANUARY, 1903.

Day.	Shift.	Time drilling.	Holes drilled.	Feet drilled.	Holes fired.	Time of blasting.	Holes missed and cause.	Time mucking.	Skips rock hoisted.	Skips water hoisted.	Time timbering.	Sticks powder used.	Caps used.	Feet fuse used.	Candles used.	Depth of shaft.	Total feet for month.	Remarks.
1st	1	7:30 A. to 12 M.	8	45	8	12:15 P.	1—Cut off.	12:45 to 3 P.	12	0		40	8	58	6	702		Fired cut holes, 2 machines used; shaft down 702 feet.
	2	5 to 10:30 P.	10	52	10	11 P.	0	3 to 4:30 P.	5	3		50	10	63	6	....		
	3	4:30 to 6:30 A.	6	13	6	6:50 A.	0	11:30 P. to 4 A.	24	4		18	6	36	7	706		Squaring up at end of shift.
2nd	1							7:15 to 8:30 A.	7	4	8:30 A. to 3 P.				7			Finished timbering 3 P. M.; water falling off.
	2	3:30 to 10:30 P.	10	56	8	11 P.	2—1 blown out, 1 can't find.			4		46	8	60	6			
	3							11:25 P. to 1:50 A.	14	3					6			One shot not counted probably went off.
3rd	1	2:25 to 6:40 A.	4	36	7	7 A.	0			3½		43	7	56	6			Fired hole blown out No. 2 shift 2nd inst.
	2							12 M. to 3 P.	17	3½	7:30 to 11:30 A.				8			Last shift broke wall plate; repaired at 11:40 (new plate).
	3	3:25 to 10:30 P.	13	58	13	11 P.	1—Bad fuse.			4		63	13	64	6			8 cut holes; 5 squaring up holes.
.....		.....	....	....	....	.....	.....	.....	....	....	.....	....	....	....	....	....	....	.....
31st	1	7 to 10 A.	6	22	6	10:30 P.	0	11 A. to 2 P.	12	3		18	6	18	6	797		
	2	9:30 to 11 P.	2	12						3	5 to 9 P.				7			
	3	11 P. to 6:20 A.	6	30	8	6:50 P.	0			4		48	8	56	6		15	

The Montezuma Lead Mine.

Shortly after Henry Wickenburg discovered the Vulture mine in Maricopa county, Ariz., many prospectors were attracted to the locality, and among them was one J. Swelling, who discovered an ancient shaft in which there were numerous stone hammers which had evidently been used by the same race of ancient people that inhabited the Salt River valley before the Pima and Maricopa Indians. On account of the danger from the Apache Indians, who then infested that part of the country, no work was done on this property until some ten or twelve years later, when Swelling returned. With the assistance of his partner the ancient shaft was cleaned out and about 10,000 tons of ore was taken out and shipped to reduction works in San Francisco, Cal. At that time it was necessary to haul the ore across the desert to Ehrenburg, on the Colorado river, then on barges it was sent down the river to the Gulf of California, where it was placed on steamers bound for San Francisco. Notwithstanding the high transportation charges the grade of the ore was sufficient to give a handsome return to Swelling and his partner.

In 1880 the mine was purchased by Eastern parties, who shipped some 40,000 tons of ore, hauling it to Maricopa and then shipping by rail from there to Benson, where a silver-lead smelter was in operation. Then the mine was purchased by Frank Ryland, who worked the property until his death in the early nineties. Arizona and St. Louis parties acquired the property when the estate was settled, and they are now preparing to install a concentrating plant and operate it on an extensive scale.

The Montezuma mine is located ¼ mile from the Hassayampa river, and about 3 miles west of Hot Springs Junction on the main line of the Santa Fe, Prescott and Phœnix railroad. The group to which the Montezuma belongs is known as the Black Jack, and the group consists of four claims and two millsites. Through two of the claims runs a fissure vein, which has a dip of 32° to the north. The original workings of the Montezuma consist of an open pit 60 feet in length and 80 feet in depth, extending across the entire breast of the vein, which is 25 feet from wall to wall at this point. The ore is cerussite (lead carbonate) and anglesite (lead sulphate), carrying from 60% to 65% of lead and from 1 ounce to 10 ounces of silver. Some galena is encountered in kidneys in the carbonate and anglesite. Farther west along the vein are three shafts, 30 feet, 80 feet and 105 feet deep, respectively. The accompanying illustration shows the dumps of the shafts.

The formation is similar to that at the Vulture mine, a schist which is found throughout the entire Vulture district, and in which are found all of the gold and silver-lead veins of that district.

Within a short time this property will again become a silver-lead producer. There are but few lead producing properties at present in the Territory, and there are fewer still known that are near railroads. Maricopa county is one of the coming lead-producing counties of the Territory.

Montezuma Lead Mine, Vulture District, Arizona.

Hand Sorting vs. Milling.

The Arlington mine at Erie, B. C., is an irregular vein in a slate formation. The vein has a slight dip to the west, and sometimes lies conformably with the slates and sometimes cutting across them, says the Canadian Mining Review. The slate formation is much broken and contorted, and there are layers of porphyry sometimes following the bedding of the slates and sometimes cutting across them at various angles and with different strikes. The ore consists of mixed sulphides of iron, lead and zinc, and the gold values vary greatly. Sometimes values as high as nineteen ounces gold per ton in the mine car samples occur where the ore contains a larger proportion of zinc sulphides. The vein varies from a few inches to as much as 25 inches in thickness, but the sulphides are always in separate and distinct layers or bunches free from the surrounding vein matter, and the remaining vein matter contains practically no value. This fact of the ore being separate from the vein matter has an important effect on the question of hand sorting or milling, as also the fact that

concentration only increases the value of the ore about 10%—that is, the clean ore shipped averaged $49.35 per ton, while the concentrates averaged $54.66 (assay value).

During the fifteen months from March, 1901, to May, 1902, a concentrator and tramway were built and the mine was worked as a concentrating proposition, the whole width of the vein being broken in the stopes and put through the concentrator, a portion of the clean ore being sorted by hand and sent direct to the smelter.

From September, 1901, to May, 1902, when the mill was running steadily and doing the best work, the results were as follows:

Tons milled		8,630.5
Concentrates produced		1,183
Gross assay value of ore milled	Gold	$94,504 00
	Silver	7,767.45
Gross smelter value of concentrates	Gold	54,088 00
	Silver	3,418.05
Percentage of recovery	Gold	57.9
	Silver	44.0
Average value of tailings per ton in gold and silver		5.93
Ratio of ore milled to concentrates produced, 7.3 to 1.		

Leslie Hill took charge of the property on April 1, 1902, and closed down the mill on May 14, as soon as the ore in hand had been milled. The mine at that time was gutted. The former manager and foreman stated that the mine was worked out and could not be operated further without loss. Previous to March, 1901, a large amount of development work had been done and the ore body developed and its limits apparently determined. All this ore body which was developed, and which was much larger than any ore body subsequently found, had been stoped out and the ore gouged out wherever it was sufficiently rich to put through the mill. It was evident that the mill could not be run any longer, and, in fact, it was as hard looking a proposition as one could run up against. An examination convinced Mr. Hill that it was a mistake to attempt to concentrate such ore. Mixed sulphides containing iron, lead and zinc are difficut to concentrate, and, where the values are largely in the lead and zinc, cannot be concentrated without considerable loss, even in the best of mills, whereas in a cheap plant such as the Arlington mill the loss was ruinously high. Concentration did not materially increase the value of the ore, so that there was no great saving in cost of transportation and smelting. The streaks and bunches of ore were defined, separate, and generally free from the vein filling, so that a large amount of waste material was being broken down and put through the mill out of which nothing was gained. The vein was nearly horizontal and very irregular, sometimes forming hollows, so that the cost of mucking was excessive, as the ore had to be moved by hand, and sometimes thrown up as much as 7 or 8 feet with a shovel. The roof being flat and disturbed, the stopes required filling in to make them safe. Taking all these facts into consideration, it was apparent that the proper method of mining this ore was by careful mining and sorting at the face. This plan was adopted and the mine at once paid its way. In fact, the ore which had been left behind as not good enough for the mill uot only paid for extraction, but in addition paid for the development work necessary to open up further ore shoots, and the mine has been worked at a profit ever since. It is sometimes necessary to break down a great width of veiu for a few inches of clean ore, but the vein filling is soft and can be broken down first and then the cleau ore taken out with the gad, or with light shots, and the saviug effected by filling back the stopes, instead of mucking out a large quantity, more than makes up for the expense of sorting.

When the mill was erected the only ore body which could be calculated on was the body already blocked out, and if that would not pay for the mill there was nothing to justify its erection. As a matter of fact, this ore body turned out in stoping much better than was anticipated, and yet the ore extracted and milled did not pay for the erection of the mill and tramway, even though all cost of mining was charged against the clean ore, and nothing against the milled. If the milling ore had simply been thrown on the dump as waste, a large saving would have been effected for the company.

It is not often that a direct comparison can be made between the results of different methods of mining. The following statements will show the results in this case of the two methods, concentrating and hand sorting at the face:

FOR FIFTEEN MONTHS—FROM MARCH 1, 1901, TO MAY 31, 1902.

Ore and concentrates shipped, tons	2,322.7
Net smelter value	$93,804.22
Cost of mining and shipping	83,589.67
Profit over mine cost	$10,214.55

The gross profit equals 10.9% of the net smelter returns Average net smelter value per ton, $40.39. Additional sums expended on capital accounts:

March 1, 1901, to June 1, 1901	$17,737.22	
June 1, 1901, to June 1, 1902	15,462.75	
Gross profit above		$10,214.55
Mess house profit, fifteen months		1,979.50
Net deficit		21,005.80
	$33,199.97	$33,199 85

FOR TWELVE MONTHS—JUNE 1, 1902, TO MAY 31, 1903.

Quantity shipped, tons	1,157.6
Net smelter value	$44,298.78
Total cost of mining and shipping	28,207.20
Profit over mine cost	$16,082.58

Average net smelter value of ore, $38.26 per ton. The gross profit equals 36.3% of the net smelter value. Charged to capital account, nil.

COMPARISON OF COSTS, PER TON.

1901-2.		1902-3.	
Supplies	$ 2.46	Supplies	$ 1.45
Developing and stoping	9 88	Development	3.74
Surface and general expense	3.79	Stoping	8 71
Mucking	3 90	Surface and general expense	2 83
Timbering	1 50	Mucking	3 45
Hauling and shipping	2.60	Timbering	.34
		Hauling and shipping	3 03
Total	$24.13	Total	$23 55
Mill working	9.31		
Tram working	.53		
Assaying	.98		
Stores (for mill, etc.)	.85		
Total	$11.67		
Cost, 1901-2, per ton	35 80		
Cost, 1902-3, per ton	23.55		
Difference	$12.25		

PROFIT AND LOSS.

1901-2.

10.9% of $93,804.22 equals $10,214.67

1902-3.

6.3% of $44,298.78 equals $16,082.58

Estimated profit in 1901–2 if worked on same plan as in 1902–3:

36.3% of $93,804.22 equals	$34,050.93
Actual deficit in 1901–2	21,005.80
Total	$55,056.73

The latter sum is the actual loss to the company through the building of the mill and the adoption of the system of concentration. Of course, the plant is at the mine, but if sold the net sum realized would be very small.

Foundation Bolts for Steam Engines.

Where a light cap stone is used, or where uo stone at all is provided, a type of bolt illustrated in Fig. 1

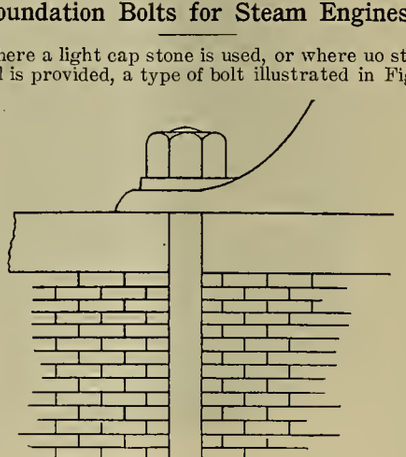


FIG. 1.

is sometimes used, writes W. H. Wakeman in Electricity. It consists of an ordinary bolt, except that it has no head, because it is easier and cheaper to put the end of it into a forge fire, heat it and bend it

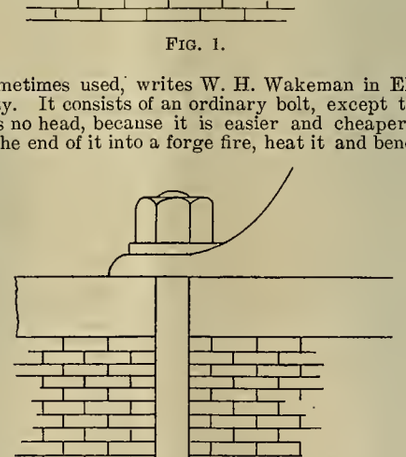


FIG. 2.

at right angles than to weld on a head, and, furthermore, some engineers can do the bending act who cannot make a good weld. Perhaps this is no discredit to them, as an engineer is uot supposed to be a blacksmith.

If care is exercised in building this into the brick wall so that it will have a good bearing it may give satisfaction in some cases, but it is not recommended. It is what may be termed an "unmechanical contrivance" at best, for the strain cannot come fairly upon it, as a consideration of its design will show. It is possible to make the bolt come up flush with the top of the nut, or a little above it, as shown, but if the feat is accomplished it is due to good luck more than to good management, for such a bolt will always yield some when the nut is tightened, and there is no rule or formula for determining the exact amount so that allowance can be made for it.

Fig. 2 illustrates a slight improvemeut, as the lower end of bolt is bent around a piece of iron, and this form of construction brings a straight pull on the bolt.

Of course this cannot turn when an attempt is made to turn the nut, neither can the form shown in Fig. 1, which is a desirable feature, but special care should be taken when building the foundation to have the bricks immediately above the horizontal part so laid that a good bearing will be provided when leverage applied to the nut gives a strong upward pull on the bolt.

Some engineers prefer to have their fonndation bolts located in pipes much larger than the bolts, but this idea is not recommended for either of the foregoing kinds, as it is much better to build them solidly into the masonry, if they must be used at all.

In this connectiou it is well to call attention to the fact that a foundation bolt very seldom resists a shearing strain directly, as it is employed to clamp the frame to the foundation, thus bringing a tensile stress upon it.

Fig. 3 shows a form of bolt that is extensively

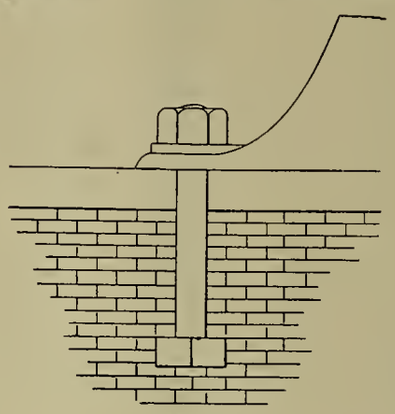


FIG. 3.

used. It has a large square head firmly welded to the bolt. Care is exercised to build the head solidly into the brickwork, so that the bricks above it may afford a good hold, while those at the sides prevent it from turning in case the nut does not turn easily.

It is not a good idea to use a pipe on a bolt of this kind, as it is better to have the bricks in close contact with it as above mentioned. The idea of using a pipe in this connection is but a makeshift at best, as the only object is to allow the bolt to be moved to come into the hole in the frame when it is lowered over it. This, of course, is all very well when care is not exercised iu locating the bolts, but theu there is no law against putting the bolts where they belong.

There are undoubtedly some brick masons who are competent to locate foundation bolts where they belong, but the majority of them are very careless, as they apparently think that if one is put anywhere within an inch or two of the designated place it will answer every purpose.

Wooden templates are furnished aud the bolts suspended in place, through holes bored in the templates, which is a good idea and should secure correct location of the bolts, but it is customary to remove the templates before the foundation is completed, then in some unaccountable manner, the tops of the bolts are moved out of place. This is not a theory but a condition to which I refer.

Bolts that are made according to the three previous illustrations are uot adjustable so far as height is concerned, therefore care must be taken to have them set high enough to give what is called a "full nut" when the work is finished. In other words, when the nut is screwed down tightly the bolt must be at least flush with top of nut.

Of course it is not a hard matter to cut off the bolt if it is too long (or rather, too high), but if not high enough it is difficult to make it right. My attention was recently called to this matter by seeing an engine on which some of the bolts projected about ½ inch above the engine frame, therefore it is necessary to do much chipping in order to get the nuts on far enough to hold, making an expensive and unsatisfactory job, simply because the template was not set high enough to bring the bolts up where they belong. The hole in the top of nut where the end of bolt should be, may be filled with putty and nicely painted, or a nickel-plated cover may hide the defect, but such a makeshift does not remedy the evil, except in outward appearance.

THE annual convention of Canadian mining engineers and mine managers will be held under the auspices of the Canadian Mining Institute in the King Edward Hotel, Toronto, on March 2, 3, 4, 1904.

Table Showing Weight of Cast Steel.

The following gives the weight in pounds of a lineal foot of round, octagon and square steel:

Size in Inches.	Round.	Octagon.	Square.
1/16	.010	.011	.013
1/8	.042	.044	.053
3/16	.094	.099	.120
1/4	.168	.177	.214
5/16	.262	.277	.334
3/8	.378	.398	.481
7/16	.514	.542	.655
1/2	.671	.708	.855
9/16	.850	.896	1.082
5/8	1.049	1.107	1.336
11/16	1.270	1.339	1.616
3/4	1.511	1.594	1.924
13/16	1.773	1.870	2.258
7/8	2.056	2.169	2.618
15/16	2.361	2.490	3.006
1	2.686	2.833	3.420
1 1/8	3.399	3.585	4.328
1 1/4	4.197	4.427	5.344
1 3/8	5.078	5.356	6.466
1 1/2	6.044	6.374	7.695
1 5/8	7.093	7.481	9.031
1 3/4	8.226	8.674	10.474
1 7/8	9.443	9.960	12.023
2	10.744	11.332	13.680
2 1/4	12.129	12.793	15.443
2 1/4	13.598	14.343	17.314
2 3/8	15.151	15.981	19.291
2 1/2	16.79	17.71	21.37
2 5/8	18.51	19.52	23.56
2 3/4	20.31	21.42	25.86
2 7/8	22.20	23.41	28.27
3	24.17	25.50	30.78
3 1/8	26.23	27.66	33.40
3 1/4	28.37	29.92	36.12
3 3/8	30.59	32.27	38.95
3 1/2	32.90	34.70	41.89
3 5/8	35.29	37.23	44.94
3 3/4	37.77	39.84	48.09
3 7/8	40.33	42.54	51.35
4	42.97	45.33	54.72
4 1/4	48.51	51.17	61.77
4 1/2	54.39	57.37	69.25
4 3/4	60.60	63.92	77.16
5	67.15	70.83	85.50
5 1/4	74.03	78.08	94.26
5 1/2	81.25	85.70	103.45
5 3/4	88.80	93.67	113.07
6	96.69	101.99	123.12
7	131.61	138.82	167.58
8	171.90	181.32	218.88
9	217.57	229.48	277.02
10	268.60	283.31	342.00
11	325.01	342.80	413.82
12	386.79	407.97	492.48

ONE of the interesting engineering feats of the past few years is the construction of the new bridge across the East river from New York to Williamsburg which was dedicated and thrown open to the public December 19. It is 7200 feet long, 1211 feet longer than the Brooklyn bridge, and cost $20,000,000, against $14,750,000 for the Brooklyn structure. It is double decked and carries two roadways, two trolley tracks, two promenades, two bicycle tracks, and a central space with two tracks for the L Road cars. The towers are 333 feet from high water, and the whole construction is of steel.

Mechanical vs. Natural Draft.

The question of draft in a manufacturing establishment, mining plant, or at any place where steam making is carried on, is often an important consideration in construction and first cost. The initial cost of a mechanical draft apparatus, breeching, fan, engine and stack is less than the first cost of a chimney. With natural draft, there is a large loss of heat, with a consequent waste, and it is estimated that the efficiency of steam, when used to create draft artificially, does not exceed 2% of the steaming capacity and is often lower than that. With natural draft, the temperature of the flue gases should not be lower than 600°, and it is known that between 600° and 700° F. the maximum results are obtained. With mechanical draft, the temperature of the flue gases need not necessarily be high, so far as related to the intensity of the draft, and this insures the highest efficiency of the fuel economizers, which utilize the waste heat of gases when installed with mechanical draft plants. The draft may be so regulated, with mechanical draft, that all the carbon of the fuel will be burned to carbonic acid gas, giving out 14,500 heat units for each pound of carbon burned. Mechanical draft is largely used in the anthracite districts, where large quantities of culm are available, and is an indespensable adjunct of mechanical stokers. It is claimed that mechanical draft results in a material increase in the capacity of the steam plant without increasing boiler plant. It makes it possible to burn lower and cheaper grades of coal, saves fuel and prevents smoke, and it has come to be recognized as an essential feature of the best modern boiler practice. The smoke seen issuing from stacks is largely of unburned particles of carbon, which, mixed with the gases from the furnace, is blown away into the air—a direct waste of fuel. This, it is claimed by the manufacturers of the mechanical draft apparatus here illustrated—the Buffalo Forge Co. of Buffalo, N. Y.—is obviated by the use of their devices. Fig. 1 illustrates the induced draft plant of the United Electric Co. of Hoboken, N. J. The fans and housing that are made by the Buffalo Forge Co. differ in design, according to the conditions under which they are to operate. Fig. 2 represents a Buffalo steel plate, left-hand top, horizontal discharge pulley fan, with steel housing. They are built right or left hand and to deliver air in the following forms: Bottom horizontal, top horizontal,- upblast and down-blast, and in any desired size. Fig. 3 illustrates a left-hand up-blast discharge steel plate fan, 80 inches in diameter, with overhung blast wheel.

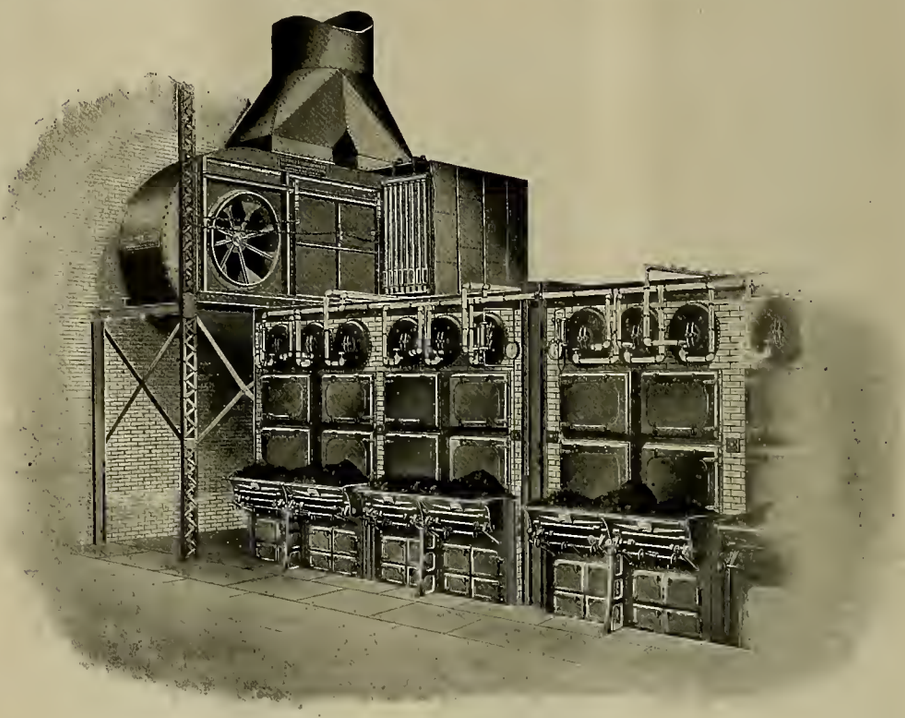


Fig. 1.—Induced Draft Plant–Horizontal Fans.

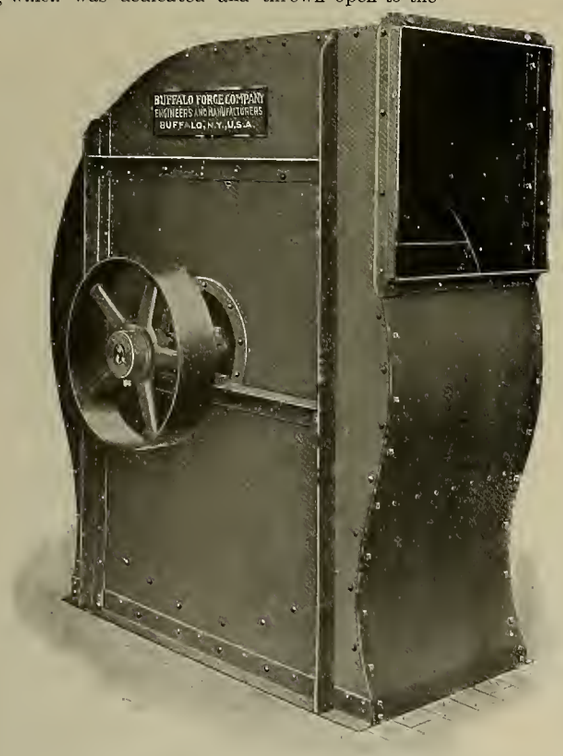


Fig. 2.—Left-Hand, Top Horizontal Discharge, Pulley Fan.

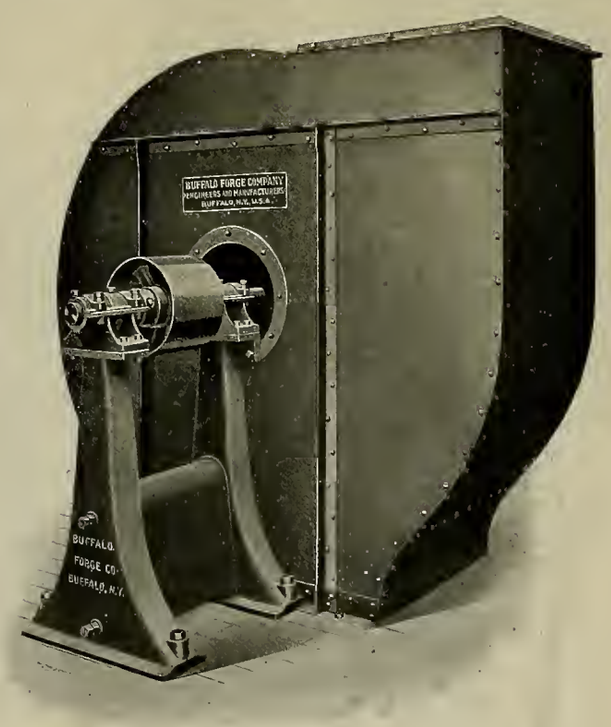
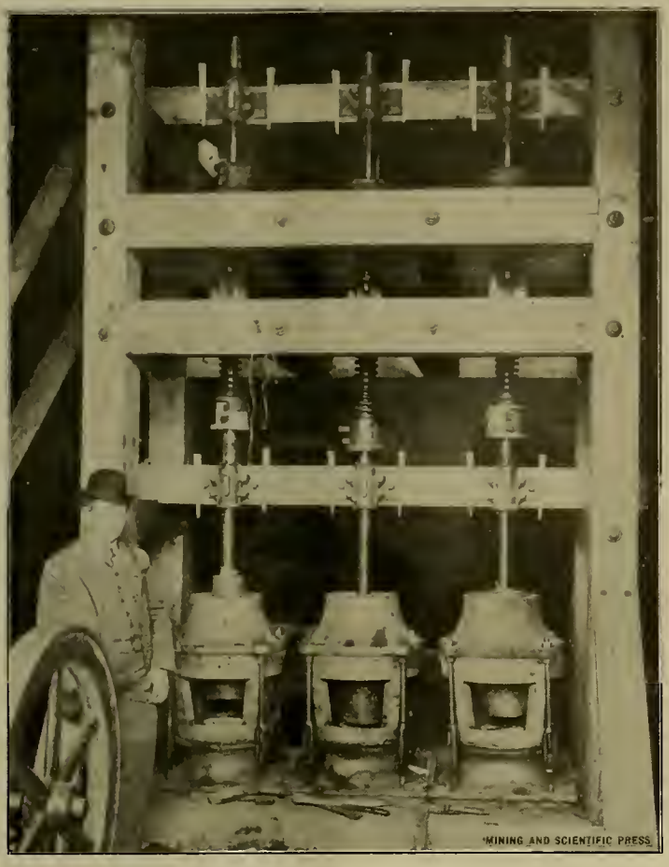


Fig. 3.—Left-Hand, Up-Blast Discharge, Steel Plate Pulley Fan.

A Novel Quartz Mill.

The gravity stamp is one of the oldest as well as the most widely used means for reducing metal-bearing rock to a fine state of division for the purpose of extracting the metal contained in the ore. The gravity stamp is so simple a device that inventive genius has endeavored to find something better, or at least more efficient for the amount of power expended in crushing the rock, and thus more economical. This effort has led to the invention of a multitude of devices, including steam and pneumatic stamps, rolls, rotary mills (improvements on the arrastra), pulverizers of many types, and various other forms of rock crushing machinery. One of the latest and most interesting of these numerous types of ore mills is the Richards mill, herewith illustrated. In general appearance it is not unlike the single mortar gravity stamp mill, but in manner of operating it varies materially. The engraving shows three of the individual mortars arranged in a battery. The screens being removed show the stamps within the mortars. The stem is secured to a boss-head in the same manner as in the ordinary mill, and the shank of the shoe is fitted with wooden wedges into the lower end of the boss in the usual way. Guides similar to those in gravity mills may be employed, and the battery frame is similar. The mortar block is also of the usual type, and to it the mortar is securely bolted by means of the turn buckles shown in the engraving. The mortar is in three pieces—the square base, the central circular portion, and the top or cover. Thus far the Richards mill is not very unlike any gravity stamp mill, but the operation of the stamps is novel. It is actuated by a crank shaft, driven by a belt from an engine (or other means of power). The three accompanying sketches show the manner in which the mill works. The crank shaft operates a rocker arm, which raises and drops the stamp with a certain amount of "play." The "sliding block," shown in the central part of the front view of the battery, is held firmly, but not rigidly, in place by the spiral springs shown in the figures. This arrangement permits each stamp to be raised and dropped at any speed between 100 and 225 drops per minute. When running at a speed of 162 drops the maker estimates the stamp, which weighs about 750 pounds, strikes a blow equal to 2500 pounds, with one-third the power required to run an ordinary gravity stamp. Three stamps are run by means of a 4-inch belt. There is an adjustment for taking up the wear of shoe and die. The particular features claimed for this mill are: Low power required to operate; rapid drop of stamps; large screen area, and impingement of pulp from the center outward equally in all directions against the circular screen, with consequent large capacity. The above described mill is in operation and can be seen at 124 Fremont street, San Francisco, Cal.



The Richards Rapid Drop Stamp Mill.

Testing Ores for Cyanide Treatment.

NUMBER III.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by R. STUART BROWNE.

C. TIME OF LEACHING.—In this series of experiments the size of the ore remains the same; the solution is the one chosen from the last work, but the time of treatment is variable. Some attempt must be made now to imitate the conditions of actual work as regards the volume of solution used. A total of 800 c.c. for 500 grams of ore would be a little high, but is near enough for this work. In regular mill work it is customary to use at least two solutions of different strength, the weaker one usually being about one-half the strength of the strong one. Therefore a second solution should be prepared of one-half the strength of the one already chosen for the strong. It is a difficult matter to at once determine the proper ratio of weak and strong solution, and the time of contact of each. This can be done only after the general form of treatment has been outlined. In this experiment it is best to adopt the emperical rule of equal volume of each, and equal time of contact.

The five samples in the percolators are now leached for periods varying from four to eight days with 400 c.c. of strong solution and an equal amount of weak. For example, the first one is leached for two days with strong, two days with weak, and then washed. The second is given two and one-half days with each solution and then washed, and so on with the others. As the time of leaching is extended the rate of percolation is decreased. It is a difficult matter to ad-

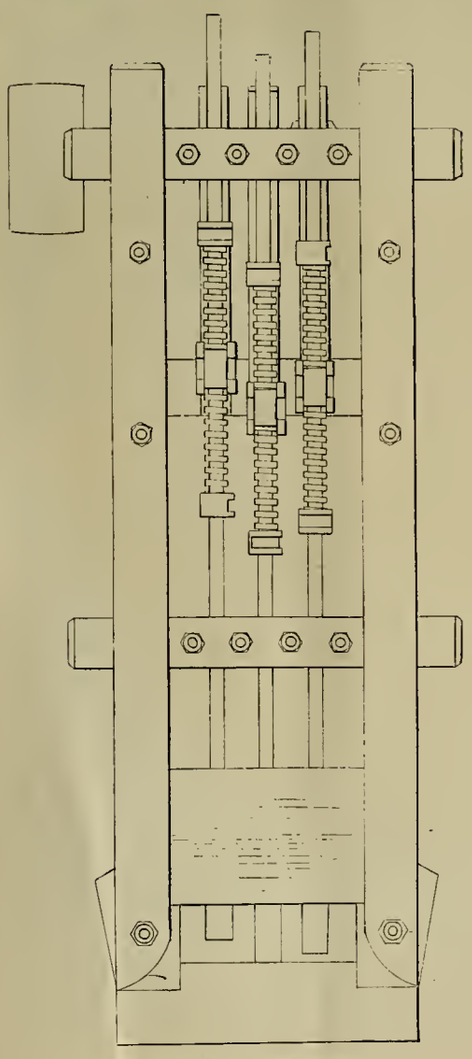


Fig. 1.—Front View.

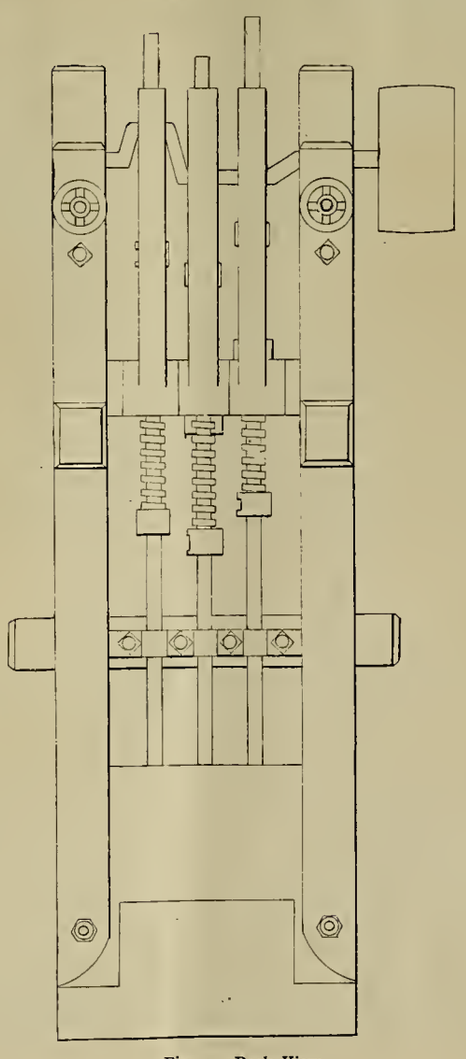


Fig. 2.—Back View.

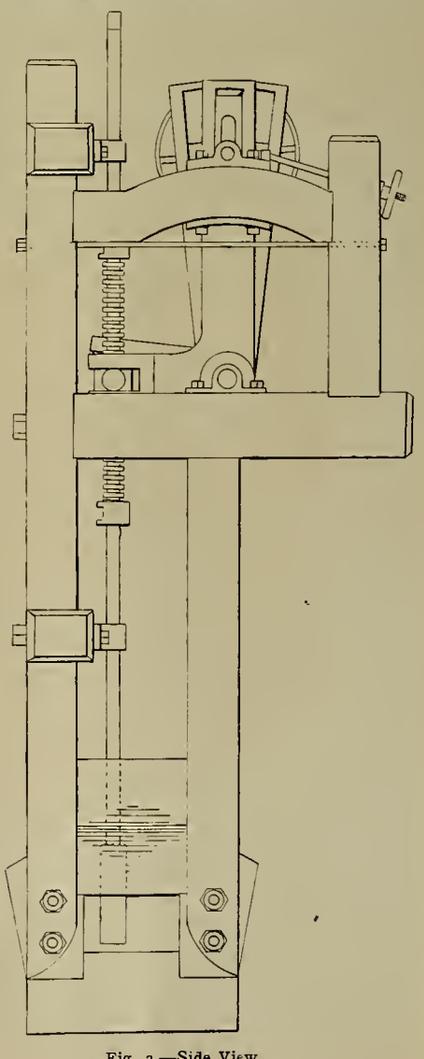


Fig. 3.—Side View.

just the clamp so that a given amount will drain off in a certain time. I have found it best to adjust the clamp as near as possible for the delivery of the required amount of solution for each tweuty-four hours, and if the amount is delivered before the time is up, to shut it off until the beginning of the next period. A graduated flask should be used to catch the solution. As soon as these tests are completed a close idea can be formed as to the probable treatment necessary for large scale work. If it is thought that the leaching can be done in less than four days, the experiments should be made to establish the fact; and likewise, if it is thought that more than eight days are goiug to be required, then extend the experiments to include twelve days. Au ore that requires longer time would hardly pay to treat by this process.

We will suppose, however, that the ore is well adapted for cyanide treatment and that a satifactory extractiou cau be secured in six days.

D. RATIO OF SOLUTION OF ORE.—A series of experiments must now be made to determine the amount of solution to use, and the proportiou of weak and strong. The work can be done systematically by using different volumes and then varyiug the proportion of the two solutions. But this takes up too much time. The chemist should be able to judge uow the best treatmeut to give, and therefore, instead of continuing the work along on systematic lines, he should assume a form of treatment and test it in the percolators. It is best to run a number at the same time, but with slight modifications in each. The general features, such as mesh, strength of strong solution and time, would remain the same, but the other features would vary slightly. When these results are tabulated the work is practically completed, and it only remains to make a final test on a larger scale. Generally, laboratories are not equipped for handling big samples, but 500 pounds can be manipulated easily, and the results would be sufficiently accurate to judge the behavior of a large charge. In my own laboratory I use for these tests large tubs thoroughly soaked with paraffine paint, so as to prevent any absorption of solution. The wooden filter frame is likewise protected. The filter cloth is made from heavy muslin and a new one is used in each test. For couveying the solution ¾-inch iron pipes are used. They should be arranged so that they can be readily taken out and cleaued. Unless these precautions are taken the solutions will be coutaminated from some previous test, or else there will be a loss from absorption. I attach a great deal of importance to the results from the solution assays, for they represent something that is capable of accurate measurement and sampling. Not only this; the extraction for each day can only be determined through them. For these reasons it is very important that everything possible should be done to eliminate any possible source of error.

Before making this fiual experiment the ore should be thoroughly mixed and sampled on a large canvas mat, and likewise after the leaching is finished. The exact weight of dry ore used in the experiment should be noted. Other details, such as the rate of flow, streugth of solution as it comes off, the amount of gold and silver dissolved each day, must be also determined and recorded. The consumption of cyanide can be calculated from the data of this test. In making the report the figures should be based on the treatment of one tou of dry ore.

Iu making these experiments the following hints will be of value:

Use C. P. potassium cyanide. The commercial cyanide contains both sodium aud potassium, and it is difficult to find its real strength.

Make up the solutions in large quantities, so that the strength is uniform in every percolator.

Never use a solution twice. Keep the solutions that drain off in separate bottles, and properly labeled, with number of experiment, date, volume, strength aud value. At the end take samples from each, assay and use as a check on the total extraction.

Having determined the mesh, crush up a lot to this size. It saves sampling.

Work systematically and tabulate results.

Remember that the cyanide chemist endeavors to obtaiu the maximum extraction with the coarsest mesh, minimum amount of time, weakest solution, and lowest cost. The combination that produces the greatest profit is the desired process.

In the foregoing experiments we have endeavored to find a process by which we cau treat the ore by straight percolation. Now, it may happen, either from chemical or physical causes, that the ore cannot be treated in this way. It may require a preliminary treatment, such as roasting, concentration, removal of the slime, etc. The mere fact that the preliminary investigation has shown a poor extraction is not sufficient grounds for rejecting the process altogether. The cyanide process is very elastic and it is rare, indeed, that it cannot be applied in some modified form. Of course, the question of cost of treatment must enter largely into the matter. No process is a success unless it is so financially.

Owing to its non-permeability, the treatment of slimes has always been one of considerable difficulty. But the introduction of the filter press and the method of agitation aud decantatiou has in a great measure overcome the trouble, and to-day large accumulations of slimes are being treated at a satistory profit. In experimenting in the laboratory with this class of material, apparatus different from that used in percolation is necessary. Slime tests are much simpler than percolation, for the reason that the mesh is already determined, the time of treatmeut and volume of solution are fixed within close limits, and the gold and silver are already soluble, as a general rule. The chemist will, therefore, make some comparative tests to determine the strength of solution and fix the time of agitation. The solution used will vary from one to three parts by weight for each part of dry slimes. The amount required for displacement must be determined from the value of the solution, the rate of settling, etc. Small tubs paiuted with paraffine paint are well adapted for these tests. Some form of agitator must be employed, preferably the same kiu d that will be used in the large plant. This may be either compressed air-pumps or some form of mechanical stirrer. In all agitation plants the time of extraction is influenced in a marked way by the opportunity given for the solutious to aerate themselves. For laboratory tests to be representative, similar conditions must prevail as in large plants.

Within a comparatively recent time it has been found that a great many sulphide and telluride ores will give a high extraction without roasting if the ore is slimed. When the chemist comes across such an ore it would be well to carry out some experimeuts along this line before recommending roasting. A great many mills produce low-grade concentrates that could be treated more cheaply by this process than shipment to a smelter or chlorination works. The material gathered from the canvas table is particularly well adapted to this form of treatment.

It would be well to come back, now, and consider the question of how far the results of the laboratory work may be taken as a criterion of the work of a large plant. The results of a test ou a 500-pound sample are, I think, very closely approximate to the work of a mill. If anything, they are a trifle high. One reason for this is that the mill has to use impure solutions, while in the laboratory only pure ones are used. Some chemists, however, have claimed that au old mill solution has greater power than a new one of equal strength. If this is so, then the accuracy of laboratory work is much increased, for then the errors would be more compensating. Another factor favoring higher results in the laboratory is the shallow depth of the charges. In the percolator or tub the air can more easily penetrate to the bottom of the charge than in a large vat. The pressure of plenty of oxygen means a more rapid solution of the gold and probably a higher extraction. Another thiug frequently overlooked is the method of washing the ore. In the laboratory the pulp is washed much cleaner than would be done in a mill, and this would give slightly higher results. This can, of course, be remedied by regulating the wash water. The possible difference in the physical condition of the ore is an important matter, aud it is difficult to just see how it will influence the work.

Ore crushed in a laboratory will be more granular thau that which comes from any mill. Inasmuch as finer grinding favors higher extractiou, it would seem that we could expect a higher extraction in the mill. But increased depth of charges packs the material more, and it may be that the fines will become less pervious to the solution and thus offset this advantage. Weathered tailings always contain twigs, roots and similar foreign matter, and the slimes which always constitute a part of the dump are caked. In my own experience, covering work in a good many laboratories, I have yet to see the chemist who does not pick out the sticks and carefully break up the lumps of slime. It may be good practice and it may not be. One thiug is certain, however: It favors higher extraction in the laboratory. These are the principal reasons why the laboratory work is apt to give higher returns than the mill. The amount of error is not very great, however, and I think the results may be taken for all practical purposes as representative.

The Tinplate Industry.

Sir John Jeukins has coutributed au article on the Welsh tin industry to the Westminster Gazette, in which he says: The discovery of the method of sheet iron rolling established the iudustry in Moumouthshire iu 1778, and tinplate making remained practically a Welsh monopoly until 1891, when the McKinley tariff came into force. In 1862, 1,000,434 boxes of 112 tiuned steel plates, 20x14 inches, weighing 108 pounds each, were exported; more thau half of these went to the United States. In 1882 5,300,000 boxes were exported, of which the United States took 430,000. By 1889 the respective figures were 8,600,000 aud 670,000. Iucreasing demand in the Uuited States was due to the development of the food canning industry and the adoption of terne plates for roofing purposes. The McKinley tariff threatened a tax of 10s ou a box which could be sold at 9s f. o. b. Swansea, and that caused feverish activity in Wales. The average price of coke plates —13s 7d at Liverpool aud $4.37 at New York in 1889 —went up to $5.45 in 1891. Under pressure the tariff was then reduced from 22 to 12 cents per pound, but it was raised again to 15 ceuts iu 1897. There are now 320 tinplate mills in the United States, employing 15,000 people. But Wales still supplies tin plates to the United States for exportation of packages, and as the exports are allowed a rebate of 99%, it follows that the Standard Oil Co. and others are receiving a subsidy for using Welsh plates or export packages. The immediate effect of the McKinley tariff on the Welsh mills was disastrous. Mills had to shut down temporarily, and if it had not been for the previous boom there would have been more failures. The men suffered great distress, however. In 1893, 12,560 were out of work, against 15,500 regularly employed. But by 1899 an improvement had been effected—412 works, against 500 in 1891, were at work again. The exports to the other countries were pushed; new industries have developed, and the home demand for tin plates has almost doubled iu ten years—from 2,500,000 boxes in 1892 to 4,500,000 in 1902.

Gold Deposits of New Zealand.*

NUMBER III.—CONCLUDED.

Written by ALEXANDER MCKAY.

GOLDFIELDS OF THE NORTHERN DISTRICT OF WESTLAND.—At one time it was thought that the granitic rocks of Mount Rangitoto were gold bearing. On this mountain a vein of iron pyrites contained about one-fifth of its bulk of galena, which was prospected as a silver ore, and this also proved to be auriferous. Neither the silver nor the gold was in quantity sufficient to pay for the working of the deposit, and the report that gold was preseut in the adjacent granite, on being investigated, did not lead to miuing in that rock, although it was said the preseuce of minute quautities of gold was proved. The Cedar Creek reefs, and some reefs on the west slopes of Mount Greenlaud are yet to be proved payable; aud of the different reefs known to exist in the mountains, from the gorge of the Hokitika to Jackson's, on the Teremakau, all of them that have beeu prospected have failed to indicate a paying character, and the attempt to work such reefs has beeu abandoned.

GOLDFIELDS OF THE REEFTON DISTRICT.—The gold obtained from quartz very considerably exceeds in amount and value the alluvial gold obtained in the same district.

UPPER BULLER GOLDFIELDS.—It is only on Lyell creek that quartz mines are being worked within this area. The Owen reefs, though for a time assiduously prospected, are now abandoned.

WAIMANGAROA AND MOKIHINUI GOLDFIELDS.—Reefs of a payable character occur on both of these fields, but up to the present the yield of gold from them has been small, and much less than the amount of alluvial obtained in the same district.

GOLDFIELDS OF THE NORTHWEST OF NELSON.—Within the bounds of Collingwood county there are only two quartz mines being worked at the present time. These are situated in the mountains between the Aorere valley and the west coast south of West Wanganui iulet. The production of gold from these mines up to the present time has not been great, though recent results have been encouraging. Quartz mining in the Aorere valley has ceased. The yield of reef gold from all parts of the district has been little compared with the amount of alluvial gold that has been obtained from the same field.

TERAWHITI GOLDFIELD, WELLINGTON.—The amount of gold obtained from this field was not great. Alluvial and reef gold was obtained in nearly equal proportions, and the alluvial has, without doubt, been derived from the reefs, whether of pure quartz or from a peculiar brecciated deposit that consists mainly of country rock cemented by quartz.

GOLDFIELDS OF THE AUCKLAND PROVINCIAL DISTRICT.—Practically the whole of the gold from these fields has been the result of mining in quartz, and the almost total absence of alluvial gold from the Hauraki goldfields is a peculiar feature that has already been referred to.

CONCLUSIONS.—From the preceding it will be appareut that in eastern and central Otago the prospects favor a more energetic development of alluvial mining in that district. The search for quartz reefs need not, however, be discouraged or abandoned, for it will be a surprising thing if it should prove that hitherto the only payable auriferous reefs have been found, and it cannot be supposed that in every case these are already exhausted. Improvements, more especially in the method of dealing with refractory ores, should enable the reworking of many of the mines now lying idle on the Carrick range. In the past these mines paid to work till reaching the limit of circulatiug waters, when, from the presence of increasing quantities of sulphides and arsenides, the ores became refractory, and with the then means and appliances they ceased to yield a profit to the shareholders or owuers. The same may be said of other parts of the district where large lodes exist, and no doubt the future will provide the means of again workiug a uumber of mines that are now idle.

The progress of miniug in Otago for some time recently has showu that for many years to come the chief and largest returns of gold must be derived

*Abstract Report of Government Geologist.

from the extensive alluvial cement deposits of various ages that are spread over the country.

The richer and more accessible superficial deposits are being exhausted. Such deposits supplied almost all the gold during the first three years after the discovery at Gabriel's gully. In deep and wet ground the ordinary methods of mining failed to reach the gold, or reached it at such cost that its extraction was no longer profitable. Hence extensive and costly dams, head and tail races, diversion of streams, and the building of dredgers to scoop up the gold of the river beds.

Improvements in the construction of dredgers and the discovery that by means of these machines profitable returns were to be obtained elsewhere than from the beds of the Molyneux and other large streams, so stimulated this form of the industry that for two or three years there was a boom in dredging over the whole of Otago and the west coast of the South island. As a rule, dredging can be applied only to modern deposits or the superficial exposures of beds of greater age. Yet the field for dredging in Otago and Southland is extensive, much of which is virgin ground that could not be successfully worked by any of the different hydraulic methods. Dredging in the greater part deals only with the most modern gravels of the district, but there are places where older rocks are also being worked by means of dredgers.

Gravels of Pleistocene and Pliocene age are worked at many places by hydraulic sluicing at heights varying from sea level up to 2500 feet above the sea, and by the same process the older quartz drifts are worked at an elevation of 4000 feet above sea level.

The Maori bottom (Pliocene) and the younger and older quartz drifts are at places much disturbed, and the auriferous bands are sometimes in a vertical position.

At Preservation inlet and on the Wilson river goldfield further discoveries of quartz lodes may be expected in the Silurian rocks of that district. At the same time alluvial mining should not be neglected, as there are possibilities in both directions of an improved condition of mining on this field.

In northern Westland and along the southern side of the Grey valley every effort should be made to develop alluvial mining, quartz mining being less promising.

In the Reefton district, including the eastern side of the Little Grey watershed, something should be done in the way of prospecting the older gravels of the district and the quartz cements that lie at the base of the coal bearing series.

The southern part of the Paparoa range, where this is formed of Carboniferous rocks and of the same in character as the Reefton auriferous rocks, merits further prospecting for auriferous quartz reefs.

North of the Buller to Collingwood and Cape Farewell, wherever there are indications of quartz lodes, the country should be prospected for auriferous reefs; and prospecting for fresh deposits of auriferous alluvial and cement deposits should also be carried on.

The hope of the Marlborough goldfields appears to lie in the development of its reefs, despite the fact that in the past the results have not been such as could be wished.

On the Hauraki goldfields of Cape Colville peninsula much prospecting was done between the years 1895 and 1899, which did not result as anticipated. Nevertheless, prospecting should be continued, as it cannot very well be that all the payable lodes of the peninsula should have been discovered and sufficiently tested.

Method of Treatment of Low-Grade Copper Ores.*

Written by J. J. MUIR.

In following out the writer's investigations on the treatment of low-grade copper ores, he has ventured to present an improved method of forced extraction, which will fulfill the conditions required in treating these ore bodies at a commercial profit.

A great bulk of this class of ore exists in various parts of Australia and Tasmania, and in no conceivable way can it be profitably dealt with by a smelting operation. After arriving at this conclusion, the writer turned his attention in an experimental way to the various methods in general use, with a view of ascertaining what percentage of copper extraction could be obtained by them under the existing conditions, and also at what cost. In such methods as natural leaching, salt roast, ferrous sulphate and the principles laid down in the Hunt-Douglas process, the results at which the writer arrived fully established the claims of all of them to a good extraction under the conditions necessary for their operation.

It is, however, essential in proposing a method of treating these ores that the commercial side of the problem should be equally as successful and prominent as the metallurgical one. It is in the satisfactory adjustment of these two opposing factors that a solution of this subject will be found, and, as a consequence, increased activity in the handling of these classes of ore.

After a patient review of the foregoing results and conclusions, it appeared to the writer that the lines on which investigation must be carried out in reconciling the two factors referred to would be a careful consideration of the chemical conditions of the ores themselves.

The chief obstacle to be overcome is the avoidance of the necessity of transporting large quantities of chemical re-agents to isolated positions for a treatment process of the ores. The first cost of these re-agents in addition to their excessive transport charges in most cases renders it impossible to work out a satisfactory result. In conjunction with this difficulty, it is also necessary to arrive at a high extraction of the copper, and, moreover, to show a speed in the work that will compare with that obtained in a smelting operation. The lines of investigation followed by the writer were, therefore, narrowed down considerably, and the issue on which a successful result would be arrived at clearly defined.

In considering the ores to be treated the writer will confine himself to those typical of the West Coast of Tasmania, as these ores through their high silica contents have baffled the smelter from the financial point of view. The writer does not suggest that these ores cannot be smelted, but that the operation results in a loss, when importing the necessary fluxes and fuels. The following is a typical analysis of these ores: Silica, 48.00%; copper, 4.56%; iron, 13.29%; sulphur, 12.60%; alumina, 12.90; zinc, 1.17%; manganese, 1.26%; lead, 1.40%; magnesia, 3.40%; and oxygen and loss by ignition, 1.42%.

It will be seen from the conditions that these ores contain a large amount of sulphur, and, moreover, that by a judicious selection of a small proportion of the ores, as they leave the mine, the sulphur contents can be considerably increased. This is the main condition by means of which the writer proceeded to work out a method for their profitable treatment.

OPERATIONS AT THE MINE.—In extracting the ore from the mine by any of the usual systems, the aim should be to roughly and cheaply throw out the richer sulphides; to the extent of from 10% to 12% of the bulk of the ore treated. This smaller proportion is reserved for separate treatment, and the conversion of its sulphur contents into sulphur dioxide (SO_2) fumes, and in turn their conversion into sulphurous acid (H_2SO_3) by solution in water. The main bulk of the ore then goes forward to the regular plant.

PREPARATION OF THE ORE (MAIN BULK).—The ore is first reduced to such a degree of fineness as the operator may find necessary in order to expose the small sulphide particles to the oxidizing flame of the reverberatory calciner. The machinery employed for this purpose can be adapted by any individual operator to suit himself. The writer would employ a Gates crusher followed by rolls, the schistose ores being soft and easily dealt with.

CALCINATION OF THE ORE.—In this connection the writer would like to mention that the type of reverberatory calciner described by Dr. Peters in his Modern Copper Smelting is well adapted for this process. The stage to which the calcination must be carried is the first important consideration in dealing successfully with these ores. Provided that the last of the sulphides, as such, have been converted, it is a matter of no moment what proportion the residual oxides and sulphates bear one to the other, and the charges can be drawn at that stage. The sulphates being easily soluble, the writer provides for the attack on the oxides only.

FORCED LEACHING OF THE ORE.—The calcined ore is then transferred to the wooden leaching vats (fitted with filter bottoms), being discharged gradually and hot from the furnace onto the sulphurous acid (H_2SO_3) plus water solution, derived from the ore that has been separately treated. The best mixing proportion is 200 gallons of solution to one ton of the roasted ore. The ore is covered and the temperature considerably raised by the hot ore. The hot-air blast, described under the separate treatment, is then turned on, and the temperature is further raised. The copper oxides are attacked very rapidly by the sulphurous acid, following the equation $CuO + H_2SO_3 = CuSO_3 + H_2O$, and the extraction is completed in a very short time.

The hot oxygen of the blast tends to oxidize the surplus sulphurous acid (H_2SO_3) into sulphuric acid (H_2SO_4) and this is an advantage. The chilling effect of the cold solution on the hot air is greatly obviated by the initial raising of the temperature with the hot ore, and it will be found that a rapid extraction temperature is quickly reached.

PRECIPITATING THE COPPER.—The strong copper solution is then run into the precipitating vats onto bars of pig iron and the temperature is again raised for a quick precipitation. One wash water will recover the soluble copper in the dampness of the ore.

SEPARATE TREATMENT OF THE SELECTED PORTION OF THE ORES.—This portion, being higher in sulphur contents than the main portion of the ore body, will be used for making the sulphurous acid necessary for leaching the whole of the ores. It is essential that as little of the sulphur contained in these ores should go to waste as possible, and it is, therefore, necessary in the arrangement of plant to provide for this. Pyrites, heated in a closed muffle or retort, does not give up the whole of its sulphur; but this result can be minimized by admitting a light pressure of compressed air, sufficient to overcome the head, due to the depth to which the fume discharge pipe is immersed. The hot air coil is arranged in the furnace chamber of the muffle, so as to utilize the heat from the same fuel and minimize cost. Both the hot air and fume-discharge pipes are led into the leaching vats, and the water charge is thus prepared for the reception of the hot ore from the calciner. The pressure behind both of these pipes is, of course, regulated to suit the mechanical conditions.

By the adjustment of these conditions to the ores under treatment, and according to the detailed plant which the writer has designed, a rate and cost of production can be obtained that will successfully deal with these ores.

COST OF TREATMENT PER TON OF CRUDE ORE.—Under the conditions prevailing where these ores exist, the cost of treatment would be as follows per ton of crude ore:

	s.	d.
Crushing schistose ores	5	0
Reverberatory roast	3	0
Labor on leaching vats	0	6
Hot air	0	6
Sulphurous-acid water	2	0
Pig iron	2	0
Total	14	0

In addition to this, mining and delivery of the ore to the works by self-acting tram would cost 10s, or, say, a total of 24s per ton of crude ore. Against this, a deduction of 4s could be safely made on the copper recovery from the muffle-roasted ores, leaving everything well on the conservative side.

Under average conditions, therefore, the total charges against the ore would be £1 per ton, and the precipitated copper will range in assay value from 70% to 80%. It would be the final product of this process, and the writer feels it unnecessary to follow it further on its course to refined copper. There is a ready market for this high-grade product, so that returns and final adjustments can be made at short notice.

CONCLUSION.—After a long and careful consideration of this subject, the writer has arrived at the conclusion that this process will fulfill the conditions necessary for the successful treatment of these ores. The action is rapid, continuous and complete, and the costs of running can be further minimized in many directions, not detailed in the general outline of this paper.

In operation it is advisable to have an excess of sulphurous acid (H_2SO_3) in the solution, over and above what is necessary for the conversion of the copper oxides into their sulphites, and a day's experience of any ore will disclose the best conditions to an operator. A minor advantage of this process is that it is not based upon any nicely-drawn chemical equations, with the corollary of high cost of supervision.

*Abstract Trans. Inst. M. E., Eng.

In discussion, E. D. Peters wrote that J. J. Muir now described the results that he had obtained in the wet treatment of copper ores since his former communication. Mr. Muir is evidently going through the same difficult and laborious investigations that have been undertaken for the same purpose in the United States during the past twenty-five years, and that have resulted in the two Hunt-Douglas methods, the McNeill process, the Van Arsdale process and others. They nearly all of them depend upon the utilization of the sulphur in the ore, or derived from extraneous ores, as a solvent for the copper—the sulphur being first burned to sulphurous acid gas, and the gas being converted into sulphuric acid by various means. Mr. Muir finds that he can obtain from the sulphurous acid derived from a careful roasting of a very moderate amount of pyrites a sufficient quantity of sulphuric acid to rapidly dissolve the oxidized copper contained in the roasted ore. He effects this result by forcing a blast of heated air through an aqueous solution of sulphurous acid while in contact with the ore in the leaching vats. The copper is then precipitated by pig iron in the usual manner.

G. D. Van Arsdale proposes a still greater economy in this direction, though he had not tried it on a working scale at the time of writing the above article. Mr. Van Arsdale finds that a heated solution of cupric solution, when saturated with sulphurous acid gas under pressure, yields a considerable proportion of its dissolved metal in the shape of a precipitate of metallic copper, while free sulphuric acid is formed. The solution is then used to dissolve fresh ore, the operation thus being continuous. He gives the following formulæ in explanation of this interesting reaction:

(1) $3\,CuSO_4 + 3\,SO_2 + 4\,H_2O = Cu_2SO_3, CuSO_3$ (cupro-cupric sulphite) $+ 4\,H_2SO_4$.

The sulphite precipitate then usually reacts further with the free acid formed thus:

(2) $Cu_2SO_3, CuSO_3 + 4\,H_2SO_4 = Cu + 2\,CuSO_4 + 2\,H_2SO_4 + 2\,SO_2 + 2\,H_2O$.

Mr. Peters figures that Mr. Muir has already found, in common with all investigators in the United States, that there is little difficulty in selecting a method that will dissolve the copper from these low-grade quartzose ores. The sulphur in the ore will furnish the solvent required, and the ore can be easily and cheaply roasted in such a manner as to reu-

der 90% or more of its copper contents soluble in quite dilute acids.

The main difficulties lie in carrying out the operation rapidly and economically on a large scale, and are for the most part mechanical. Much money and labor has in this country been expended in devising apparatus that shall burn the crushed pyrites thoroughly and with an exactly regulated admissiou of air, so that a sufficiently concentrated sulphurous acid gas can be obtained from an ore low in sulphur. Still greater difficulties have been encouutered in the leaching of the ore, wooden tanks having proved unsuitable for these acid solutions, and, fiually, iron vats lined with heavy lead have been employed. The presence of slimes, produced both by the ore itself and by ferric salts precipitated from the solution, has beeu very troublesome, and at some works has called for an extensive installation of filter presses.

How Radium is Obtained.

Written for the MINING AND SCIENTIFIC PRESS by A. SELWYN-BROWN, E. M.

Few chemical discoveries iu recent years have been so valuable, or have created keener interest, thau the brilliaut investigations that led up to the separation of radium and the examination of many of its chemical, physical and physiological properties. Already the knowledge gained by investigating its action upon different substances has revolutionized our knowledge of the constitution of matter, aud altered many important scientific theories; and in the near future more remarkable results are promised.

The present value of radium is $2,721,000 per pouud, and it is by far the most expensive of all the metals. Even at this extraordinary price the demand far exceeds the supply, and there is consequently a fine incentive to search for radium ores. But such a search is difficult. All the ores of radium have not been determined, and most prospectors are unable to have their minerals tested for the metal. Very little has been published on the chemistry of the radium compounds, aud a rapid and simple reaction to test the presence of radium in a mineral or ore is wanting. However, a knowledge of the present means of isolating the metal is of importance, and a little further experimentiug may lead to the discovery of short and suitable methods of analysis, and to the finding of radium iu greater abuudance than is at present thought of.

ORES OF RADIUM.—Origiually radium was obtained from the uranium mineral pitchblende, and at the present time uranium minerals furnish most of the metal. But the latest researches show that radium occurs in association with numerous other minerals, and dispersed in many localities throughout the world. The following minerals are distiuctly radioactive, and, although radium has not beeu proveu to be in all of them, their radio-active properties are most probably due to its presence:

Uranium.	Æschynite.
Pitchblende.	Fergusonite.
Cleveite.	Samarskite.
Alunite.	Niobite.
Autunite.	Tantalite.
Sipylite.	Polycrase.
Compounds of Thorium	Euxenite.
Orangite.	Columbite.
Monazite.	Carnotite.
Xenotime.	

It would also appear that radium is present in mauy bismuth, tellurium, zinc, barium, stroutium, calcium and cadmium minerals.

CURRIE'S EXTRACTION PROCESS.—Prof. Currie obtains radium from pitchblende by an involved and tedious process. The ore is crushed fine aud roasted with the addition of carbouate of soda. The roasted ore is then washed and treated with dilute sulphuric acid. The sulphates thus obtained are couverted into carbonates by boiling with carbonate of soda. The carbouates are agaiu converted into sulphates. Radium sulphate is an exceedingly insoluble salt, and at this stage of the process it may easily be separated from the more readily soluble sulphates by filtratiou. The residue, containing radium, barium and several other sulphates, is then treated with dilute hydrochloric acid, which extracts polouium, actinium and a couple of other chlorides, and leaves radium aud barium sulphates. These are converted into carbonates by treatmeut with a strong boiling solution of sodium carbonate. The carbonates are theu dissolved in hydrochloric acid, aud precipitated again as sulphates by means of sulphuric acid. The sulphates are purified to a further exteut by a repetition of the above treatments with hydrochloric and sulphuric acids, and ultimately the radium chloride is separated from the barium chloride by the slow process of fractional crystallization. A ton of pitchbleude by this meaus usually yields about fifteen pouuds of the combined chlorides of barium and radium.

GIESEL'S PROCESS.—F. Giesel, a German chemist and experimenter, prepares radium by treating barium, strontium and calcium with bromic acid, after the ores have been purified as described in the Currie process. The mixed bromides are then subjected to fractional crystallization. The first crystallization, when carefully carried out, is generally sufficieut to remove the strontium and calcium. After about eight or nine more crystallizations of the barium and radium bromide mixture from distilled water, the separation of the more readily soluble radium bromide is easily obtained. During these operations the flame coloration of a Bunsen burner may be conveniently utilized to indicate the progress of the purification; or fractional precipitatiou by ammonium carbouate may be employed. The radium carbonate is precipitated last. Pure anhydrous radium bromide produced in this manner exhibits a bluish phosphorescence when freshly prepared, but in the course of a couple of days the salt discolors and all signs of phosphorescence disappear.

ELECTROLYTIC PROCESS.—It has beeu found that radio-active substances can be obtaiued from bismuth and analogous miuerals by electrolytic means. It is thus possible to obtain thin films of radium from minute quantities of radium in any ore. The metals are first dissolved from the ores by any suitable means, and then submitted to electrolysis at ordinary temperatures. The cathode requires to be made of pure bismuth, and carbon or any other suitable anode may be employed. The requisite current strength has to be found by experiment; but it is usually fairly low. This process is comparatively simple and more rapid than the purely chemical processes, and is likely to be shortly improved so that it may easily be employed in every assay office.

Dry Concentration.

Written for the MINING AND SCIENTIFIC PRESS.

Though the concentration of ores in the United States has not reached the development and importauce that it has in Europe, it is now making rapid advauces yearly. The advantages of conceutration were not fully realized until it became necessary to mine the low-grade ores, or those far from transportation by railroad. Millions of dollars are locked up in such ores with no profitable means of release but some form of conceutration. A large proportion of these ores are in either cold or dry regions; hence the importance of dry concentration.

Prejudice has probably had a great deal to do with retarding many improvements in the business of mining, notwithstanding the fact that pure prejudice uever made a dollar for any one, and that careful thought and experiment are the only elements that yield profits. One of the main troubles in the concentration of ore has been that it has not been generally understood that the actual operation of conceutrating by any particular device is only one-half the problem.

The preparation of the ore before it goes to the concentrator is even more important than the operation of concentration itself, for if the ore is not properly prepared, no satisfactory concentration can be obtained, no matter how expert aud vigilant the operator may be.

Iu the preparation of ore for concentration the slime, or, as it becomes the dust questiou in dry crushing, is one of the most important in the process. The production of undue fines is serious in almost any process, and especially so to either wet or dry concentration. In wet concentration the fines float off with the water. In dry concentration they tend to clog the ore strata, so that it is difficult for the air to act freely.

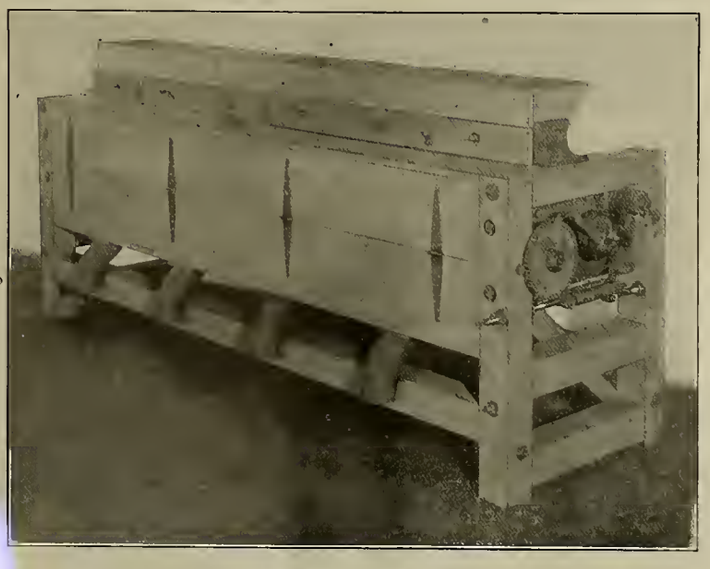
Jaw breakers that produce a uniform product by a crushing action combined with a series of rolls have been found to furnish a crushed product having a small amount of fines. Both the breakers and the rolls crush the ore but once, as the ore passes directly through them. There is no crushing of material already fine enough and no grinding of particle on particle.

The rolls should not be set too closely together. They should be arranged in series of three or more, accordiug to the nature of ore, each set of rolls crushing a little finer than the precediug oue and the product of each screened after it passes through, only the over-size going to the next roll. The rolls should be run but little faster than the ore is dropping from the hopper to them, which is less than 16 feet per secoud. If the roll runs faster than this it is doing no work, as it is ruuning ahead of the delivery, aud, wheu the ore does strike, the increased crushing shock from the high speed produces undue fines. The wear and tear on the roll is far greater, power is needlessly eaten up, aud all to uo purpose.

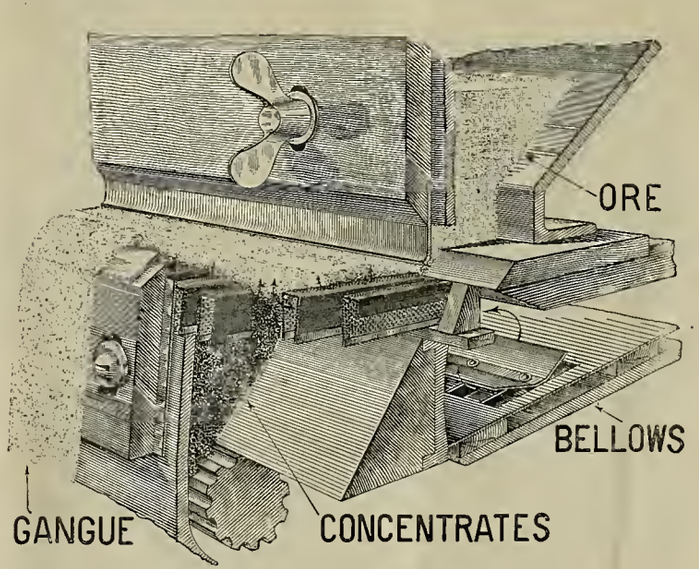
A dry coucentrator recently developed by the Krom Machine Works, 170 Broadway, New York City, is shown herewith. The ore is delivered without sizing to the hopper of the machine, from which it is fed by gravity to the table of the machine. This table is composed of a number of inverted tubes formed of wire cloth aud placed ¼-inch apart. As the ore flows from the hopper on the table, 600 sharp air blows per minute are projected through the tubes and into the ore from an oscillating fan, the effect of which is to rapidly raise and drop the mass of ore, lifting the lighter mineral more than the heavy and superposing it on the heavier mineral, which sinks between the tubes to a chamber below, where it is removed by a take-off roller as fast as may be required. The lighter portion of the ore at the top is pushed over the tailiug gate by the outflowing ore from the hopper.

The tailings are the only means of escape for values in this process, so that an inspection of them shows if any loss is taking place. When the machine is once set to the ore the concentration goes on automatically. Floating dust is saved by an exhaust fan aud pipes connecting concentrators, roll housing, bins, screens, etc., with a series of long canvas bags, from which the dust can be collected if valuable for treatment. By this arrangement the awful dust of a dry crushing mill is avoided, converting an uninhabitable mill into a habitable one.

Dry concentration is designed to furuish conceutrates ready for smelting, cyaniding, leaching or any further treatment.



Dry Pneumatic Concentrator.



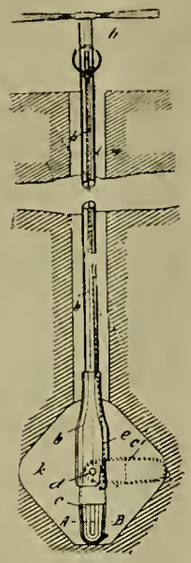
Sectional View of Dry Ore Concentrator.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 5, 1904.

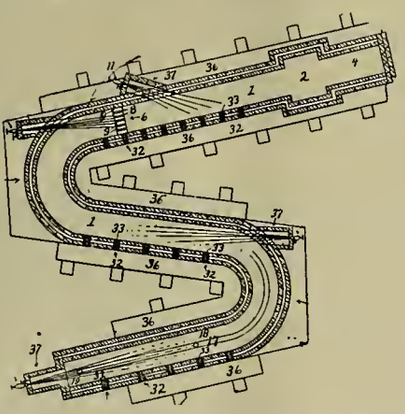
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

DEVICE FOR THE CLEANING OF EXPLOSION CHAMBERS.—No. 748,034; F. Anschutz, Neunkirchen, near Trier, Germany.



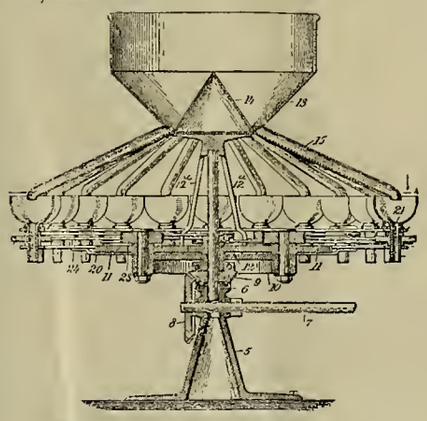
Device for cleaning of explosion chambers at ends of horizontal bore holes, comprising in combination tube with handle at upper end, spoon pivoted to enlarged bottom end of tube, traction wire fixed at one end to spoon before and beside pivot of same, longitudinal slot at upper end of tube near handle for passage of upper end of traction wire and ring fixed to upper end of traction wire.

SMELTING FURNACE.—No. 748,561; E. Riveroll, Los Angeles, Cal.



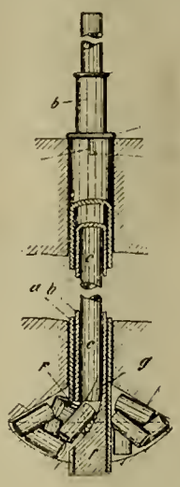
In smelting furnace, inclined sinuous chamber, upper end of which is gradually tapering its entire length in cross sectional area and provided with means for feeding ore thereto, and plurality of hydrocarbon burners communicating with chambers along its length.

CONCENTRATOR.—No. 749,104; L. F. Schoenfeldt, Denver, Colo.



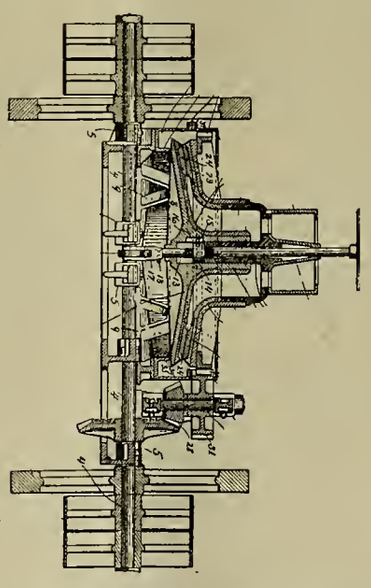
A concentrator comprising series of cups, rotary part carrying cups, outlet tubes extending from bottoms of cups and having rotative bearings in rotary part, means for imparting rotary motion to cups, a hopper and conveyors for material leading from hopper to several cups.

APPARATUS FOR THE LOADING OF EXPLOSION CHAMBERS.—No. 748,035; F. Anschutz, Neunkirchen, Germany.



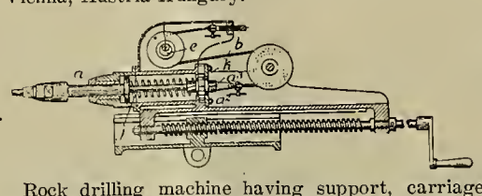
Apparatus for loading with cartridges explosion chambers at ends of bore holes, comprising in combination, tube of diameter to fit bore hole, lateral opening at bottom end of tube, flange at upper end of tube, longitudinal slot through flange and upper end of tube wall, second tube of diameter to fit outer tube, metal piece closing inner tube at bottom end, curved upper surface of metal piece, lateral opening in wall of inner tube close to lower edge of curved upper surface of metal piece, nipple at upper end of inner tube adapted to engage longitudinal slot of outer tube, flange at upper end of inner tube, rod fitting inner tube, curved surface at bottom end of rod correspouding to curved surface of metal piece in inner tube.

QUARTZ MILL.—No. 748,867; C. J. Hodge, Houghton, Mich.



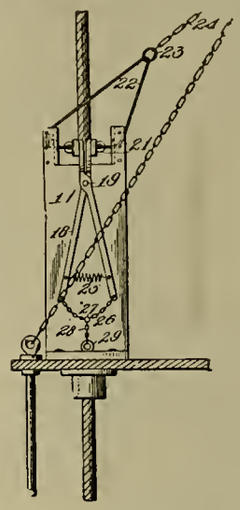
A quartz mill comprising a lower fixed cone having upwardly extending elougated tubular neck, driving shaft, stem passed through tubular neck and supported on driving shaft, upper revolving cone having gear ring, dome shaped upper member fitting within revolving cone and having depending hollow spindle supported on stem within tubular neck, inner and outer plates secured to fixed and revolving cones respectively aud providing bell shaped space between them, hardened plates set in inner and outer plates and formed with annular pocket between them, lower and upper casings within which cones are located.

ROCK DRILLING MACHINE.—No. 748,712; A. Fauck, Vienna, Austria-Hungary.



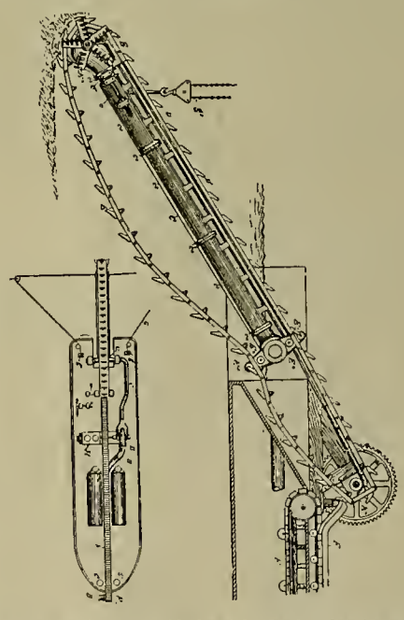
Rock drilling machine having support, carriage movable longitudinally thereon, means to move carriage, reciprocatory drill bar, driving shaft and pulley carried by carriage, spring to move drill bar in one direction, eccentric ou driving shaft, cord having ends conuected respectively to carriage and drill bar and having oppositely extended bights eugaging pulley and eccentric, and motor to drive shaft and carried by carriage.

SAFETY APPLIANCE FOR MINING HOISTS.—No. 748,962; J. Lewis, Sault Ste. Marie, Canada.



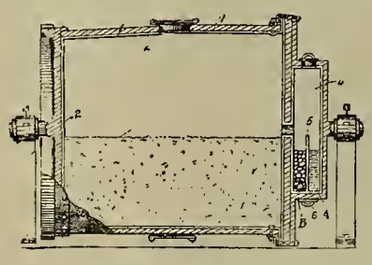
In safety device for hoisting apparatus, combinations with cage, of vertical guides between which cage travels, cable for raising and lowering cage, tongs arranged to grip guides and hold cage stationary, flexible connections between tongs and hoisting cable arranged to hold tongs inoperative while hoisting cable is taut, and means connected to cage and constructed to automatically cause tongs to clamp guides and prevent descent of cage when cable becomes slack.

DREDGING MACHINE.—No. 748,804; W. H. Smyth and A. R. Bowers, San Francisco, Cal.



A suction pipe provided with device having projections extending beyond its normal surface adapted to engage with and remove obstructions from mouth of pipe and mechanism to actuate device independent of water flow.

CHLORINATION BARREL.—No. 748,462; W. J. Armbruster, St. Louis, Mo.



Chlorination barrel having pulp chamber, and chlorine generating compartment carried thereby and rotatable, and in unobstructed communication therewith through one of ends of barrel, and freely discharging chlorine thercinto above surface of pulp.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

The following table gives, in long tons, copper production of the world for the years 1901 and 1902, with estimates of 1903 outputs, reports H. J. Steveus in the Daily Mining Record. The final figures will not be secured for six months yet, in some cases:

Country.	1903.	1902.	1901.
United States	318,861	303,446	272,609
Spain and Portugal	51,000	49,790	53,621
Mexico	48,000	35,785	23,795
Chile	50,000	28,130	30,730
Japan	31,000	29,775	27,475
Germany	22,000	21,605	21,720
Canada	22,500	17,485	18,800
Austra asia	29,000	28,640	30,875
Peru	7,500	7,580	9,520
Russia	8,000	8,000	6,740
Cape Colony	4,500	4,450	6,400
Norway	5,000	4,565	3,375
Italy	3,500	3,370	3,000
Miscellaneous	8,500	7,895	7,282
Totals	589,361	551,316	515,992

ALASKA.

A third gusher is reportod struck in the Kayak oil fields. The flow was developed in one of the wells of the McKenzie-Mann Co., which is oporating, under bond, the holdings of the Alaska Dev. Co. The flow, whicb was struck in an oil sand at a depth of 900 feet, is said to have spurted 70 feet iuto the air.

ARIZONA.

Cochise County.

The pumps of the 700-foot level of the Tombstone Con. Co. shaft at Tombstone aro in operation. These pumps are duplicates of tbe station pump on the 200-foot level. The daily capacity of the station pumps is 2,500,000 gallons each, the lower pump draining tho incoming flow and sending the same to tbe reservoir on 600-foot level. From there the first duplex pumps continuo to lift to the surface. Since working the pumps on the 700-foot level, drifting has been started. Tbe inflow of water on the 700-foot is diminishing, according to the pumping record, says Manager W. F. Staunton. The company is arranging to sink the shaft to 1000 feet.

Gila County.

B. Gaylord of Los Angeles, Cal., and Boston, Mass., men havo for $200,000 bought the Taylor group of twelve claims and tbe Bird group of eight claims near Globe. The Taylor group is on Buffalo hill, running nortbeast, and adjoins mines of the United Globe, near the Old Dominion. Development on the Taylor group consists of a crosscut tunuel on the Bobby Burns, which has cut two veins at sballow depth, from which shipments of copper ore have been made. A shaft 100 feet deep on the Tip Top claim, sunk on tbe vein, shows in the bottom a ledge of iron oro. A 120-foot sbaft on the Tip Top No. 2 is in copper ore. The Bird group of eight claims adjoins the Big Johnny mine, the Iron Cap group, the Copper Hill and the Taylor group. Development on the Bird group consists of several prospect shafts, showing veins, and a shaft 185 feet in depth on the Bird claim, the ore carrying values in copper. Development work has been started on both groups by Gaylord.

Graham County.

Manager S. S. Campbell of the Chase Creek C. Co., operating near Cliftou, says work is progressing on their group, which consists of forty claims in a body betweeu tho Longfellow mine and the claims of tho New England Co. A tunnel bas been driven in 440 feet from Chase creek on one of the claims. This tunnel is the lowest in the camp, says the Standard, being 1200 feet lower than tho tunnel driven by tho Clifton Con. It is headed towards the New England claims, and if continued beneath them it will give them an outlet on Cbase creek and tap their ore bodies at a depth of 2000 feet.

The Shannon C. Co. near Clifton is adding 250 tons to the capacity of its concentrator, wbich will increaso the output of refined copper about 300,000 pounds per month, and make total capacity of works 14,000,000 pounds per annum. Necessary converter improvements will cost $25,000, and are expected to be completed by March 1.

E. Pergoli, of New York, has a bond on the Cuprite group of claims near Garfiold, near Moreuci.

Maricopa County.

(Special Correspondence).—C. Schellenbergor has men at work on a group of claims which he has located northeast of Hot Springs junction.——S. W. Haines is taking out free-milling oro from his mine near Buckeye. —— The Wickenburg smelter has suspended operations for an indefinite time. —— Hull & Duke will put men at work on their group near the Garcia mine. —— G. Francis is working men on his property in the Vulture district. Ore has been struck.

Phœnix, Jan. 11.

Mohave County.

The Yucca Cyanide M. & M. Co. is driving for the vein at the 480-foot level of tho San Francisco mine, says tho Kingman Miner. As soon as the vein is broken into and drifts started, work will be resumed in the shaft, which will be sunk to the 600-foot level.

Santa Cruz County.

The Happy Jack M. Co., operating in the Santa Rita mountains, is shipping high-grade ore.——In the Hardshell mine, near Harshaw, a drift is being run on the 325-foot level, from which a raise is being made. Botb drift and raise are in good ore. ——In the Hermosa mine, near Harshaw, the tunnel running to cut the ore body below tbe old workings is going ahead.

I. N. Curtis, manager of the Globe Exploration Co., says he is increasing development work on the Mowry mine, near Harshaw.——Proto Bros. are increasing operations upon their Abunduncia and Thessalia mines, on tbe west side of the Patagonia mountains, north from the Washington camp road, and are opening up ore.

Yavapai County.

G. Wood, manager of the Bed Rock M. Co., says operations on their holdings are expected to resume this month. This company owns five groups of patented claims in Hassayampa, Groom Creek and Lynx Creek districts, near Walker. Of these are the Dutchman, Golden Fleece, Mammoth and Midnight Test groups. The Dutchman is near the Mudhole. The Midnight Test is ¼ mile from the Home Rule mine, on Groom creok.

Machinery for the 10-stamp mill at tbe Hiddon Treasure group of mines, owned by tho Stark M. Co., on lower Turkey creek, 20 miles southeast of Prescott, is on the ground, says Superintendent W. W. Elliott. The mill building has been completed. Tho battery of two 60 H. P. boilers is also set up. Tbe process will be amalgamation and cyaniding. The cyaniding plant will bave a capacity of twenty-five tons daily. It is expected the entire plant will be in operation by Feb. 1st. The hoist is being set up, which has a capacity for sinking 1000 feet.

The Black Rock M. Co., operating near Constellation, reports work progressing. Superintendent J. K. Murphy is putting up buildiugs and has excavations for the mill completed. Machinery is on the ground, including a hoist for sinking the shaft, whicb is down 200 feet and will go to 500 feet.

CALIFORNIA.

Amador County.

(Special Correspondence).—G. G. Gates is experimenting with the tailings from the mill of the Fremont Con. (Fremont-Gover) G. M. Co., noar Drytown, preparatory to building a canvas plant.

Drytown, Jan. 13.

It is reported that T. Boyson of Plymouth has arranged to work the Illinois quartz mine near Plymouth.

A steam 2-stamp mill is being put up at the Climax mine in Clinton district, near Pinegrove, which is expected to handle twenty tons of rock a day. There are 100 tons of ore on the dump and 1000 tons blocked out in the mine, says the Dispatch.

At the Oneida mine, near Jackson, work continues. The mill is dropping fifty stamps, and ore is being taken from the various levels from the 1200-foot to the 2200-foot station. Development work is being done south from the 1200-foot station, but the principal work is being done north of the shaft, says the Dispatch.

At the Hendy mine, in the black slate belt north of Plymouth, the company is sinking from the 600-foot point to 1000 feet. At 700 feet a body of milling rock 18 feet wide is being developed. The 20-stamp mill is being put in ordor.

Butte County.

A. Brown of Stockton has options on 1200 acres of land near Bangor, 12 miles from Oroville. Brown agrees to begin prospecting within ninety days. This land includes the Blue Lead mine. The company proposes to run a tunnel for drainage and then drive drifts and raises from this main tunnel.

Calaveras County.

A. L. Fortman et al. bave bought the Spring Day quartz mine near Glencoe.—— C. W. Tryon has bought the Sunny South and Sunny Side quartz claims, near Augels.

The mining suit by J. H. Brotherton of Denver, Colo., involving tbe Royal Con. mine at Hodson, has been compromised and the suit dismissed by stipulation. Owing to a strike of the miners at tbe Royal, the mine was closed down and the strikers have been temporarily enjoined from interfering with the mine or the non-union men who have been secured to take the places of the strikers. The taking out of ore has been resumed and forty stamps are operating.

Operations are resuming in the Union copper mines at Copperopolis. For the past twelve years nothing has been done with tbe property, except to keep out water and prospecting for new ore bodies, says the Angels Record. During that time, however, the company bas been acquiring additional land, and it owns a strip 6 miles long extending on each side of the town north and south. F. L. Ames, Jr., of Boston, Mass., owner, has put men to work repairing the buildings. A French company is said to be negotiating for the property.

Contra Costa County.

G. B. Fredenburg of the Pacific Coast (Standard) Oil Co. at Point Richmoud is preparing to build a plant, auxiliary to tbe refinery, for manufacture of acids used in refining oil. Construction will begin tbis week. The capacity of the refinery is to be furtber enlarged.

Mooo County.

The repair work at the reservoir and power bouse having been completed the Standard Con. M. Co. at Bodie last week resumed operations in the mine and mill.

Nevada County.

The Mountaineer G. M. Co. of Nevada City bas been incorporated by J. Bender of Hamilton, Ohio, D. E. Morgan, F. Searls, J. C. Campbell of Nevada City, J. M. Duke, W. T. Farrer of San Francisco and G. M. Henderson of New York. The property consists of a consolidation of the Mountaineer, Walrath, Fortuna, Dodo, Live Yankee, Orleans and Orleans Extension, covering 3 miles along the road in a southerly direction from the Mountaineer. Manager Campbell has men unwatering tho Mountaineer aud clearing the 400-foot and 700-foot drifts south. He will drive the 400-foot level south through the group of claims, the most southerly of which it will tap at depth of 700 feet. It will be used as a drain tunnel and enable the company to handle the flow of water which in former years interfered with development.

Placer County.

N. J. Pierson, H. Wales and N. T. Collins have bought the Big Boulder mining claim, in Secret canyon on the American river, near Colfax.

Plumas Couoty.

A tunnel is being run on the Glazier mine, near Greenville, to tap the channel at the lower end of the claim. The tunnel is in 700 feet,. with three shifts at work. The channel has been worked on the upper end of the Glazier.——The Dunn mine, owned by Dunn Bros., is being oporated steadily. Tbe mill is crusbing fiftoen tons of ore per day.

T. J. Lamoureaux of Oakland, working quartz properties at Horseshoe Point on the North Fork, near Greenville, reports a 10-stamp mill will be built on the Horseshoe mine as soon as transportation facilities will permit, says the Independent.

Shasta County.

Near Lowden's Ranch, in the spring work will resume in dredge mining at Poker Bar, on Trinity river. The Poker Bar M. Co. bas operated a dredger at that place for several seasons. The company has been reorganized with J. D. Morse of San Francisco as president. A new boat will be built. The company has a ten years' lease on the Poker Bar ground. They also propose to build a dredger on the Lowden ground.

It is reported the Redding G. & C. Co. is preparing to build a 100-ton smelter 8 miles west of Redding for custom work. It will put in an electric plant near the smelter of 1000 H. P. capacity.

W. F. Snyder of Salt Lake City, Utah, manager of the Western Exploration Co. of Utab, controlling the Balaklala M. Co. copper mines at Kennett, says he is preparing to build a reduction plant at the mines. It is expected to be in operation before the end of the year.

Trinity Couoty.

At Lewiston, Superintendent J. W. Phillips of the White Cloud mine has cleaned up the old workings, preparatory to running a crosscut tunnel to tap the vein. The ledge matter in the White Cloud is said to have a width of 30 feet. ——E. H. Hugbes and T. Hancock have completed their reservoir and ditch and bave begun piping in their hydraulic mine in Jennings' gulch.——The Mooney Con. M. Co. will resume operations on its gravel property in Mooney gulch.—— There is considerable activity among tbe quartz mines in Eastman gulch. C. E. Goodyear and W. Richards have built a 2-stamp mill, which they will have in operation by Feb. 1st.

Tuolumne Couoty.

T. A. Piper of San Jose bas taken hold of the New York tunnel gravel mine in Jeffersonville section, near Jamestown, and has seven men at work cleaning out the tunuel preparatory to reopening the mine.

Work at the Mary Ellen mine will be resumed. The mine is on the main river, next to the Mohican mine, near Groveland. —— Electric drills are in use at the McAlpine mine and are said to be giving satisfaction. The buildings at the mine, as well as the underground workings, are lighted by electricity. Sinking and drifting are progressing.

The labor trouble at tbe App mine at Quartz has been settled and the mine started again. It is stated the management agrees to pay tbe miners tbe wages desired, but will not pay engineers as much as demanded.

J. Viera has bought the Kelly and Marshner mines, on the middle fork of Tuolumne river, 5 miles above Drew's bridge, near Carters, together with water rights belonging to both claims, consisting of 300 and 200 inches, respectively, with ditcbes.

Tbe Hoosac G. M. Co. bas bougbt the Nancy Lawton mine and millsite, on tbe south fork of the Stanislaus river, ½ mile abovo Deer Creek, near Columbia.

Tbere are being placed at the Horseshoe Bend mine, on the Stanislaus river, near Columbia, for tunnel work, an oil-burning engine, air compressor and machine drills.——Work has been resumed at the Hull mine, near Groveland, says Superintendent Froelich.

COLORADO.

(Special Correspondence). — Reports from different parts of the State indicate renewed activity in the mining industry in Colorado. In many of the smaller camps, especially, is sent word of good strikes being made. These reports are not confined to any one locality, but seem to extend to most of the mining sections.

The action of the militia in demanding the surrender of all firearms, as well as the enforcement of the vagrancy order in the Telluride and Cripple Creek districts, has provoked considerable discussion pro and con. Tbe "vag" order is to the effect that all men who have no visible means of support are considered vagrants and can be deported by the militia from the different camps. This order has been enforced extensively in the Telluride district. In Cripple Creek the Western Federation has asked tbe courts to enjoin the militia from carrying out the order, but the militia, so far, have refused to be enjoined, claiming that the civil authorities bave no voice in the matter; that the militia have full power to act as it deems best, and that they are not deporting men who are willing and ready to work, but are deporting the ones who will not work themselves or allow any one else to work.

Denvor, Jan. 11.

Chaffee County.

Tbe Vivandiere concentrating mill, near Salida, is nearing completion and will be put in operation Feb. 1st. The mill will have a daily capacity of fifty tons. C. T. Snedeker is superintendent.——The 4-foot body of ore found in the Hershberger tunnel on Cameron mountain is a gold-bearing hematite, and runs $6 per ton, says Superintendent Miller. He is driving the tunnel ahead.

Custer County.

The Dolomite mine, owned by the Custer M. & R. Co., west of Custer, will be opened up to the 200-foot level. The Elematah also will be opened up and shipments started. The Evening Star and Bryan, on North mountain, are showing mineral values.——G. White, superintendent of the Grand Rapids G. M. Co., is working men on its prospects. At the Dakota Bill and Valley mines the shaft bouse has been nailed up for the winter. With a view to having them milled, the dumps at the Humboldt have been sampled and are being tested.

Mineral County.

The output of the mines of Mineral county for 1903 is given by the Creede Candle as follows:

	1903.	1902.
Gold	$ 375,450	$ 102,813
Silver	2,905,983	3,420,553
Lead	1,501,800	717,336
Zinc	150,180	75,000
Totals	$4,933,413	$4,315,702

The output for the year was:

Month.	Tons.
January	5,283
February	5,788
March	7,072
April	5,715
May	5,645
June	5,711
July	5,636
August	6,396
September	6,891
October	6,914
November	7,039
December	5,674
Total	73,764

This, against the total tonnage for 1902 of 71,193 tons.

Cleghorn, Ewing & Weiss of Denver,

owning the Krutzer Sonata mine, near Creede, are preparing to increase development work this season.

Ouray County.

W. R. Kramer, manager of the Governor mine, in Mount Sneffels district, near Ouray, has let contract for additional development work, to consist of drifting on the vein and making a raise from the lower tunnel to the upper workings. The Governor has bodies of ore partially blocked out. Arrangements have been made to put in a 10-stamp mill in the spring.

San Miguel County.

During the past year the Tom Boy G. M. Co., near Telluride, crushed 80,000 tons of ore at its mills, from which was obtained approximate total of $740,000, including both gold and bullion concentrates. The bullion shipped amounted to 39,180 ounces, and the concentrates 6960 tons. The new 60-stamp mill is said to average 10,000 tons of ore per month, and the capacity of the Huntington mill is 4500 tons. Except at brief intervals the two mills have not been operated at the same time. The old mill is run on ore taken from the Tom Boy workings by leasers, the company treating the ore on a percentage plan. The estimated cost of mining, milling and treating the ore per ton, including all development expenses, is $5.80. The mine is 6 miles from a railroad, and all supplies and machinery must be transported from the shipping station in Telluride to the mine either by mule back or in wagons.

Teller County.

The lessees operating on the Proper mine in Poverty gulch, Cripple Creek, owned by Stratton's Cripple Creek M. and Dev. Co., are shipping ore.

A strike of high-grade ore 2 feet wide is reported made in one of the properties of the United Mines Co., under lease on Ironclad Hill, Cripple Creek. The United Mines Co. is controlled by Woods Bros. Their Gold Coin mine is said to be improving. Water is going down in the shaft.

IDAHO.

(Special Correspondence).—R. N. Bell, State Inspector of Mines, reports the total output of metals for Idaho for year 1903 as follows:

	Quantity.	Value.
Gold, fine ounces.....	92,938.42	$ 2,085,993.76
Silver, fine ounces.....	7,224,021.58	9,318,986.41
Lead, pounds.....	220,857,456.00	9,386,213.13
Copper, pounds..	2,524,000.00	336,954.00
Total value.....		$21,123,147 30

Gold at $20.67; Silver, $1.29; Lead, $4.25; Copper, $0.1335.

The Cœur d'Alene district of Shosbone county alone produced 213,520,000 pounds of lead and 5,750,000 ounces of silver; an increase in lead of 33% over the output of 1902.

Boise, Jan 10.

Boise County.

Manager V. Thorne is arranging to sink a shaft for development of the English company's quartz claims in Gambrinus district, near Idaho City. It will cut the John Henry ledge at depth of 500 feet on the dip and those of the other claims at greater depths.

Idaho County.

(Special Correspondence).—The Belle of Thunder Mountain M. & M. Co. of Pittsburg, Pa., C. D. Greenleaf president and E. L. Abbott superintendent, owns five claims in one group and another of eight claims on Coney and Divide creeks. Showings of ore have been developed in all of them by tunnels. On Botha creek it has three claims and on the slopes of Sunnyside creek six claims and four fractions. On Marble creek it owns eleven quartz and five placer claims. They have twenty-seven men at work on eight-hour shifts, wages being $2.50 per day and board. The principal works and buildings are on the Sunnyside claim, 3½ miles east from Roosevelt. An upper working tunnel is driven in a westerly direction for 425 feet; an auxiliary tunnel 50 feet higher up the hill is in 200 feet, connection being made between the tunnels by a winze. A north drift from the main tunnel is driven 200 feet and the face is in ore. The south drift is driven to the south line of the claim. Raises of 25 to 35 feet and other drifts from the main tunnels have developed a body of milling ore averaging $7 gold per ton. Treatment will be by amalgamation and cyanide. The company has machinery for a 40-stamp mill at the end of the wagon road and at Nampa a 12-drill compressor and a 100 H. P. boiler, which will be taken in in the spring. The mill will be put up on Marble creek and the ore sent down from the tunnels to the mill by an aerial tram 1½ mile long. A power plant for generating electricity will be built 8 miles down Marble creek, below the mouth of Cottonwood creek, where it is estimated a sufficient head of water can be had to develop 5000 H. P. Below the company's buildings on Sunnyside creek a lower tunnel is being driven by two shifts to tap the ore at depth of 480 feet below the apex of the bill on the Sunnyside claim in horizontal distance of 1200 feet. A 15 H. P. boiler runs a blower furnishing air in the tunnel, and a sawmill for cutting lumber for general purposes. The tunnel is in 864 feet. It is expected the wagon road, as surveyed to Roosevelt, will be completed in June.

At the Black Horse and Shiner claims, between the Sunnyside and the Dewey mines, owned by T. Neighbors of The Dalles, Or., a shaft is being sunk and is down 50 feet. It has passed through conglomerate and is in clay and talc.——The East Dewey Co. owns a group of claims north and east of the Sunnyside ground, and work is under way on three tunnels. T. Matthews is superintendent.
Roosevelt, Jan. 9.

R. S. Law and J. McMahon are reported to have bought a group of quicksilver mines in Thunder Mountain district, near Roosevelt. The ore is said to average 6% mercury. Development will start this month.

The Kamiah M. Co. has been incorporated by E. L. Marvin, J. J. Turrish, M. A. Kinne, R. L. Edmiston, W. T. Birdsall, P. Gerhart and H. K. Cross, and has bought sixteen claims in Buffalo gulch, 3¾ miles northwest of Elk City. Development will begin in the spring. E. L. Marvin is president and headquarters of the company are in Spokane, Wash.

Manager W. Hegan of the Crooked River M. & M. Co. at Orogrande, southwest of Elk City, says he will make several changes in the mill this winter. The ore bins will also be remodeled.

Le Roy G. M. Co. has been incorporated under Washington laws, with main office in Philadelphia, Pa., to operate a group of nine full claims 1½ miles north of the Hogan mine, near Orogrande. On its ground Le Roy has timber supply, wood as well as water to run ten stamps. Its ore bodies are said to average 200 feet wide, carrying gold values. The company owns on the river water power for installation of an electric plant of 1500 H. P. F. Hyo of Spokane, Wash., superintendent, is building a mill and has development work under way.

Kootenai County.

With 120 men and 129 horses the Idaho-Continental M. Co. is shipping two cars of ore daily from the Continental mine, near Porthill, says W. T. Bailey, part owner. Snow covers the road from the mine at the top of the mountain, 6000 feet elevation, down to the Kootenai river, and sleighs are carrying the ore to the railway at Porthill. They expect to continue shipment at rate of fifty tons a day. The galena is said to carry 50% lead and 40 ounces silver. It goes to the Tacoma smelter and freight and treatment charges total $16 a ton. They are mining along the Continental lode for 3500 feet, the best ore coming from the new tunnel on the Jasper, the middle claim, where there is a shoot of shipping ore 3½ feet wide. The rest of the vein there for 25 feet is concentrating ore. Further north, in the Blue Joe tunnel, at 750 feet below the top of the hill, they are taking out ore at 600 feet from the portal of the tunnel. W. Roberts is superintendent.

P. Sherlock of Wallace, owning placer claims near the St. Joe basin at head of St. Joe river, says the past season he reached bedrock at 15 feet and completed a bedrock drain. He built a flume 1200 feet long of poles and logs. Heretofore it has been necessary to go 25 feet before bedrock was reached. The largest nugget found weighed $1.50, while many ran from 10 to 30 cents. The gravel is fine. These claims are 130 miles above the head of navigation of St. Joe river and 24 miles below its headwaters, near St. Joe basin, on Sherlock creek. To reach them it is necessary to go to Iron Mountain, Mont., 80 miles from Wallace; then up Cedar creek 20 miles and thence over the main range of the Bitter Roots to the St. Joe, says Sherlock.

Shoshone County.

The Gold Hunter mine, near Mullan, which was closed down several months ago, has resumed operations with J. Gearen of Wallace as superintendent, and twenty-five miners are at work. For the present the mill will remain idle, but it will be improved. The ore bodies will be blocked out. The company is of Minnesota men, with P. J. Hennesey of Chicago, Ill., one of the principal owners. D. P. Roblfing of Salt Lake City, Utah, is manager.

C. S. Crysler of Spokane, Wash., interested in gold dredging near Delta, says his Mascot dredger will resume in the spring as soon as the ice gets out of the creek. The tests of the ground for three and a half months last fall proved the dredger can handle 2000 yards a day with nine men. The Delta G. M. Co. has a dredger which can handle 1200 yards a day. It ran two months last fall. The Mascot dredger works to depth of 26 feet and for width of 20 feet, which is half the width of the gulch. Crysler says he has worked half way across the stream for 600 feet and has 3200 feet more to go.

MICHIGAN.

The output the year 1903 is reported at 190,000,000 pounds of copper by the Lake mines, an increase over 1902.

Houghton County.

No. 3, the northerly, or Mesnard, shaft of the Quincy mine, at Hancok, is 2000 feet in depth. The showing in the lower levels is said to be improving. At the surface the vein was narrow and lean in copper. Eventually this shaft will be connected with the workings of the North Quincy, under the Franklin mine. The output of the Quincy mine for month of December was 1202½ tons of copper.

Construction is progressing at the reduction works of the Michigan Smelting Co., 3 miles west of Houghton, and it is expected they will blow in the furnaces by July. This plant will handle the mineral of the Wolverine, Mohawk, Atlantic, Baltic, Trimountain, Champion, Winona and Michigan mines, says the Record.

The destruction of No. 1 shaft of the Isle Royale mine, near Houghton, by fire will probably curtail production for several months, until the shaft can be retimbered, though extra men can be worked on No. 2 shaft. It is expected to require six months to complete the repairs.

The Old Colony mine, near Calumet, reports having struck last week a nest of mass copper in crosscutting to the lode shown by the diamond drill.

The Elm River mine shaft, near Winona, is down 820 feet, and they are crosscutting the lode.

The Centennial mine "A" shaft, near Calumet, is down 2825 feet on the Kearsarge lode and drifting is in progress north and south at the 27th level. The shaft house is completed.

The product for month of December of the Copper Range Con. mines, near Painesdale, was as follows: Champion, 852 tons of copper; Baltic, 708 tons; Trimountain, 547 tons. The amygdaloid rock being taken from the Champion mine is said to be increasing in values. The air compressor which the company is putting in will increase the company's milling facilities 50%. The compressor parts filled sixteen freight cars when shipped. The machine has quadruple expansion cylinders and takes steam from special boilers at an initial pressure of 300 pounds per square inch.

The December product of the Atlantic mine, south of Houghton, amounted to 336 tons of copper.

Keweenaw County.

The Mohawk mine, near Allouez, month of December output amounted to 319 tons 700 pounds of copper. Two heads are operating in the mill and 1000 tons of rock are shipped to the mill daily. The third head is nearly finished and the equipment of shaft No. 4 is ready. Most of the additional rock will be taken from this shaft.

The Allouez shaft on the Kearsarge lode, near Allouez, was sunk 75 feet during December, giving it depth of 320 feet. Several months will be required to reach the lode and get levels run, says the News.

Ontonagon County.

The main shaft of the Victoria mine, at Victoria, is near the twenty-first level. Stoping ground has been opened up and production will begin. —— By cutting down its tonnage and increasing grade of rock treated, through selection, the Mass mine at Mass City is obtaining thirty pounds of refined copper per ton from rock stamped. The Mass mine yielded during December 160 tons of copper, consisting of eighty-five tons of mass and seventy-five tons of mineral, obtained from stamping 6400 tons of rock.

Superintendent Brady of the Michigan C. M. Co., at Rockland, says little drifting is being done at present, the ground already broken being more than sufficient for needs of the mill for some time to come. The production is equally divided between mass copper and that taken from stamp rock. The Branch vein is showing satisfactory values. About 250 tons of rock are being treated daily, which amount will be increased to the full capacity of one head, 500 tons.

MISSOURI.

Jasper County.

(Special Correspondence).—During the year 1903 the Joplin mining district produced 184,196 tons of zinc sulphide and 28,387 tons of lead sulphide (galena). This ore sold for over $7,000,000. The new year finds mining operations in the district in an active condition for this season of the year. The price of zinc sulphide concentrates for the week ending Jan. 9 was $38 per ton, which is the highest ever received for any corresponding week since this industry was established. The price for the same week in 1903 was $33.50; in 1902, $30, and in 1901, $27. In 1894 it was $18 per ton. Galena concentrates sold last week for $54 per ton, which is the highest price paid in any corresponding week, except 1900, for several years. The price in the same week for 1903 was $51, and in 1902, $42. The price of these ores generally rules low at this season of the year.

Joplin, Jan. 11.

In Sherwood, near Webb City, the Webb City Iron Works, on the Crellor & Young land, in a drift started south of the pump shaft on the 125-foot level, has opened up an ore body in spar ground. J. Stewart and G. Wright, owners of the Webb City Iron Works, say they will begin this week sinking the pump shaft to the 150-foot level, when they will extend the drifts into the ore body, and expect to have sufficient ore blocked out by spring to stope and supply a mill which they will build. Varnor, Rice & Co., on the same land, have been sinking their pump shaft to get water to clean their ore with, and are 130 feet deep. The company begins this week cleaning ore on hand jigs from the ore body that they sank into, which yields 25% zinc sulphide. On the Mitchell land, adjoining on the west, Nails, Martin & Co. and the Utility have resumed operations.

The 100-ton mill at the Hayseed mine, northwest of Carthage, was completed last week and is in operation.

W. Jones and F. J. Gay are sinking a shaft on Shoal creek, south of Galena, for the Galena G. M. Co. The company intends to prospect for gold. Several shafts have been put down. The deepest one, the Murdock shaft, is down 219 feet, but no ore has as yet been found there, says the News-Herald. Assays taken from some of the other shafts show values. The Murdock shaft will be sunk deeper.

W. G. Bryant and J. Durby of Carterville, at their new mine and mill at Neck City, report they have a face of ore 45x70 feet which they are opening up.

MONTANA.

Deer Lodge County.

A strike is reported made in the Olive May mine, in Olsen gulch, 7 miles west of Anaconda. The Olive May is owned by A. Dumouchel, A. P. Cloutier, J. P. Prouix and A. Bourbonnere of Anaconda. The samples taken show values in gold, silver and lead. The shaft has been sunk to depth of 250 feet, and the find was made in drifting. There are several other mines being worked in Olsen gulch, including the May Flower, owned by G. Gunn and C. W. French, and an iron mine owned by F. G. Brown. At the May Flower a tunnel has been run and two ore chutes crosscut at depth of 300 feet. The average value is $15 a ton.

Granite County.

The Milwaukee G. Extraction Co., which owns twenty-five claims near Phillipsburg, is building a 100-stamp cyanide mill. Development work has been in progress for three years and a vein of ore 60 feet wide, running $4 per ton, is said to have been opened.

Kaiser Bros. and C. Williams, who own mining claims on northern slope of Red Hill, north of the Hope Co.'s ground, last week resumed work by putting men to work on their tunnel. They have a body of iron ore carrying 4% copper and silver values. It is in Flint Creek district, 2 miles north of Philipsburg.

Jefferson County.

The West Montana M. Co. has been organized by S. L. Burbridge and J. Winscot of Helena and has taken over a group of mines near Basin. There are six claims in the group on which considerable development work has been done, showing a vein of 40 feet at the crosscut. Values are in gold, silver, copper and lead. The claims are 2½ miles from the Great Northern and Northern Pacific railroads, and there is said to be sufficient water for a concentration plant on the property. Work will be started this month.

L. E. Dubois of the Red Berg M. Co., manager of the Reliance mine in High Ore gulch, near Basin, says this property has been prospected by a tunnel, and the company is preparing to increase development work.

Lewis and Clarke County.

The South Bend M. Co. is increasing development work on its group adjoining the Peerless Jennie, in Ontario district, near Helena. A 500-foot tunnel is being run which is in 260 feet and which will give depth of 2250 feet below the upper tunnel, says the Record. In the upper tunnel a vein has been struck which runs fifty ounces silver and $10 gold per ton. The company has leased its Uncle Tom claim to Eastern men, who will develop it.

Park County.

The plant of the Kimberly-Montana M. Co. at Jardine, including that at the Bear Gulch group, will be operated by electricity.

Silver Bow County.

The average daily output of ore of the mines of Butte is 10,000 tons, of which one-half goes to the Washoe smelter, at Anaconda, and the remainder to the Colorado smelter, the Montana Ore Co. smelter, the Butte & Boston reduction works and to the Boston & Montana smelter at Great Falls.

The Amalgamated C. Co. is working its mines and smelters full blast and expects to continue. It is employing nearly 12,000 men, distributed as follows:

In Butte mines	6,000
Butte smelters	600
Anaconda smelter	1,800
Great Falls smelter	1,300
Coal mines in Montana	500
Coal mines in Wyoming	650
Lumber camps, etc	800
Prospecting, etc	300
Total	11,950

The company ships to its smelters 9700 tons of ore per day. Exclusive of the salaries paid to local officials, the Amalgamated pays out in Butte in wages alone $22,500 per day.

NEVADA.

Churchill County.

It is reported the Hollinger Bros. group at Pike's Diggings in Eagle valley, near Eagleville, has been bonded by D. Francis and G. P. Smith for $10,000. A shaft has been sunk to depth of 125 feet, and free milling ore is exposed. The ledge shows width of 12 feet. The camp is said to have timber and water close at hand.

Esmeralda County.

T. L. Oddie of Tonopah bought an interest in three groups of claims known as the Diamond Joe, Joshua Man and Mattie groups, 3 miles east of Goldfield, southeast of Tonopah.

Eureka County.

At the Ruby Hill T. & M. Co. mine the south crosscut in the tunnel of 20 feet last week broke into ore. More men have been put on to increase development. The find made is in 1700 feet and at depth of 700 feet from the surface.

Humboldt County.

Assays on ore from the strike in the mine of the Glasgow & Western Exp. Co., near Golconda, show 10% copper, 6.5 ounces silver, with $4 gold per ton, says J. Farren, general superintendent. The find is on Peacock ground in the Adelaide group of mines, and 3000 feet distant from any ground previously worked.

Lander County.

C. S. Vadner, manager of the Gracie group of copper claims at Elder creek, near Battle Mountain, has made arrangements for further development of the Gracie.

Lincoln County.

The Good Hope mine at Searchlight has resumed operations, says Superintendent Drummond.——The shaft on the Searchlight M. & M. Co.'s mine is down 200 feet.

Lyon County.

H. E. Miller, part owner of the Bluestone and Douglas group of copper mines near Yerington, says the Bluestone, after being under bond for some time, has reverted to Miller & Co. Superintendent A. F. Whitman has men doing development work on the mine.

Nye County.

The California-Tonopah M. Co. has closed its mine, which adjoins the Gold Hill at southeast part of Tonopah.——At the Halifax mine the water has been pumped out of the 600-foot level and a station cut at which the pump is placed. The remaining 40 feet of water in the shaft is being pumped out and three shifts will be put to work sinking. It is intended to sink to the 1000-foot mark before crosscutting.

Washoe County.

W. J. Alexander and J. W. Simpson report opening up gold-bearing rock on their claims, 29 miles north of Reno and northwest of Wadsworth. The vein is 18 inches wide, of free-milling ore, and was cut at 50 feet by a tunnel.

NEW MEXICO.

Taos County.

A. E. Eckles of Alamosa, Colo., is developing the Brown Palace mine on Malette creek, near Red River. The ore assays $10 gold. Eckles will build an arrastra.

OREGON.

Baker County.

Superintendent W. Rummery has put men to work on the Gipsy Queen mine, near Sumpter. A shaft is being sunk at the mouth of the tunnel, which runs on the vein.

B. MacDonald of Spokane, Wash., manager of the Cornucopia group of mines, says work is progressing. The group comprises forty-one mining claims, twenty of which are patented. The property is equipped with mining and milling machinery which is driven by electricity generated at a power station 2½ miles from the mines. The electric plant has capacity of 1000 H. P. The position occupied by the mines makes it possible in their development to get considerable depth by cross-cut tunnels. Two crosscut tunnels are to be driven; the shorter will be 4000 feet in length, and its course will cut two of the principal veins of the district at average depths of 1000 to 1500 feet below the surface. The lower tunnel will be driven at a point near the foot of the mountain and 1000 feet vertically under the shorter tunnel. Near the portal of deeper tunnel a mill will be built, and all the ore mined will pass by gravity through raises connecting the workings with the tunnel through which it will pass to the mill.

Columbia County.

F. Payne & Co., of Scappoose, have bought the smelter plant at Linnton, and removed it to their mine on north fork of the Scappoose river, where they expect to produce pig iron. The iron ore deposits at this place have been proved by tests to carry 60% iron, says the Telegram.

Grant County.

Mills will be built on both the Belcher and Red Lion mines, near Granite, in the spring, says Superintendent P. A. Brady. A 20-stamp mill will go in on the Belcher and a smaller plant on the Red Lion. Development work is progressing. At the Belcher the lower tunnel is being driven and a raise made on No. 3 ore shoot from lower to upper tunnels. The distance is 153 feet. In the tunnel No. 4 shoot has been cut.

Josephine County.

The Golden Drift M. Co., operating on Rogue river, 3 miles above Grant's Pass, has completed the main structures of its power dam across the Rogue, and has suspended work for the winter. The cribs have been all filled in with stone and barred over to resist the winter freshets. In the spring the turbines and pumps will be placed. At the start 5000 H. P. will be generated. During this winter the company is operating its dry diggings placers, water being derived from the hydraulic ditches tapping Jones creek. This stream is small, and through the aid of a reservoir water for six hours' run each day is secured for the giants.

Burton & White have bought seven placer claims on Reuben creek near Mount Reuben, near Grant's Pass. They will put in machinery—a boiler, engines, derricks and cables and hydraulic giants.——The Oregon M. Co., composed of Seattle, Wash., men, is doing development work on Wagner creek. The company is putting in a 5-stamp mill. It owns fifty acres of mineral land on Wagner creek, with water rights. The claims are the Pittsburg, Little Pittsburg, Riverside, Rutb, Double Jack and Pilgrim. The mill is expected to be in operation this week.——Imbler & Isaac are developing and have equipped an hydraulic placer mine on Chetco river, south of Kerby. Water is derived from Chetco river. The diggings are said to carry coarse gold and platinum and are not deep, running but 6 and 8 feet.

J. B. Crawford, with Eastern men, operating mines near Grant's Pass, says he will build a smelter at Grant's Pass which will handle custom ores in addition to their own.

Lincoln County.

B. F. Jones, operating placer mines on the ocean beach at Otter Rock, north of Newport, has taken 1½ miles of beach. The sand is said to carry platinum and flour gold. It is intended to test the beach and secure if possible a process to save platinum.

Multnomah County.

Work still continues steadily on the oil well near St. Johns by the Ogden Petroleum Oil Co. The well is down 495 feet, and the refuse from the drilling is impregnated with oil. At the depth attained the cuttings show shale, coal and lignite mixed with slate and carrying petroleum, says the Telegram. It is intended to go to the depth of 1000 feet.

Wallowa County.

D. C. Guernsey, superintendent and manager of the Eureka M. Co., near Enterprise, says their sawmill at Buckborn Springs is getting out timber. The company is completing the smelter, having the foundations done and the frame work going up. Other work under way is the building of a suspension bridge across the Imnaha river to connect the mine and smelter; also a dam across the Imnaha to operate and light the mine and smelter. Another steamer is being built for transportation on the river and is expected to be ready May 1.

SOUTH DAKOTA.

Lawrence County.

With the operation of 100 additional stamps at the Amicus mill at Lead, making 240 at this plant, the aggregate number of stamps dropping in the Homestake system will be 1000. The framework of the Amicus is completed and inclosed. A portion of the machinery is in position.—— At cyanide plant No. 1 at Lead arrangements have been made for building an L-shaped structure 200 feet in length by 150 feet in width at the west end, containing floor capacity for six additional tanks, making a total of twenty sand vats for the entire plant. The addition to the cyanide plant is expected to be ready by the time the additional stamps to the Amicus mill begins dropping.

It is reported the Golden Reward smelter, below Deadwood, will resume operations, treating ore from the company's mines in Bald Mountain district. H. Franklin is manager of the Golden Reward. The smelter was shut down eighteen months ago on account of a strike.

The plant for the reduction of tin ore for the Tinton M. Co. at Tinton is nearing completion and is expected to be ready for operation in February. The building is enclosed and the machinery is being placed. The boilers have been set. A compressor is on the ground. The mine is opened with a tunnel into one of the ledges, and is blocked out for stoping.

Pennington County.

The Keystone Recorder says machinery for the Lucky Boy mine, near Keystone, arrived last week, having been delayed in transit. Development work will be resumed.

TENNESSEE.

Polk County.

The Tennessee C. Co. at Ducktown expects to produce between 14,000,000 and 15,000,000 pounds of copper during 1904. The company is planning to increase its furnace capacity to six furnaces by 1905, which is twice the number now in operation, including the one blown in Dec. 17.

UTAH.

The situation in the coal camps in eastern Utah is showing improvement, says the News, and it is expected the normal output of coal will again be available by Feb. 1st. As a result the metal mining districts no longer fear danger of a coal famine for the mines, mills and smelters.

Beaver County.

Work has been resumed on the Curzon group in Star district, near Milford, under J. Forgie. This group adjoins the Copper King.——The Catawba M. Co., owning eleven claims in Beaver Lake district, proposes to increase work during the coming year, says President and Manager Botkin.

Superintendent Trenam reports an increased flow of water at the Beaver Con. mine, near Milford, amounting to fifteen gallons per minute. They have been able to hoist it thus far, but a pump will be put in.——Manager B. Lloyd of Salt Lake City of the Copper Ranch and Copper Mountain companies, says at the Copper Ranch it is intended to resume sinking on the Jewel mound incline, which is 125 feet deep. At the east end drifting will be done from the bottom of the shaft.——W. J. Bowring, who has a lease and bond on the Copper Mountain mine, has arrived from Salt Lake City to put on more men to increase development.——Neihurg & Erickson have resumed work on the Humboldt mine, near the Kitty Cluff mine.

Box Elder County.

On the west side of the Great Salt Lake, west of Ogden and 10 miles from Lucin, on the Southern Pacific Railway, the Giant Copper Queen M. Co., C. A. Dugger manager, is opening up ore. The mine is being worked by a tunnel, which has been driven 1020 feet, at which point a ledge was cut showing a width of 13 feet. The group is 3 miles from the Copper Mountain mine.

Iron County.

At the Johnny mine at Stateline the sinking of the shaft to the 300-foot level has been completed and drifting will start towards the ore body shown in the upper workings. The mill is closed down pending addition of slimes attachment to the cyanide department. The plant will be in operation again by Feb. 1st.

Juab County.

The Yankee Con. of Tintic, near Eureka, shipped during 1903 a total of 7600 dry tons of ore, from which, says Secretary Amsden, there was smelted 3,865,827 pounds of lead, 157,619 ounces of silver, and gold of value of $16,000. While the management has first-class ore exposed, it is confining the output at this time to the second-class while continuing exploratory work.

At the mines of the Morning Glory G. M. Co., up Undine hollow near Robinson, men are drifting on the vein, which is 5 feet wide. A shoot a foot wide has been opened up.——The South Swansea mine, near Eureka, owing to the smelters not desiring to handle that class of ore, has been closed indefinitely.

Morgan County.

The Park City Co-operative M. Co. of Park City has bought the Copper Mountain group of ten claims 5 miles from Morgan, on which it will start development work this week.

Piute County.

Development work is under way on the Marion group of mines near Marysvale, adjoining the Log Cabin mine, says B. D. Luce, manager. They have decided to tap its ledges by tunnel. From its outcrop, the main fissure shows $3 gold per ton. The main tunnel on the Log Cabin group is in 480 feet, the last 80 feet having been on the strike of the ledge, showing an average of $3.56 gold per ton. In addition to this, the company is driving two other tunnels.—— The Bradburn group, in same location, is being developed by a Pittsburg Pa., company.

Work is reported progressing at the Hope group of claims near Marysvale. Two shafts will be sunk. Men have been put to work at the paint mines near Koosharem, which are owned by Kansas City, Mo., men. J. M. Jones is superintendent.

Salt Lake County.

The production of the Utah Con. mine and smelter for mouth of December was the largest in the history of the company, says the News, and 18,000 tons of ore were sent from mine to smelter. This produced 1,250,000 pounds of copper bullion. The monthly product for 1904 is expected to reach 1,500,000 pounds of copper.

At the Ohio C. (Columbia) Co. mine at Bingham the station at the 115-foot level was completed last week and drifting east and west begun. Sinking was also resumed, and the shaft will be put down to 215 feet. Breaking ore in the All's Well stopes has resumed. An extension of the Copper Belt railroad from its former lower terminus to the Winnamuck mill bin is being made and on its completion the Columbia ore will begin to move.

A deep tunnel to open up the Copper Glance group, near Bingham, has been started in McGuire gulch by J. E. Edmunds, manager. The tunnel will cut the main ledge at 1800 and 750 feet vertically under the old workings in the Keystone gulch, which were abandoned owing to water.

Bingham ore shipments via the Copper Belt Railroad comprise 300 tons daily from the Commercial mine for the Bingham Con. smelter, 150 tons daily from the Boston Con., and 200 tons daily from the Yampa.——Connection between the Columbia and its mill is completed and ore will be started this week.——During December the Bingham Con. Co. at Bingham shipped 1000 tons of ore from the Fortune mine. Shipments from the Dalton & Lark, Brooklyn and Fortune continue to average 150 tons daily, and from the Commercial 300 tons. As the Dalton & Lark is now drained by the Mascot tunnel, and the Brooklyn nearly so, driving of the tunnel may not be resumed until spring, says the Bulletin. It continues to discharge a large volume of water, with beneficial results to several neighboring properties.

The Rob Roy M. Co., organized to develop the Rob Roy group on Clipper hill, near the Zelnora, Argentine and Morning Star mines, near Bingham, has begun work. The officers are E. Rauch, A. McKellar Jr. and E. McGurrin.

Plans are under consideration for conveying ores from Alta camp to the lower end of Little Cottonwood canyon by aerial tramway and thence to the smelters over the tracks of the Rio Grande Western Railway, says President T. Jacobson of the Columbus Con. M. Co., the tram to run from the mine to the company's power plant, 3 miles above Wasatch. It is thought the present cost of transporting ores to the smelters can be reduced 50%. Usually the fall of snow in the camp in the winter is heavy, says the News, and occasionally the roads become blocked. With a tramway in operation, no interference of this kind would occur. There has been some talk of rebuilding the old rail tramway line and equipping it with electric motors and cars.

Sevier County.

The B. W. & H. mine in Henry district, near Richfield, has temporarily closed down with the completion of the tunnel contract. A length of 720 feet has been reached. A consolidation with the Blue Eagle, an adjoining group, is proposed, and no more development will be done until this is settled.

Work continues in progress at the Signal Peak mine on the Fish creek side of Gold mountain, near Richfield, says Manager J. H. Nelson. The tunnel is nearing the vein.—— A mill, next spring, is proposed, says W. G. Elvin, manager of the Trapper's Pride mine, on the Fish creek slope of Gold mountain. Superintendent A. D. McLain has cleaned out and retimbered the workings. The main tunnel has been increased 500 feet in length since summer. It follows a 15-foot vein that

runs $9 gold per ton at a vertical depth of 400 feet.

Summit County.

The Cougar G. & S. M. Co. has been incorporated at Park City to operate the Cougar group of five lode claims on the Smith & Morehouse fork of Weber river. The officers are: R. McDonald, B. J. and A. M. Martin.

Tooele County.

The Honerine M. Co. at Stockton, W. F. Snyder manager, reports the drain tunnel completed to length of 5850 feet and progress is being made at rate of 7 feet a day. The mill will be ready for operation by Feb. 1st. While the drain tunnel is not expected to reach the ore bodies of the Honerino till next summer, the mill during the first six months of its operation will be supplied with ores from the surface workings and from other mines of the camp.

The Reynolds group at Stockton, which adjoins the Honerine on the west, has been taken over by F. G. Richmond, B. F. Bauer and S. V. Ham of Salt Lake City for $100,000. The group is of eight full claims and two fractions, and was mined in former years. The driving of the Honerino tunnel will unwater the ground in the Reynolds group. It is intended to start work on the group this month. A plant of machinery will be put in. F. G. Richmond is manager.

The Geyser-Marion mill at Mercur is in operation, under direction of the Green Reduction Co. of New York, which is working over the tailings dumps.

The annual report of the Black Diamond M. Co. of Stockton, says Manager Dedorichs, shows work has been resumed, with a crosscut being extended from the 180-foot level to the Ada vein. The most important development is that made in Black Diamond ground through the Honerine tunnel. The Black Diamond adjoins the Honerine.

WASHINGTON.

Ferry County.

The Nob Hill mine at Republic is progressing under lessees. Thirteen men are working underground and drilling is by hand. The raise from the tunnel is up 35 feet and will go 60 feet more to connect with the surface stope. Ore is being stoped from the tunnel level upward and is being shipped. The stope is 7 feet wide. More men will be put on.

Okanogan County.

L. Hedges of Wauconda says the Wauconda tunnel is in 1300 feet and he has seven men on two shifts driving it ahead. He is also operating mines at Buffalo Hump, Idaho. The litigation between the company and J. B. Rossman has been settled, the company buying the Rossman mill and all of the interests owned by Rossman & Brown in the Wauconda group.

Pierce County.

Work is progressing on the improvements under way at the Tacoma smelter at Tacoma. These consist of additions to the lead refining plant and a three-story brick bag house and a steel blast furnace. The bag house, which is 110x60 feet, is expected to result in additional saving to the smelter. The apparatus includes 1000 bags, being each 25 feet in length by 2 feet in diameter, which are placed suspended with the open end downward. The smoke is passed into the bag house and forced through the bags, which catch all the valuable mineral otherwise carried off in the smoke. It is expected that the bag house will be in operation by March 1. The new steel blast is completed and will be fired up this week. It will make the fourth lead furnace in operation at the plant. Its capacity will be 200 tons daily, and it will nearly double the capacity of the lead plant. The total capacity of the smelter will be 300 tons of copper ore and 500 tons of lead ore daily.

Stevens County.

L. P. Larson of Spokane reports buying the Last Chance (the Silver Butte), on Deep creek, near Northport, and first payment of $3000 made. The ledge has been opened up at depth of 300 feet, showing 4 feet of galena. Adjoining the Last Chance group is the Great Western.

D. F. Stroheck, superintendent of the Copper King mine at Chewelah, reports surface improvements completed and underground work resumed. Sinking will be continued in the new shafts, as well as drifting and stoping on the ore shoots. They expect to begin shipping in February. He says the ore averages $30 per ton, and they will get a rate of $4.50 for freight and treatment. Superintendent Parker has men at work on the June-Echo.——The development of the Nellie S. mine, under Manager Baker, is progressing.——The Jay Gould is preparing to resume work and ship ore.

WYOMING.

Carbon County.

J. F. Ledhetter of Salt Lake City, Utah, operating the Beulah mine, at Battle, says he is getting out copper ore and the tunnel is nearing the contact. The main tunnel has been driven 825 feet, and besides this, 250 feet of drifting has been done.

FOREIGN.

AFRICA.

Transvaal.

The production of gold for the Transvaal for month of December is reported at 285,000 ounces, compared with 279,813 ounces in November, 1903, and 196,023 ounces in December, 1902. The following are the figures in fine ouncos:

Month.	1903.	1002.
January	199,279	70,341
February	196,513	81,405
March	217,465	104,127
April	227,871	119,589
May	234,125	138,602
June	238,320	142,780
July	251,043	149,179
August	271,918	162,750
September	276,197	170,802
October	284,544	181,440
November	270,813	187,375
December	285,000	106,023
Totals	2,962,088	1,705,413

AUSTRALIA.

New South Wales.

At Jembaicumbene there are four dredgers at work and another is being built.——Opal is reported struck at depth of 73 feet at White Cliffs by Dunlop & Vincent, this being the deepest point that the gem has hitherto been met with on the field, says the Government Journal.

Drilling operations that have been in progress at Cessnock, near Maitland, for some months past have shown a seam of coal. The measure was reached at depth of 260 feet and has been proved for thickness of 27 feet. The drilling operations are being carried out on the H. Smith mine, in conjunction with the Caledonian Co.

BRITISH COLUMBIA.

Boundary District.

At the Athelstan mine, near Greenwood, the number of men at work has been increased to thirty and ore shipments are also being increased.

East Kootenay District.

At the North Star mine, near Fort Steele, thirty men are at work and development is progressing. Shipments will be resumed before Feb. 1st. It is reported that an ore body 3 feet wide has been opened in the 300-foot level. The shaft will be sunk to a depth of 500 feet.

The total output of the three Crow's Nest collieries operated by the Crow's Nest Pass Coal & Coke Co. for the year 1903 is reported as follows:

Coal—	Tons.
Coal Creek (Fernie)	240,000
Michel	262,000
Morrissey	150,000
Total	652,000
Coke—	**Tons.**
Fernie plant	96,000
Michel plant	70,000
Total	166,000

The present daily capacity of the three collieries is as follows:

	Tons
Coal Creek	1,200
Michel	1,400
Morrissey	800
Total	3,400

The capacity of the three coke oven plants, two of them still incomplete, is estimated at between 1200 and 1400 tons of coke per day.

The following table shows the number of men on the company's payroll at present:

	Miners.	Oven-men.
Coal Creek	427	117
Michel	583	105
Morrissey	291	25
Totals	1,301	247
Men on general construction		250
Management, engineering, clerical		37
Total on payroll		1,835

The management of the St. Eugene mine at Cranbrook is putting in a slime concentrating process to increase the savings from the lead concentrating ores. It is estimated that 1½% of the values are lost in the tailings, says the Review. The process will be to rework the tailings and slimes heretofore dumped into the lake. A building 150 feet long by 25 feet wide has been built on the dump at the lake shore. On the upper floor will be settling tanks and on the lower floor a series of concentrating slimes tables.

Nelson District.

The Dundee mine at Ymir has been sold to A. E. Rand et al. of New Westminster and first payment of $5000 made.

Slocan District.

A. K. Stewart has resumed operations on the Whitewater Deep mine, near Sandon. He has seven men at work and has started driving a crosscut.——It is stated the Slocan Star is overhauling the concentrator and will put in a magnetic zinc separator in addition to other machinery. Operations will start in February.

Rossland District.

The Rossland Miner gives the following output for 1903 for the mines of Rossland district:

Mine—	Gross Tonnage.	Estimated Gross Values.
Le Roi	182,000	$2,112,000
Centre Star	81,957	1,093,353
War Eagle	59,948	813,198
Le Roi Two	22,000	352,000
Le Roi Two (milled)	2,000	16,000
Jumbo	4,205	52,740
Spitzee	570	8,550
I. X. L. (milled)	2,000	12,000
Kootenay	7,606	87,469
Giant	830	10,375
Velvet	3,376	67,520
Iron Horse	40	320
White Bear	297	4,145
O. K.	25	625
Homestake	90	675
Total	377,131	$4,631,270

The output for the past ten years has been:

Year—	Tonnage.	Estimated Value.
1894	1,856	$75,000
1895	19,693	702,359
1896	98,075	1,243,360
1897	68,804	2,007,780
1898	111,282	2,470,811
1899	180,300	3,211,400
1900	221,902	3,500,000
1901	279,133	3,500,000
1902	329,580	4,274,352
1903	377,134	4,631,280
	1,705,668	$25,816,340

In the payrolls of Rossland mines the amounts disbursed by the mines are divided under two headings—one for wages of mine workers and the second embracing salaries paid to managers and office staffs. Following are the amounts:

Mine.	Wage Roll for Year.
Le Roi	$385,000
Centre Star	162,500
War Eagle	136,700
Le Roi Two	102,000
Kootenay	45,000
Jumbo	25,000
Spitzee	12,000
Giant	4,000
Velvet	25,000
White Bear	50,000
I. X. L.	3,000
Other Mines	25,000
Total	$975,200
Mine salaries (estimated)	$45,000
Total	$1,020.000

This does not include the payroll of the Northport and Trail smelters nor the amount expended in prospecting.

The returns for the year 1903 from the Rossland mining recorder's office show:

Certificates of improvement	14
Certificates of work	136
Payment in lieu of work ($100)	2
Claims recorded	64
Bills of sale, etc., recorded	24
Water grants issued	6
FREE MINERS' CERTIFICATES.	
Companies	15
Personal	466
Substitute personal	1
Special personal	11
	493
Existing crown granted mineral claims, (approximate)	657

A feature of the foregoing is the number of crown granted mineral claims existing within the boundaries of the Trail Creek or Rossland mining division. The division is one of the smallest in area in the province. The expenditure in work on these claims, together with costs of procuring the crown grant in each instance, will average $1000. The acreage under crown grant is over 20,000.

West Kootenay District.

A strike is reported from the Oyster-Criterion mine, Rossland, near Camborne. Additional men are being put on and the stamps are dropping steadily at the mill. Manager M. W. Pool says thirty tons of ore per day are being treated. The rock being put through is from the Rossland, and development is being increased on the Oyster and Criterion with machine drills. They propose to add ten stamps to the 10-stamp mill.

W. F. Teetzel has bought the Golden West and Crown King claims for $25,000. These claims are in the Poplar Creek district, in the Lardeau.

INDIA.

The annual report of the Champion Reef G. M. Co. of India, Ltd., operating in Kolar section of Mysore district, has been issued, showing 174,115 ounces of bar gold obtained from 173,629 tons of quartz crushed in the mills, an average yield of 19 dwts. 21 grs. per ton; while 32,335 ounces were gained by the cyanide process from 246,300 tons of tailings, an average yield of 2 dwts. 15 grs. per ton. These figures, compared with those for 1902, show an increase, the tonnage milled being an increase of 39,541 tons. Better duty has been obtained from the batteries, an average of over 14,000 tons per month having been crushed: and with regard to the tailings, the additions to the cyanide plant built in 1902 have been in full operation, so that the total quantity treated has been maintained at an average of 20,000 tons per month. The yield per ton of bar gold from the quartz and tailings together equalled 1 oz. 2 dwts. 12 grs., or 6 grs. per ton less than in 1902. The total returns for the year amounted to 206,450 ounces of bar gold of the value of £782,756. After deducting royalty payable under the leases, and adding other receipts in the income and expenditure account, an income of £749,419 results. The total costs charged against this income amounted to £308,078. The mining and milling costs were 2s. 9d. per ton less than during 1902, and 7s. 6d. less than in 1901. The tailings costs are down 1s. 1d. per ton. The comparatively large reduction in the tailings costs is largely due to no longer having to pay royalty to the Cassell Co. on the gold produced by cyanide process. During the year additional mining rights were bought from the Gold Fields of Mysore Co. Preparations for starting the new vertical shaft, projected to strike the lode at depth of from 3500 to 4000 feet, have been made and sinking begun. The Cauvery electrical power scheme having proved a success, the company, under agreement with the Mysore Government, is preparing to increase this supply, which is expected to be available by July. The extra horse power thus obtained will be used for driving the air compressor, which at present is working under steam. The central electric power station will be finished and the substitution of electricity for steam as motivo power for all the machinery on the mine completed. No difficulty has this year been experienced in regard to a sufficiency of water, the weather in the district of the mines having been favorable for keeping the tanks fully supplied. During the past three months the rainfall has been abnormal, causing considerable damage in the locality. Mining development work for the year exceeded that of 1902 by 2376 feet, the total amounting to 3¾ miles.

MEXICO.

Chihuahua.

The Encinillas Mines, Ltd., has its smelter at Santa Rosalia, in operation, and has on hand five road traction engines capable of hauling seventy-five tons of ore each at a trip in the two cars built for the purpose. It is expected the engines will make a trip with a load from the mines to Santa Rosalia, a distance of 60 miles, in a day. The road to the mines has been shortened, and it is stated that 10% grade is the heaviest on the route. At the mines electric power is used for hoisting and for lights for the buildings and mines. The deepest shaft is 430 feet.

The Pinos Altos mines, at Pinos Altos, have been sold to W. P. Dunham and associates of Denver, Colo., and Los Angeles, Cal. The mines produce silver-gold ores, and are equipped with a 55-stamp mill.

Coahuila.

La Constancia M. Co. of Saltillo is operating the Deonea, Guadalupe, 3a. Zona, Providencia, La Blanca and Esmeralda claims in Monclova district, 125 kilometers east from Escalon, Chihuahua. The mines are being developed through fourteen shafts, two tunnels, driven an aggregate of 1500 feet, and drifts, crosscuts, levels, etc. The ore is said to carry silver, lead and copper, averaging $30 per ton. They have five double steam hoists, five pumps with capacity of 1094 gallons of water per minute, ten boilers aggregating 400 H. P., and three horse whims.

A deal is said to be under way hy St. Louis, Mo., men to huy the La Luz mine, owned by V. Garza & Bros., in Muzquiz district. The mine is said to carry lead and silver values.

Durango.

The Penoles M. Co. of Mapimi has put up an electric power plant to do away with steam hoists, and concentrate the power supplies of the company. The cost was $400,000. The new machinery consists of four boilers, aggregating 2500 H. P., two engines, and two three-phase alternating current generators. The new plant is in operation.

An American company is reported developing the sulphur mines at Cardenas y Lugo, near Conejos, on the Mexican Central, under an option. E. F. White is manager.

Sonora.

It is reported the Zeckendorf group (the Old Goldtree group) will be reopened. L. Zeckendorf & Co. own twenty-three claims in the group. A tunnel will be driven cutting all the ledges at a depth of over 1000 feet.

The Constitution & Italia G. M. & M. Association, operating in Hermosillo district, 25 miles east from Hermosillo, reports work progressing. The mines are on a gulch running northerly 2 miles southwest of Tortuga mountain. The workings in the Italia consist of one tunnel, five shafts and several drifts, all in ore and aggregating 600 feet. The following table of cost for mining and milling sixty tons of ore (a day's run of the

milling plant) is given by the superintendent:

MINING.	Mexican Money.	
10 Miners at $1.75	$17.50	
1 Foreman	2.50	
Powder, fuse and caps	7.50	
Wear of tools	2.50	$30.00
DELIVERY OF ORE TO MILL.		
4 Men (shovelers) at	$1.50	
1 Car handler	1.50	
1 Hoistman	2.00	9.50
MILLING.		
2 Millmen at	$3.00	$ 6.00
2 Helpers at	2.00	4.00
2 Firemen at	1.75	3.50
1 Pumpman		2.00
1 Rockbreaker man		1.75
1 Blacksmith		4.00
1 Blacksmith helper		1.50
1 Foreman (superintendent)		10.00
1 Bookkeeper and assayer		5.00
2 Woodwheelers and corders at	1.50	3.00
2 Cords of wood at	5.00	10.00
Oil and lights		5.00
Quicksilver—loss of		1.50
Repairs, etc		3.75 $61.00
Total		$100.50

This is equivalent to $40 to $50 gold, according to fluctuation of Mexican silver, or 66⅔ cents to 80 cents United States money. The plant includes two 5-foot Huntington mills (each with a daily capacity of thirty tons of ore), a 70 H. P. engine, a 50 H. P. boiler, a 6-inch discharge pump. It is intended to add two more Huntington mills. For present use there is an ample supply of water coming from shaft No. 4. For the larger mill they will put in a pumping plant and pipe line from the Arroyo de la Junta, 600 yards distant, and at a vertical depth of 100 feet, in which all the year flows sufficient water. Wood is at hand, and the company owns interests in the Rancho San Francisco, which gives it the right to cut wood.

Zacatecas.

The Asturiana y Anexas group of 214 pertenencias, 5 kilometers southeast from Zacatecas in Mexico district, are owned and operated by the Asturiana y Anexas M. Co. of Zacatecas. The ground is developed by twenty shafts, one tunnel driven 900 feet, and crosscuts, drifts, etc. The maximum depth of several of the shafts is 700 feet. Equipment consists of seven Chilean mills, ten hand windlasses, two engines and two boilers. After going through the Chilean mills the pulp is treated by the patio process. The ore is said to carry silver, with a little gold.

It is reported the Mazapil C. Co. will build a smelter at Saltillo, Coahuila, to handle its ores from the Mazapil Concepcion del Oro mines. The company has been shipping to other smelters and it owns eighty-three producing properties at Mazapil.

SIBERIA.

W. McCornick of Salt Lake City, Utah, of the Siberian Exploration Co. operating in Eastern Siberia, says equipment has been put in with which they can handle 2500 tons of gravel daily. The gravel averages 25 cents per cubic yard. This capacity will be increased in 1904. Sluicing will begin again in April. The option obtained by McCornick on gold-bearing lodes in Siberia was relinquished by him after some exploratory work the results not being satisfactory.

TASMANIA.

High-grade ore is reported struck in the north stope, No. 2 level, of the Mount Rex tin mine at Mount Rex.——A diamond drill hole put down on the site of the balance shaft at the Lyell Blocks mine, near Mount Lyell, has proved the existence of a body of copper bearing clays, which is said to have averaged up to 3% copper.

Personal.

E. B. BURNS of Gold Beach, Or., is in San Francisco, Cal.

A. CARMICHAEL of Atlin, B. C., is in San Francisco, Cal.

E. B. WICKS of Salt Lake City, Utah, is in San Francisco, Cal.

A. SUTHERLAND is assayer at the Ajax mine, near Eureka, Utah.

T. R. COUNTRYMAN has returned from Oakland, Cal., to Denver, Colo.

J. W. NEILL of Salt Lake City, Utah, is in Butte, Mont., on mining business.

J. G. CUSHING of Tonopah, Nev., is in San Francisco, Cal., on mining business.

T. EWING of Los Angeles, Cal., is in San Francisco, Cal., on mining business.

W. MATHEWS has resigned as superintendent of the May Day mine near Eureka, Utah.

P. L. WILLIAMS JR. is superintendent of the Highland Boy mines at Bingham, Utah.

C. L. MORRIS is smelter superintendent of the Highland Boy mines at Bingham, Utah.

T. S. WOOD of Leadville, Colo., interested in Colorado mines, is in San Francisco, Cal.

O. J. SALISBURY of Salt Lake City, Utah, interested in Utah mines, is in San Francisco, Cal.

G. L. CARR of Carrville, Trinity county, Cal., interested in Trinity county mines, is in San Francisco, Cal.

J. B. WATSON of Salt Lake City, Utah, has gone to Brazil, South America, to make mine examinations.

G. M. PINNEY returned to San Francisco, Cal., from a trip to Minneapolis, Minn., on mining business.

D. P. ROHLFING of Salt Lake City, Utah, is manager of the Gold Hunter mine, near Mullan, Idaho.

C. C. WARNER of Bisbee, Ariz., is assistant superintendent of the Copper Queen mine at Bisbee, Ariz.

A. MORGAN succeeds P. E. Murray as superintendent of the Zubiate M. Co., near La Colorada, Sonora, Mex.

J. GEAREN of Wallace, Idaho, is superintendent of the Gold Hunter mine, near Mullan, Shoshone county, Idaho.

C. H. WELLMAN, manager Wellman-Seaver-Morgan Co., has returned from Denver, Colo., to Cleveland, Ohio.

H. W. TURNER, E. M., of San Francisco, Cal., has gone to Bohemia, Douglas county, Oregon, to examine mines.

M. L. REQUA of San Francisco, Cal., is at copper mines in which he is interested near Ely, White Pine county, Nev.

F. W. BRADLEY AND J. H. MACKENZIE of San Francisco, Cal., have gone to Nevada to make mine examinations.

L. E. DUBOIS of Butte, Mont., is manager of the Red Berg M. Co., operating near Basin, Jefferson county, Mont.

W. S. KEYES of San Francisco, Cal., goes to the State of Sinaloa, Mexico, to note mining progress in that vicinity.

J. L. SHINN, superintendent of the Utica G. M. Co., has returned to Angels, Cal., from a trip to San Francisco, Cal.

BERT C. AUSTIN, formerly assistant to F. W. Bradley, is now assistant superintendent at the Oneida mine, Jackson, Cal.

D. P. RHOLFING of Salt Lake City, Utah, is manager of the Gold Hunter lead mines in the Cœur d'Alene district, Idaho.

JOHN LAWLER, owner of the Hillside mine, Yavapai county, Ariz., has returned to Prescott, Ariz., from San Francisco, Cal.

L. GINGER, president of the Gold Coin M. Co. at San Javier, Sonora, Mexico, returned last week from Colorado Springs, Colo.

F. A. MANLEY has closed his office in Boise, Idaho, and is now chief engineer of the Union Pacific Coal Co., Rock Springs, Wyo.

J. T. HODSON, manager of the Lincoln mine, near Pearl, Idaho, returned to camp last week from Salt Lake City, Utah.

D. R. OLIVER of San Francisco, Cal., president of the Zubiate M. Co., is at the company's mines at Zubiate, Sonora, Mexico.

J. L. BRYSON has resigned as superintendent of El Oro mines at Maybert, Nevada county, Cal., and is in San Francisco, Cal.

M. W. MATHER, superintendent of the Plumbago mine at Alleghany, Sierra county, Cal., is in San Francisco, Cal., on mining business.

G. B. EARNSHAW, former superintendent of the Shawmut mine, and builder of the Shawmut mill at Bingham, Utah, is located at Nogales, Ariz.

F. J. HARD of Portland, Or., who controls the Vesuvius, Riverside and Oregon-Colorado mines at Bohemia, Or., is in the East on mining business.

H. W. STEVENS, general manager of Picacho Blanco M. Co., Morristown, Arizona, has returned from San Francisco, Cal., accompanied by his bride.

C. I. DAVENPORT, assistant manager of the Ruby G. & C. Co., of La Batamote, Sonora, Mexico, has gone to Oaxaca, Mexico, inspecting mining properties.

A. H. BUCK, E. M., until recently manager of the Sunset M. Co. at Maguarichic, Chihuahua, Mexico, is in Honduras, Central America, on mining business.

T. F. SINGISER, president of the American Flag M. Co., operating at Park City, Utah, returned to Salt Lake City, Utah, last week from Sioux City, Iowa.

P. JOHNSON, manager of the Alaska S. & R. Co., which is building a plant on Prince of Wales Island, is visiting Chicago and other Eastern points on business.

HERBERT C. HOOVER, E. M., of the firm of Bewick, Moreing & Co. of London, England, with extensive mining interests in Australia, is in San Francisco, Cal.

C. L. LOGUE, formerly chief chemist of the Anaconda copper refinery, Anaconda, Mont., is now head assayer and chemist for the Taylor & Brunton Ore Co., Butte, Mont.

J. H. HAMMOND of the Guggenheim Exploration Co. will move his headquarters to Salt Lake City, Utah. He has been examining mines near Kennett, Sbasta county, Cal., the past week.

WALDEMAR LINDGREN, E. M., of the U. S. Geological Survey, is in San Francisco, Cal., having returned this week from Victoria, Australia, where he has been in the interests of Bewick, Moreing & Co., of London, Eng.

N. S. BRADEN, formerly manager of the Westinghouse E. & M. Co.'s office at Cleveland, O., has been appointed sales manager of the new Canadian Westinghouse Co., Ltd., and assumed the duties of that office Jan. 1, 1904.

E. C. VOORHIES, of Sutter Creek, Cal., owner of the Sutter Creek Reduction Works, has been appointed by the President a member of the U. S. Assay Commission for 1904, which will test the weight and fineness of coins produced at the mints of the United States during the year.

GENERAL GEO. L. GILLESPIE, Chief of Engineers, succeeds General A. P. Chaffee as Assistant Chief of Staff United States Army, with the rank of Major-General, the first time that an officer of the United States Corps of Engineers has been in the line of supreme command of the army in eighty years.

WM. P. MILLER, JR., for a number of years superintendent of the city branch of the Selby Smelting & Lead Co., of San Francisco, Cal., has resigned that position to accept one in Mexico with the San Louis M. Co., at San Dimas, Durango. Mr. Miller, before his departure, was presented with a pair of field glasses by the employes of the company, in token of their esteem.

Obituary.

ARCHIBALD NEVINS, a mining engineer of Grass Valley, Cal., died Jan. 7th of pneumonia at Snowball, Ariz., where he was examining mines for Oakland, Cal., men. Deceased last summer returned to California from Corea, where he was connected with the Oriental Con. M. Co. He was a native of Nevada county, Cal., and is survived by a wife and two children.

C. W. THOMPSON of Tacoma, Wash., manager of the Tacoma Steel Co. which is preparing to build a steel plant at West Tacoma, was drowned by the wreck of the steamer Clallam at Puget Sound, Wash., on the 9th inst. Deceased was also president of the Washington Co-operative M. Syndicate and of the Montezuma M. Co., which are developing coal mines at Fairfax, Wash.

H. H. SWANEY, of Seattle, Wash., a former iron and steel manufacturer of Pittsburg, Pa., was drowned by the wreck of the steamer Clallam on Puget Sound, Wash., on the 9th inst. He was en route to Victoria, B. C., to complete the purchase of iron mines in which Pittsburg men were interested. Five years ago Swaney et al. erected a blast furnace plant at Irondale, near Port Townsend, Wash.

Commercial Paragraphs.

THE Brown Corliss Engine Co., Corliss, Wis., have an order from the Passaic Steel Co. of Paterson, N. J., for a 24 & 44x36 inch tandem rolling mill engine.

A. E. LINDROOTH, SHUBART & CO., who have been representing the Link Belt Machinery Co. the past six years in Denver, Colo., and who are also representing the Goodman Manufacturing Co. of Chicago, have moved their offices from the ground floor of the Boston building to rooms 121-22-23 of same building.

THE American Spiral Pipe Works, 1173-1201 South Paulina street, Chicago, have furnished 44,000 feet for 250 pounds working pressure to the Newhouse mines and smelters, Frisco, Utah; 2500 feet for 325 pounds working pressure to the Kimberly-Montana G. M. Co., Gardiner, Mont., and 7000 feet for 150 pounds working pressure to the Telluride Power Co., Provo, Utah.

THE East End Boiler Works, Desner & Ritchie, 11-19 St. Aubin avenue, Detroit, Mich., have acquired the entire sale and manufacturing of the Detroit water tube boiler from the Detroit Water Tube Boiler Co.; the construction of the boiler will have the personal supervision of Messrs. Desner & Ritchie, either for stationary or marine purposes, and of any capacity. Catalogue will be mailed on application.

BENJAMIN GUGGENHEIM of New York, a member of the well-known firm of M. Guggenheim's Sons, having acquired a controlling interest in the Holthoff Machinery Co., which has been merged with the Loomis-Pettibone Gas Machinery Co. under the new corporate name of Power and Mining Machinery Co., of which Mr. Guggenheim is the president, a prominent officer of the company writes: "By this change we secure unlimited capital, and have the benefit of Mr. Guggenheim's long experience in the requirements of mining, milling and smelting from his connection, for years, with the American Smelting & Refining Co. and the Guggenheim Exploration Co. We are largely increasing our plant and are prepared to furnish not only complete mining, milling and smelting plants, as heretofore, but, in addition, Loomis-Pettibone gas plants and the American Crossly gas engines, of which over 2,000,000 H. P. are now in use. With our increased facilities we shall be able to fill orders promptly and shall continue to manufacture only machinery of the highest grade as to workmanship and efficiency. Messrs. Holtboff and Leuzarder, the original organizers of this company, still retain their interest and connection therewith, and the business will be conducted on the same lines as in the past."

Trade Treatises.

Catalogue A, of the Browning Engineering Co., of Cleveland, O., with branch offices at New York, Chicago and Pittsburg, describes and illustrates their make of locomotive cranes, overhead traveling cranes, I-beam, jib, and other styles of cranes and material handlers.

Catalogue No. 6, third edition, issued by Harron, Rickard & McCone, 21-23 Fremont street, San Francisco, Cal., treats of the Huntington centrifugal roller quartz mill, and such machinery as would be used in mining in connection therewith. The old geared under driven mill and the new style overhead direct driven mill are both illustrated and described in detail. The pamphlet is of standard size, handsomely printed, and deserves a place in a mine manager's working library.

Bulletins 1, 2, 3, 4, 5, issued by the Mine & Smelter Supply Co., Denver, Colo., describing respectively the Dimmick classifier, swinging platform switch, Durkee electric rock drill, Wilfley slime table and No. 5 Wilfley concentrator, give detailed and illustrated description of each in compact form. Any of these publications may be had upon request addressed to the Denver office or any of their branch establishments at Salt Lake City, Utah, El Paso, Texas, City of Mexico, Mexico, or 139 Liberty St., New York City.

Pamphlet L-26-A, issued by the Laidlaw-Dunn-Gordon Co. of 114 Liberty St., New York City, describes the Cincinnati air and gas compressors. One of the compressors is described as being of a new type, in that the air cylinders are provided both with mechanically moved valves and with poppet valves, all points in the compression cycle being determined by the mechanically moved valves, with the exception of the opening of the exhaust, which is determined by the poppet valves. The booklet will be sent upon request.

Catalogue No. 21 of the W. S. Tyler Co., Cleveland, Ohio, is one of the most complete and attractive of the kind ever issued by wire cloth manufacturers. Manifest care has been taken in the preparation of this work; it is especially featured by stating the size of opening in all meshes, which with the decimal size of wire are valuable helps in the selection of screens. Half-tone reproductions of different styles are drawn exactly to scale, and the catalogue contains illustrations of the uses of woven wire cloth which are practical. The book will be mailed to mining men and those interested in screen information by sending their address to the company, Cleveland, Ohio.

Latest Market Reports.

SAN FRANCISCO, January 15, 1904.

METALS.

SILVER.—Per oz., Troy: London, 27⅛d (standard ounce, 925 fine); New York, bar silvor, 58⅝c, refined (1000 fine); San Francisco, 58⅝c; Mexican dollars, 43@45c San Francisco, 45c New York.

COPPER. — New York: Standard, $12.75; Lako, 1 to 3 casks, $13.00; Electrolytic, 1 to 3 casks, $12.87½; Casting, 1 to 3 casks, $12.75; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £59 5s spot per ton.

Copper is again showing a strong rising tondoncy. It is stated that Calumet & Hecla has contracted to sell 4,000,000 pounds at 13 cents. The prospect of war in the Orient is also aiding in creating a strongor price, and consumors aro buying more freely.

LEAD. — Now York, $4.55; Salt Lako City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipo 6½, sheet 7, bar 5⅞c: pig, $4.75. London: £11 12s 6d ₱ long ton.

SPELTER.—New York, $5.10; St. Louis, $5.00; London, £21 15s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $29.25 @ 29.50; San Francisco, ton lots, 31c; 500 lbs., 31½c; 200 lbs., 32c; less, 32½o; bar tin, ₱ lb., 35@37½c. London, £133 15s.

PLATINUM. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@44.50 ₱ flask of 76½ lbs.; Donver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 20.00c; San Francisco, Plumbers', 100-lb. lots, 16.80c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60: 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.25@2.50 ₱ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ₱ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.85 @14.10; gray forge, $12.85; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x $8; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulpbur, 2@3c; flour sulpbur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphido of iron, 8c ₱ lb.; copper sulphate, 5¼@5¾c; chlorido of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.: nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsond, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracito, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracito, $14.00. Coko, $10.50 por ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 45c; cs., 50c; raw, bbl., 43c; cs., 48c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Poarl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 15c; Mineral Seal, iron bbls., 19c; woodon bbls., 21½c; cs., 25c; Mineral Sporm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtba or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@55c; Natural White, 70c; Bleached, do., 75c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per caso, ½c. per lb. above keg price. Dry Load—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., $1.00.

BISMUTH.—Subnitrate, ₱ lb., $1.75.

MERCURY.—Bichloride, ₱ lb., 90c.

MOLYBDENUM.—$2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 75c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JANUARY 5, 1904.

748,687.—GAS GENERATOR—F. H. Bates, S. F.

748,688.—RAILWAY SWITCH—W. J. Bell, Los Angeles, Cal.

748,692.—BURIAL CASKET—W. C. Booth, Elmhurst, Cal.

748,696.—SOLAR HEATER—J. M. Browning, Jr., Corona, Cal.

749,026.—GARMENT FASTENER—J. C. Christensen, Santa Rosa, Cal.

749,028.—MUSIC TURNER—J. W. Collier, Riverside, Cal.

748,845.—WATER HEATER—J. F. Connell, Los Angeles, Cal.

748,848.—DOOR OPENER AND CLOSER—Driechman Bros., S. F.

748,591.—THIRD RAIL COVER—H. F. Duffy, Seattle, Wash.

748,592.—THIRD RAIL PROTECTOR—H. F. Duffy, Seattle, Wash.

748,710.—CASTING FISH NETS—L. Einarson, Seattle, Wash.

748,714.—MARLINE SPIKE—H. Fesenfeld, Hoqulam, Wash.

748,690.—BOLSTER—G. J. Friend, Kingsley, Or.

748,850.—DISH WASHING MACHINE—J. H. Griswold, Oakland, Cal.

748,862.—OIL BURNER—C. A. Hammel, Los Angeles, Cal.

748,868.—BED BOTTOM—J. Hoey, S. F.

748,732.—OPTICAL FRAME—C. L. Hogue, S. F.

748,737.—CULTIVATOR—T. J. Huhheil, Los Angeles, Cal.

749,141.—BOOK SUPPORT—A. D. Irving, Los Angeles, Cal.

748,741.—GRAIN SHOE—J. T. Jardine, Paso Robles, Cal.

748,757.—WAVE MOTOR—J. A. Langstroth, Oakland, Cal.

748,072.—LIFTING JACK—M. M. Moore, Sr., Santa Barbara, Cal.

748,875.—MALT TURNER—J. Mueller, Seattle, Wash.

749,090.—RAKER GAUGE—J. P. Olson, Tacoma, Wash.

748,790.—SWAGE GAUGE—A. O. Reppeto, Blacbly, Or.

748,732.—DRAFTING GARMENTS—J. Rohbert, S. F.

748,804.—DREDGER—Smyth & Bowers, S. F.

748,819.—CONCENTRATOR—L. Tulloch, Angeles, Cal.

748,820.—STAMP MILL.—L. Tulloch, Angels, Cal.

748,670.—GATE HINGE—J. H. Vandever, Olalla, Or.

748,896.—VEHICLE BRAKE—W. U. Wadsworth, Sutter City, Cal.

748,897.—OIL BURNER—J. A. Walkley, Los Angeles, Cal.

749,122.—PAPER BINDER—R. G. Whitlock, Los Angeles, Cal.

748,678.—TURBINE—H. Wolke, S. F.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

DISH WASHING MACHINES.—No. 748,850. Jan. 5, 1904. J. H. Griswold, Oakland, Cal. This invention consists of a containing tunk having closed sides, bottom and ends, and so suspended in a fixed structure that it may be oscillated or tilted in the direction of its length. Trays or baskets of wire mesh or other equivalent open work are placed in the ends of this tunk and a sufficient amount of water for washing purposes. Between the luner ends of the baskets are located hinged swinging gates, the fulcrums of which extend across the tub, and the gates incline downwardly and inwardly, so that their lower edges rest upon the bottom of the tub. The tub, when free to be tilted from one side to the other, will cause the water to move alternately from end to end and through the trays containing the articles to be washed.

VEHICLE BRAKE.—No. 748,896. Jan. 5, 1904. W. W. Wadsworth, Sutter City, Cal. This invention relates to an improved brake for wheels of traveling harvesters and the like. It consists of a band brake partially encircling the periphery of the wheel normally out of contact therewith and means by which the brake is applied by a frictional device which is actuated by the rotation of the wheel itself.

BED OR COUCH BOTTOM.—No. 748,868. Jan. 5, 1904. John Hoey, San Francisco, Cal. This invention relates to improvements in bed and couch bottoms in which an elastic cable or wire support for the upper mattress is attached to a framework, which framework, usually termed the "bed bottom," is supported upon the bedstead. The object of the invention is to stiffen and strengthen the fabric comprising the bed bottom and to maintain the edges in their proper position, also to provide a means for regulating the tension where the fabric is composed of elastic cables extending across the frame upon which they are supported.

MECHANICAL DOOR OPENING OR CLOSING DEVICES.—No. 748,848. Jan. 5, 1904. W. F. Driesehmun and J. Drieschman, San Francisco, Cal. This invention relates to a device for mechanically opening and closing doors which are located at a distance from the point where the operation is conducted, such as street doors leading up flights of stairs to rooms or flats located at the head of the stairs. It consists in a mechanism which may be operated from the head of the stairs or other distant point and by which the latch of the door is first retracted, leaving the door free, and the door is afterward opened by a further movement of the mechanism.

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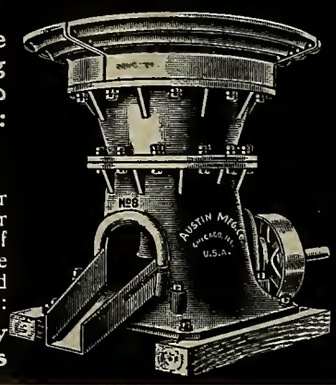

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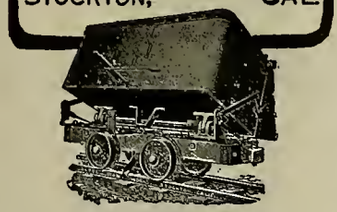

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Any stock upon which this assessment shall remain unpaid on the 13th day of February, 1904, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on MONDAY, the 7th day of March, 1904, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

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Office—Room 3, No. 214 Pine street, San Francisco, California.

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Whole No. 2270.—VOLUME LXXXVIII. Number 4. SAN FRANCISCO, CAL., SATURDAY, JANUARY, 23, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Prospecting Equipment.

The needs of a prospector and miner when he begins the development of a new claim are usnally determined by the extent of his experience, his ingenuity and the fullness of his purse. Often he may have an extended experience, a fund of inventive and constructive ability, but very little capital with which to begin business at the new mine. The average new mine, if not a "tunnel proposition," generally requires a shaft, and one is started promptly, usually on the vein and at a point where the best ore discovered crops out. The pit soon passes beyond the shoveling stage, and then a hoisting apparatus of some sort becomes a necessity. The old time-tried, but reliable, windlass is nsually the first plant set up, and by its use the shaft may be continued downward 50 or 60 feet, or even more. This sort of work is both laborious and slow, and while the miner may be willing to work untiringly at drilling holes in the rock, at filling the bucket below, and in the various other kinds of hard labor to be done in a shaft, he begrudges the time and labor spent at the windlass, and, if a horse can be obtained by any means, he proceeds to "rig up" an outfit to hoist with a whim, whip or some other sort of device which will dispense with manual labor and save time. He realizes that his capital consists chiefly of time and knowledge, and it is his aim to utilize both to the best advantage. A result of a new prospect shaft is always an unknown quantity, but usnally it does not at first justify an elaborate outlay of money in equipment, no matter what may be the subsequent outcome of the property. An elaborate head-frame may be dispensed with until the value of the prospect is proven to an extent snfficient to justify it. A simple tripod may be made to do good service for some time with a horse whim or whip. One of the accompanying illustrations represents a prospect shaft equipped with a head-frame consisting of four pieces of timber, two of them being arranged as a pair and secnred together to hold the top and bottom winding sheaves in place. The other two are disposed as shown, forming a "three-legged" frame, which will meet ordinary requirements. The shaft is provided with doors, which are opened and closed at the will of the man at the brake. The doors are balanced by counter-weights, and these evidently consist of large rocks in sacks. One of these weights overhangs the manway compartment, which is the only unworkmanlike thing observable about the works, for should the rope holding the counter-weight break, the rocks would, in all probability, go down the manway, which is uncovered. The entire equipment shows how simple, and still how complete, such a plant can be made, with a little mechanical skill and ingennity in arranging details, making everything to operate with the least possible effort on the part of the topman.

A Prospector's Hoisting Equipment.

The other illustration is that of the Petticoat mine in Calaveras county, Cal. This shaft was originally started with a windlass, but outgrew that primitive equipment. The head frame is of the four-post construction, so commonly seen at California mines, and which has so little beyond stability and rigidness to recommend it. There is a large amount of material in this head frame that is not really essential to either strength or the economical operation of the mine. A frame of two posts, with back braces to take the thrust, and with anxiliary braces from the posts to the angle braces, with the customary cross ties and cap, are all that are necessary in such a construction, but the four-post frame is one of the most commonly noticed of all the various types about metal mines, and the strange thing about it is that they are still being constructed by those professing to be mechanical engineers. A study of the strains to which a head frame are subjected will show that the resultant between the rope in the shaft and the one on the hoisting reel will fall where a line bisects the angle between the two lines of a rope. The frame should be so constructed that this line of thrust should fall just inside of the back angle brace, but the four-post frame is easy to build, and being very strong when made of sound material of liberal dimensions, all engineering features are disregarded.

A Four-Post Head Frame.

Prosperity in Mexico.

The investment of American capital in Mexican mines, and in other industries in that Republic, is assuming such large proportions as to attract more than passing notice from the foremost men of that country. The past decade has seen a greater invasion of Mexico by American capital, American miners, methods and machinery, than in all the past. The result is that old, time-honored ideas and customs are giving place to energetic, go-ahead Americanism and enterprise. Another ten years will find English as commonly spoken as Spanish in that Republic, for the influx of Americans is on the increase, and it will, without doubt, continue, for Mexico, though nearly 400 years old, is still fertile in resources of many kinds, and the opportunities for those with capital, energy and experience are considerable. This fact is being more fully appreciated in the United States with each successive year. Under the direction of President Diaz the Republic has prospered as never before, and he has rendered investment in Mexico safe, for prior to his succession to the presidency in 1884 it cannot be said that this was the case. The mines of Mexico have produced enormous amounts of silver and gold in the past by methods considered primitive and unsatisfactory in these days of modern scientific practice, but those results were accomplished under different conditions from those obtaining under American administration. The arrastra, the patio and the crude furnace will give place to the stamp mill, the pan and the modern smelter. But Mexico's mines will be developed and continue to yield great fortunes. Nor will it all be done by Americans, for the Mexican engineers have caught the American spirit of advancement and Mexican capital is also being freely expended in development of the mineral industry in that Republic.

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SAN FRANCISCO, JANUARY 23, 1904.

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New Development in Africa.

The annual report of the Tanganyika Concessions, Ltd., of London, Eng., was submitted to the directors of that company at a recent meeting. The company was organized to explore and develop the mineral resources of the Congo Free State in equatorial Africa. The name of the company is derived from a large lake, which is one of the sources of the Congo river. The principal explorations have been carried on in the Katanga, a division of the Congo State occupying its southeastern portion. The reports state that gold has been discovered in Katanga in sandstone, along a ridge which outcrops for 1000 feet in length. Some of the samples contain gold, it is claimed, to the extent of $24, but only about half of it is in free state. The streams of the region are also said to be gold bearing. Most of the gold in the sandstone, which is understood to be a ferruginous quartzite, is very fine, though coarse gold is found in the placers. The report also states that large deposits of copper have been partially developed and that the outlook is favorable. There is little doubt of the great possibilities of central Africa. From Cape Colony to Egypt, there is a succession of mineral fields. Some of these are known to the world, and others doubtless remain to be discovered. Kimberly, the Rand and Rhodesia are already famous. What may yet come out of the Congo country can only be surmised, but the indications are that the mineral belt will be found to continue in a northerly direction wherever mountains occur in the line of its course. Stanley and other travelers mention the occurrence of copper ore in the region tributary to Arruwimi river, a northern tributary of the Congo, several hundred miles northerly from the Katanga field, which is another connecting link in the chain "from the Cape to Cairo."

Power Equipment.

When equipping a mine the mistake is too often made of providing too little power, or, rather, not taking into consideration the probable increase in power that may be required. Particularly is this the case with boilers. Abundant boiler capacity is always advisable, if not absolutely necessary. Boilers occasionally require repairs, and in such instance if there be but one boiler, work depending on power must come to a standstill until the repairs can be made and steam once more is available. This alone illustrates the advisability of more than one boiler. Occasionally the mistake is made of placing a large engine in connection with a small boiler. While, under proper conditions, a large engine is more economical than a small one, a large engine cannot be snecessfully operated by a boiler supplying insufficient steam. It is a safe proposition to provide for at least double the boiler capacity that seems necessary at the start, and to put in such engines as may be required for the work in progress, and that may be reasonably anticipated. In the case of shaft sinking, for instance, a 20 H. P. boiler and a small double cylinder hoist, of about 15 H. P., will put the shaft down 700 to 800 feet, hoisting 1000 to 1200 pounds of rock at a load and at slow speed, possibly somewhat more, but it is not economy to work any machinery to the full limit of its capacity. The above instance assumes no unusual event; that little water is encountered, and that drilling is done by hand. In the event of a large flow of water being struck and pumps required, then the power would soon become inefficient. If power drills are to be employed, the compressor to be run by steam, the boiler capacity must be at least doubled for shaft sinking alone. Ventilating fans must be run, air must be supplied to the forges, and this takes considerable power. It may be desirable to run a small dynamo to furnish light, or to run some small machinery about the mine, above or below the ground, or a saw and timber framer may be required. There are always contingencies arising where it is desirable and economical to employ power. It is well enough to start with a power plant suited to present needs, but everything should be arranged in such a manner that additions may be made at the least expense and inconvenience. This refers to construction and location of buildings, space for extended foundations of boilers, etc. If a very deep shaft is contemplated it is not advisable to place at the shaft a large and expensive hoisting plant, with corresponding power equipment to sink the first few hundred or a thousand feet, but to supply machinery calculated to economically do the work to a depth of say 900 or 1000 feet, and to locate this temporary plant so that it will not interfere with the subsequent construction of the large head frame or the location of permanent hoisting and power plant. In some instances the temporary hoist is located opposite the end of the shaft, and in others on the opposite side from the site chosen for the permanent plant, but it may be placed on the same side as the latter if proper calculations be made for the placing of the permanent plant in the future. The topographical situation, or the expense of constructing suitable foundations, are the most important factors to be considered in such cases. The proper power equipment of a mine is as important and requires as much forethought and careful planning as does the method of operating the mine in the most economical manner.

IT is reported that the Standard Oil Co. has formed an alliance with the Rothschilds to control the copper market of the world. The combination, it is said, also contemplates absorbing the Heinze interest at Butte, Mont. The consolidation will be important factors in Spain, Chile, Montana, British Columbia, Mexico and Michigan, and will wield an important influence in the copper market. If the price of copper advances as a result of this combination, the opening of new copper mines in the various parts of the world that are not now known to have an existence will be sure to follow. There are large undeveloped copper resources in Arizona, Utah, Nevada, Alaska, Mexico, South America, central Africa and many other places, and the new consolidation will have to either absorb these, sharing a more or less profitable business with them, or place the price of the metal at a figure so low that the majority of them cannot afford to operate. The combination would be undoubtedly the most important that was ever formed to control copper.

Grubstake Partnerships.

Grubstaking is an old-time institution among miners and prospectors, and many good properties have been discovered by men out on a grubstake. The custom of grubstaking is recognized by the courts as a sort of partnership, in which both parties to the contract—usually unwritten—are protected in their rights. When contracts or agreements of this nature are entered into, it is customary for one party to supply the necessary tools, provisions and other supplies to the extent of a stated amount, or during a certain period. The prospector, being the other party, agrees to industriously prospect a stated region, or he may have a roving commission to seek where he may please. The agreement may only extend to the discovery and location of a mineral vein, or may go further and include its development to a stated depth or condition, or during a stipulated time. Probably no two partnerships so formed are identical in their conditions, but they are perfectly legal, just, and not infrequently prove to result fortunately to those interested. In the inception of such contracts the prospector may insist upon the one putting up the "grub" and outfit, supplying all of these things prior to his starting out on the venture. If he finds nothing during the life of the agreement the outfitter can only look upon his investment as a loss. Should the prospector find a valuable mine after the termination of the agreement, he is not bound by law, or in any other way, to give an interest to his former partner, but, on the other hand, the prospector may take no unfair advantage of his partner and convert to his own exclusive use any value he may obtain from the property. There is a difference between pure "grubstake" agreements and those where a miner is employed at a stipulated salary or by some fixed agreement to find a developed and paying mine. In the latter there is usually a fixed limit to the amount the miner shall receive as a commission or reward for his effort, but in the grubstake partnership each may enjoy the benefits of the venture to the full extent of their individual interest in the proposition, as previously determined by the agreement.

OFFICERS of British colonies in Australia and New Zealand have sent formal messages to the authorities of the Transvaal, South Africa, warning that country against the importation of Chinese laborers for the mines and railways there, and foretelling grave consequences if the evident intention be carried out. The experience of the United States, British Columbia, Australia and New Zealand with the Chinese, it would seem, should furnish sufficient data upon which to make it possible to formulate conditions under which Chinese may be safely allowed to enter the Transvaal as laborers. The commissioner who some months ago visited America with a view to studying the Chinese situation in the United States and British Columbia, upon his return to South Africa proposed a set of conditions under which he thought the Chinese might be safely admitted. These conditions were essentially: That the term of service be fixed; the class of work at which he shall be employed shall be predetermined; hours of labor to be stipulated; he can under no circumstances engage in trade; he shall not own land or vested property; and his return to China upon the expiration of his term of service shall be compulsory, unless he voluntarily determines to renew his term of service if permitted to do so. These conditions make him a non-entity. How the Chinese can socially, financially or politically affect conditions in the Transvaal under these terms, if he accepts them, it is difficult to understand.

THE present condition of the oil industry in the San Joaquin valley of California shows clearly that unorganized individual producers cannot successfully compete with large and perfectly organized companies holding large tracts of oil land. It is predicted, however, that those who have the means to hold their property until better conditions present themselves will profit largely in the end.

CONCENTRATES.

THE melting point of pure lead is 326° C. or 619° F., and that of tin is 231° C. or 448° F. An alloy of 68 parts tin and 32 parts lead melts at 180° C. or 356° F.

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COPPER is often associated with tin stone in veins, notably in the Cornish tin mines. Gold occurs with tin oxide in some of the tin-bearing veins of South Dakota.

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THE clay found in mine gouge often contains little or no alumina, being composed almost wholly of finely ground quartz, lime and other constituents of the vein.

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SELENIUM is often present with the telluride minerals. It may be detected when heated by the peculiar odor produced, resembling that of decaying horseradish.

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AN extended description of the lead-silver mines of the Coeur d'Alene district of Idaho was published in the MINING AND SCIENTIFIC PRESS in the issues of January 3, 10 and 17, 1903.

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TO MAKE a success of prospecting, the prospector should have a knowledge of mineralogy and also of geology. These can best be had by studying good texthooks on these subjects.

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THE title to a mining claim sold by an alien who had located the same is good if the alien became a citizen of the United States or announced his intention to become such hefore selling the claim.

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A MINE OWNER cannot drive a tunnel from his own claim through that of an adjoining location to reach property owned by him situated heyond. Mining is not recognized as a public utility, and a right of way cannot bo condemned through the property of others.

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CLAY consists chiefly of silicate of alumina, but usually also contains lime, iron oxide, etc., as well as more or less silicic acid uncombined with other elements. The silicate of alumina also constitutes a large portion of some slates, pumice stone and of fuller's earth.

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MILL MEN customarily hurn tin mill screens before tacking them on to the frame, bot it is not universally in practice. Where the tin is not thus removed, it is found that the sharp, cutting grains of quartz splashed against the screen keep the screen apertures free from amalgam.

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WHERE placer gold is found on top of a local "coment" depost in a gulch, it is reasonable to expect to find gold on the real bedrock underlying tho cemented gravel. This cannot bo depended upon absolutely, hut the possibility of tho occurrenco of gold on bedrock should be investigated.

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FREESTONE is a name given to homogeneous sandstones, evidently deposited in deep water, showing little or no sign of hedding and breaking with equal facility in any direction. In the Eastern United States it is largely usod in the facing of huildings. Its color is dull brown. It is of Triassic age.

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OWING to the formation of an infusihle oxido upon its surface, aluminum is difficultly fosible. It foses mere easily than silver bot less readily than tin or zinc, its point of fusion being 655° C. It is most readily bent and rolled betweeu 100° and 150° C. The specific gravity of the metal is 2.7; that of quartz 2.6.

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THE current price of molybdenum in New York City is $2 per pound. Molybdenite, tho solphide of the metal, contains 60% molybdenum. A ton of clean concentrated molybdenite would then be worth theoretically $2400. Transportation and reduction charges most be deducted, and of these latter Concentrates is not informed.

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MARSH GAS is inflammable, and is a simple compound of carhon and hydrogen. It is found in marshy places. It is probably due to a collection of gas of this character heneath the ice of the pond in Kansas, that hurns upon being afforded a vent through the ice. The "natural gas" associated with oil sands is of different character.

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THE climate along the coast of Alaska is characterized by mild winters and cool summers. The lowest temporature recorded at Sitka is 3° F. below zero, and at Juneau 4° F. below. The Ketchikan region is 300 miles south of Sitka and has a milder climate. Nearer the ranges of the interior the cold is greater, sometimes falling to 15° F. below zero.

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THE mineral sample from Ashland, Or., is quartz in what was originally (before alteration) grano-diorite. The visiblo minerals are quartz, feldspar, hornblende, chlorite (altered from hornblende) pyrite, chalcopyrite (copper sulphide) and pyrrhotite, a sob-sulphide of iron. Gold and silver may also be present. This can he determined hy assay.

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THE rock specimen from Fort Bayard, N. M., is graywacke, an aggregate of quartz grains cemented by silica and lime. The black color is largely due to carbonaceous matter. The name graywacke is of German origin and is applied to compact sedimentary grit rocks, composed of grains of quartz, feldspar, slaty material, etc. The term is almost obsolete in American petrography.

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MACHINE DRILLS are sometimes operated by steam. All of the first machine drills made were steam drills, hut compressed air is more satisfactory for several reasons. The metal does not expand and contract with air, as is the case where steam is used; the men work with more comfort and with little danger, and the air exhausted into the mine workings assists ventilation.

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A TON of ordinary quartzose ore in place in the mine measures 13 cubic feet; when broken, about 20 feet. The waste broken in mine work weighs nearly the same as the quartz, under similar conditions. Coosequently, thirteen tons of waste will practically fill the space originally occupied by twonty tons of ore. Two-thirds of a ton of waste will occupy the space taken by a ton of oro in place.

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WITHIN largo masses of ore there are sometimes observed narrow zones or vein-liko occurrences, due to the fracture and croshing of the rocks, and this small zono of fracture is foond to contain ore far richer and ofteu of different character from that of tho main mass within which it occors. This is doe to secondary deposition of mineral and an enrichment within this zone of croshing, where superior opportunity has boen afforded for ere deposition.

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THE word "bonanza" is of Spanish origin and means literally "fair weather," but has boceme a common term for a "rich strike" or a rich ore hody. "Borrasca" is the opposite of bonanza and means "bad weather." "Busconcs" in Mexico are "searchers," or more liberally translated, "prospectors." The same term is applied to those who explore old abandoued mines to get out of them such ore as they can obtain oither to work or te sell.

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A MINING CLAIM located in this month of January does not require any assessment work during the year 1904, nuless a local or State law demands it. What constitutes $100 worth of work depends to a great extent upon local custom. At one time a shaft 10 fect deep or a tunnel 10 feet long represented $100 worth of labor, but there are many places where a 10-foot drift can be run for $25 or $30, and a 10-foot shaft sunk for less than $50, as well as places where it costs upward of $100 to sink a single foot in a medium-sized shaft, owing to tho hardness of the rock.

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THE locator of a water right must stato on his notice of location the amount of water claimod, but if he does not take out and utilize all he claims, and other persons take up rights at a lower point on the stream, the prior locator cannot subsequontly increase the quantity he has been using by increasing the size of his ditch or otherwise if it is done to the detriment of thoso below him on the same stream. The first locator may claim all the water flowing in the stream at the point of appropriation, but be must take out and employ all he claims at tho beginning.

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ONE of the mineral specimens from Daggett, Cal., is colemanito (calcium borate), and is similar to tho mineral mined at Borate, in the eastern part of the Calico range, San Bernardino county, Cal. The specimen marked No. 2 is celestite (sulphato of strontium), with calcite and quartz crystals. The celestite is the bluo crystals. The calcite is the softer of the white crystals. In the present condition the celestito is only valuable as a cabinet specimen. It is omployed in tho manufacture of "red firo" in pyrotecbnics. The pulverized mineral gives a strong red color to the blowpipe flame.

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THAT there is any material difference between a "fissure veiu" and a "true fissure" vein is not apparent. Those fissures associated with intrusivo dikes are probably of the most deep-seated origin, as the dike rock came from a sphero not within tho possibility of human invention or genius to roach. A dike may be assumed to indicate great depth of fissure, hot cannot be considered an index of size of vein or of value of contents. A dike which appears at one part of a vein is sometimes observed to loave the vein. It is generally possihle to determine by careful examiuation whether the dike or the vein be the older, when the two are sitoated side by side.

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WHERE it is found necessary to place a head frame on a side hill at the collar of a shaft, and the engine below the shaft on the slope of the hill, the head frame may be held in position by being anchored down with heavy weights. To accomplish this a space must be graded oot hehind the shaft for the head framo which may be huilt in any desired shape, hut instead of back hraces to take the resultant strain, after the usual type, the sills most extend backward away from the shaft, and angle pieces run from the hoad frame to the sills. This hack portion may thon be weighted down with old railroad iron, old shoes and dies from stamp mills, or any other iron, or hoavy rocks to the amount of twenty to thirty tons, depending on the load it is intended to raise in the shaft, and also on tho leverage the hoad frame may afford to the draft of the hoist. The Argonaut mine, near Jackson, Cal., was equipped with a head frame in the position above described in 1894, and has given satisfaction. In some instances, instead of angle pieces of wood, heavy iron rods or chains are substituted to take the strain.

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THERE are few concentraters in the gold mills on the Witwatersrand, Sooth Africa. The ore is treated by amalgamation in the usual manner, with a rather coarse screen to secure large capacity. The tailings are then run to the cyanide plants and treated direct without roasting or other previous manipulation. As a result the tailings contain generally a valuo that in the Western United States is considered good enough to cyanide, and such tailings are treated at a profit. The average Western mill man naturally inclines to the belief that he could extract higher values from the Rand ores at the expense of a somewhat lower capacity, but with a better economic showing for the company.

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ALUMINUM is extracted from its ores by means of the electric current. Formerly it was obtained by fusing the double chloride of alumina with sodium. The chlorine united with the sodium leaving the aluminum in metallic state. Aluminum is not attacked by boiling nitric acid, though nearly all other metals, except gold and platinom, are. Hydrochloric acid, which will not dissolve gold or platinum, attacks aluminum readily, forming aluminum chlorido, with evolution of hydrogen. Whoo aluminum is treated with mercoric chlorido (corrosive soblimate) tho surface bccomes coated with mercury and if imuersed in water at an ordinary temperature will decompose it with violence. Massive aluminom oxidizes only superficially, but its powder burns with great rapidity liko that of magnesiom with groat heat.

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"CONCENTRATES" is weekly in recoipt of a large number of questions which require research into almost every departmont of the modern sciences connected oithor directly or indirectly with tho industry of mining and of metallurgy. As has been heretofore stated herein, to print both questions of corrospondents and the answers as well would take a large amount of space, some of which can possibly be put to better use in making replios to the various queries. The following from Butte, Mont., is one of the varieus questions asked, and, being of a somewhat complicated nature, it is thought well to print both question and answer, while it also forms an illustration of the space required to print the question alone: "In the early 80's in the Alta mine, at or near Virginia City, Nev., a dam broke away in one of the upper levels and caused such au influx of water into the mine from adjoining properties that tho Alta was flooded from the 2000-foot level to the 1900-foot. On the 2000-foot levol four men were at work in the face of a drift 1000 feet, or possibly more, from the shaft. The only opening from this level to the workings above was tho main working shaft. Tho water filled this level and rose to the 1900-foot level, or 100 feet above. Aftor pumping for the space of about six days the water was lowered below the back of the station at the 2000-foot levol sufficiontly to allow the rescuing party to enter the drift and hring out the men who had been imprisoned in the face thereof. Tho men wore alive at the tiue of beiug relieved and lived some tiue, hot died afterwards, presumably from shock. Assuming that the level had boen driven at the usual per ceut of grade, say .016, the water would, of course, strike the hack of the level at the shaft ond before it would cover the bottom of it at the face, and tho inner end of the drift would be full of air at the time, which would, of course, be compressed as the weight of water increased on the outside. What I wish to learn is, what would be the natural offect on the lungs of the imprisoned miners, and what atmospheric pressure are the lungs of a human being capable of resisting? Also, what are the couditions and arrangements under which men work in the caissons in New York harbor and other places? I have been teld that tho men who work in and under the last-mentioned conditions are subjected to a very high pressure, and that they are brought out by stages and the pressure gradually decreased." The difference in elevation between the 1900 level and the 2000 lovel is practically 100 feet. A column of water 100 feet in height will develop a hydrostatic pressure of 43.4 pounds per square inch. This pressuro is approximately that under which men work in caissons. At the St. Loois, Mo., bridge the pressure at depth in the caisson ranged from 45 to 50 pounds per square inch, corresponding to a depth (theoretically) of about 104 to 115 feet. At the Memphis, Tenn., bridge the maximum pressure was 41 to 43 pounds per sqoare inch. At the Brooklyn, N. Y., bridge the maximum pressure used was about 36 pounds por square inch, though the theoretical pressure required was much higher. This was due to the occurrence of a stratum of stiff clay, which made it possible to work at a much lower pressure in safety than would havo been required had the material been quicksand instead of clay. The maximum pressure in this caisson (36 pounds per square inch) was employed at a depth of 95 feet. Experimonts have been made in taking men out of caissous in stages, but it is not generally the practice. One of the host means yot found to assist the men on coming from the caisson is to hoist them on an elevator to the surface, instead of compelling them to climb a vertical ladder from 40 to 100 feet through a small, poorly ventilated and usoally wet shaft to the surface. The temperature in the caisson varies with the air pressure, and is often as high as 90° under prossures exceeding 45 pounds per square inch.

Improved Chlorination Process for Gold and Silver Ores.

TO THE EDITOR:—Some years ago I had occasion to erect a roasting furnace for chloridizing an ore carrying both gold and silver. the latter predominating. The ore was crushed to 30 mesh—dry stamp mill—and first roasted sweet; then salt and iron sulphide, finely pulverized. were charged in near the discharge end of the furnace. The salt and sulphide were mixed so there was 5% of free sulphur per 100 pounds of the mixture. This material was charged in by means of a long spoon made by splitting a gas pipe along the seam so as to form a trough long enough to reach across the furnace hearth.

The furnace was a mechanically rabbled reverberatory, the rabbles being carried by wheeled carriages at intervals of forty-five seconds. Eighty pounds of ore were charged in with the passage of each carriage, the amount of chloridizing mixture charged being such that the salt equaled 4% of the ore. When charged in—about 9 feet from the discharge—the ore was at a bright red heat and was roasted down to about three-tenths of 1% of sulphur—practically a sweet roast. The mixture was distributed in the charging spoon so that it made an even line across the hearth just in front of the moving carriage and was plowed under and mixed with the ore within two or three seconds after being charged in. This was kept up continually. Within thirty minutes after being mixed with the chloridizing mixture the ore was discharged to a pit under the hearth and allowed to lie about twenty-four hours. The results were good. 90% to 95% of the gold and silver being soluble in a strong solution of "hypo." No apparent gold losses were sustained.

The same year I had occasion to test the siliceous telluride ores of South Dakota. and under the same treatment, despite the greatest care. the gold loss was over 50%, the silver loss being very small. I have also met with similar losses in other localities, so have accepted the fact. as given in various metallurgical works, that roasting gold ores with salt has been a very uncertain operation as to economic results, but very certain to result in abnormal losses.

To overcome this difficulty I conceived the idea of chloridizing the hot, calcined ore in a closed receptacle, using chlorine gas under pressure. In the laboratory this gave very satisfactory results on the ores from South Dakota above referred to.

The apparatus used would hold 5 pounds of hot ore, which was about the capacity of the muffle used for roasting. Chlorine was developed in the usual style and admitted to the chloridizing device under a very slight pressure, the whole being allowed to stand over night. No loss whatever was sustained as far as we could determine by laboratory tests. The extraction by strong "hypo," by cyanide and by amalgamation (grinding in a mortar). was equally good as to both metals, being about 96%. Value of original ore from $13 gold. 18 ounces silver, to $2 to $3 gold, 10 to 30 ounces silver.

The results were so satisfactory that, under the advice of several metallurgists and practical mill men, I took out United States letters patent covering the invention, and, believing it to be of importance to the mining industry, will briefly describe the process as applied to regular mill work.

The sketch herewith shows the end of a common, hand-operated roasting furnace, with a hopper formed in the hearth and close to the finishing end. In this hopper the hot calcines accumulate as desired and are kept hot by their proximity to the firebox.

A series of sheet metal shells or upright cylinders. holding say 2 tons each, are provided and so situated that they can be charged by car through the top. As soon as the charge is in, the top is closed, except a small pet cock. Through pipes at the bottom chlorine gas is forced in. This, being heavier than the air in the ore, fills all of the interstices, completely displacing the air. As soon as the presence of chlorine gas is detected at the top the pet cock is closed and the pressure of chlorine gas continued as may be found necessary. The silver will become rapidly changed to a chloride. Such gold chlorides as form will be at once broken up by the heat to assume other forms, to be again broken up until the gradual reduction of the temperature reaches 180° C., when all the volatile gold will come down as a stable chloride. After this takes place the ore can be safely discharged and will carry with it all the mineral, as none could escape.

Ample provision is made to draw off the excess chlorine and to confine and collect the dust, so that practically nothing is lost. The chloridized ore may be discharged to an ordinary cooling floor and then charged to tanks, pans or barrels, as desired, by manual labor, or, as shown on the sketch herewith. to a cooling and conveying floor, where it is mechanically cooled, conveyed and discharged into the tank or other receptacle.

There are several ways of developing chlorine gas that can be used, but the simplest device would be to use liquid chlorine. This is sold in iron cylinders, pumped to a pressure of from six to twelve atmospheres. is anhydrous and pure. By simply opening a cock any desired amount of gas can be drawn off. and at any required pressure. One pound of liquid chlorine will yield 5.31 cubic feet of gas at 70° F., or a pressure of about two atmospheres at 800° F., which is the temperature of the ore in the chloridizing shell required for rapid chlorination. Supposing the receptacle to contain 40 cubic feet—a capacity of 2 tons of ore. Finely crushed ore represents about 66% of solid and 34% of spaces between the ore particles, or about one-third of the contents to be filled with gas. Two and two-third pounds of liquid chlorine will give 14.54 cubic feet of gas. and at 800° F. a pressure of 14 pounds in the receptacle. This will force out all the free air, practically. and bring every particle of ore in contact with hot chlorine more perfectly than in the roasting furnace, where so much of the gas goes up the stack.

Anhydrous chlorine has no effect on iron except under great heat. The sheet iron receptacles are lined with thin cast iron staves or segments joined with graphite cement. The heat radiated through this lining would not be sufficient to cause any action of the chlorine on the shell, and the gradual decomposition of the cast iron would form a graphite coating that would prevent further action of the gas on the lining.

The cooling can be accomplished by mechanical means if desired, but the preferable practice would be to provide enough receptacles so that by the time they are all filled the first would be ready for discharge and use again. This would be about the only cost in addition to the cost of present mills and would be but trifling compared to the extra saving and the certainty of operating without volatile losses.

The gist of my improvement consists in chloridizing hot ore in a closed receptacle, under pressure, preventing gold losses by confining the volatile products until cooled, so that stable chlorides are formed. The after treatment will be the present practice.

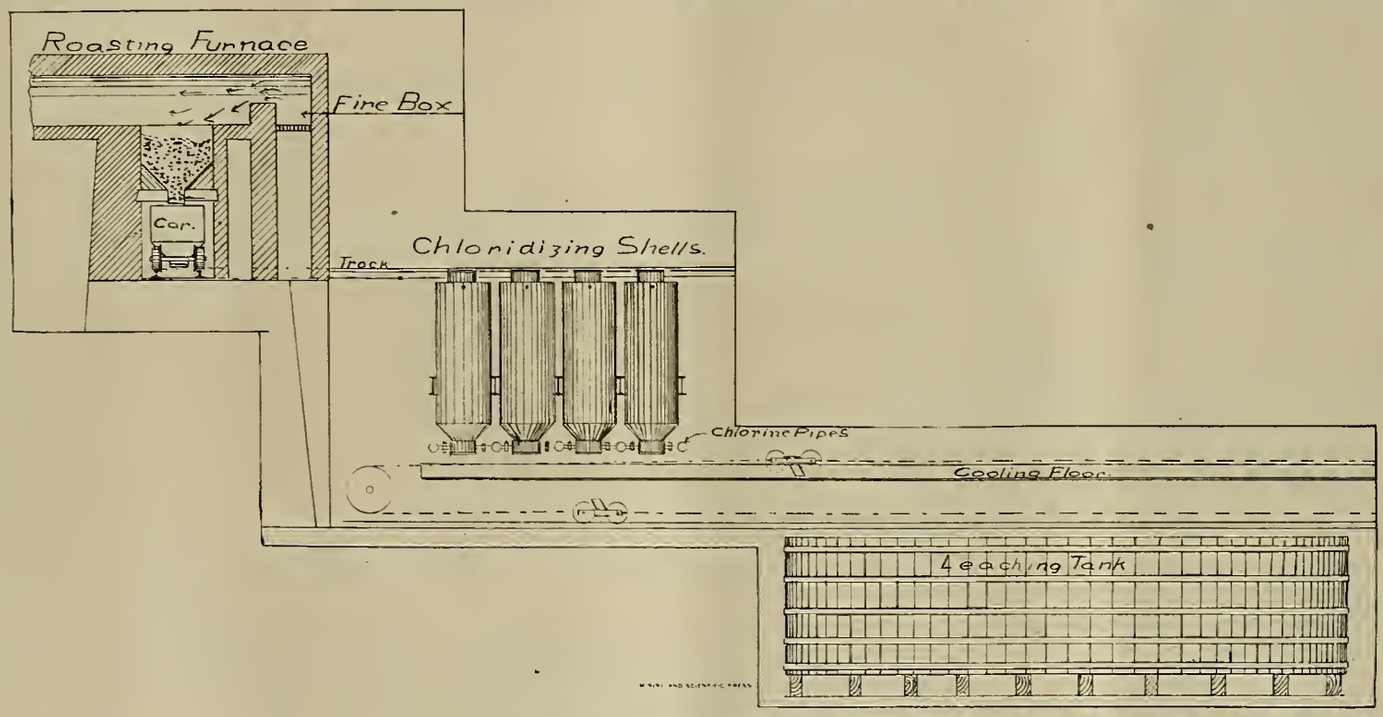
For fine gold and for a prepared chloride of silver, cyanide is a perfect dissolvent, but a poor dissolvent for a natural chloride of silver. A strong solution of "hypo" will dissolve the gold and is a natural dissolvent for silver. Pan amalgamation is often the best possible means for recovering values from chloridized ore. Local conditions and the nature of the material will determine the best means of extraction in all cases.

There are many districts and many mines that produce complex ore so low in grade that no one of the metals will yield a profit, but combined—providing the expense is not increased—the values would be sufficient to bring success. All copper and lead, as well as other base chlorides, can be washed out and recovered as by-products, while the percentage of precious metal values that will be recovered will be greater than under present practice, as no ore can be roasted with salt without 10% to 12% loss of the silver, and usually many times that of gold.

The accompanying sketch simply shows enough to give an idea of the application of the process in a small mill. The method of application to cylinders and other mechanical roasters on a large scale will be apparent without illustration, as the device can easily be adapted to existing construction. A new mill designed for this process could be made very nearly automatic and of any desired capacity.

HORACE F. BROWN.

San Francisco, Cal., Jan. 18.



Plant for Chloridizing Gold-Silver Ores.

Method of Mixing Concrete by Hand.

A tight "mixing" box, about 8 feet long, 4 feet wide and 10 or 12 inches deep, and a platform 9 feet wide, 12 feet long, of ⅞-inch matched boards laid on 2x3-inch pieces, are built and the box is placed beside the platform, says a writer in the Engineering News. The boards forming the long sides of the box and the 2x3-inch pieces of the platform are allowed to project 1 foot on the ends, and are shaped to form handles by which each is easily moved. The cement and sand, properly proportioned, are mixed dry in the box; then water is added, and a fairly "wet" mortar is made. Meanwhile the broken stone or gravel is placed upon the platform in a layer 6 inches thick (being usually measured in a bottomless box), and is thoroughly wet from hose or buckets. The mortar is then cast over the stone in a fairly uniform layer by means of shovels. The mass is then turned over two or three times on the platform by means of the shovels, and thence incorporated into the work. Turning twice on the platform is usually sufficient.

This method gives a thorough mixture and utilizes the laborers to good advantage, a gang of six men being advantageously employed. Two men will prepare the mortar while four men get the stone on to the platform; all hands then finish the operation.

Foundation Bolts for Engines.*

NUMBER II—CONCLUDED.

Fig. 4 illustrates a bolt fitted with a large cast iron washer. It is cored out to receive the square head of the bolt, so that when it is put in place the head cannot turn in the washer, but as the latter is round there is no danger of turning the whole device. Where this form of construction is used care must be taken to set one or more bricks at exactly the right height to hold the nut so that it cannot drop down and out of the washer. After these bricks are set the tops should be covered with cement, then the washer and bolt head are pressed into it until thoroughly imbedded and left to dry. The temptation to omit the cement on account of cost, especially on engine and compressor foundations, and similar work that is soon concealed, appears to be great, consequently some workmen yield to it and lay the bricks nearly dry, as they evidently do not understand the importance of thorough work along this line.

Fig. 4 affords a good hold on the bricks above it,

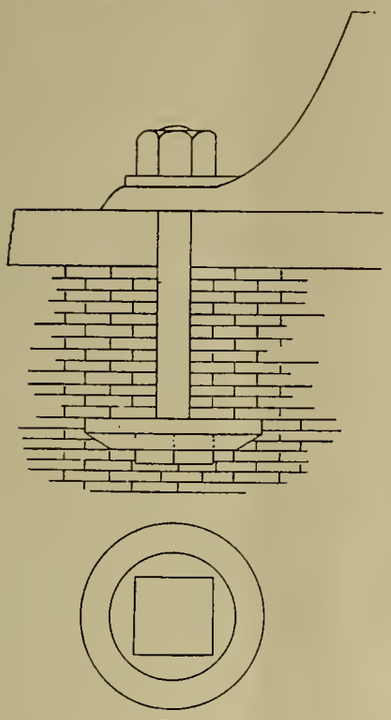


FIG. 4.

but the device shown in Fig 5 is better still, as it represents even more surface. As it is square instead of round, with a square hole cored out for the

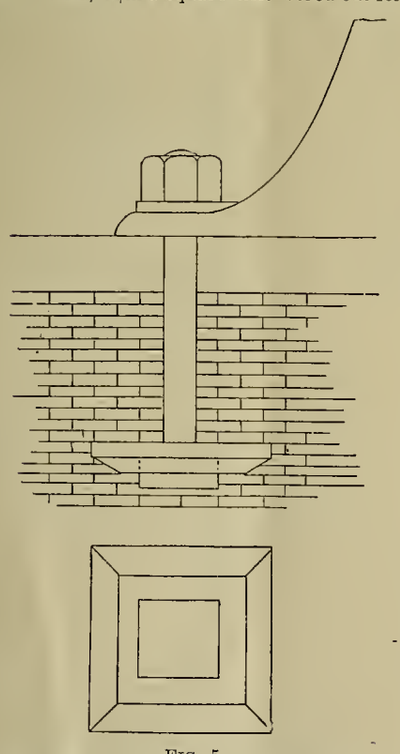


FIG. 5.

bolt head, it is impossible for it to get loose and turn, even if excessive stress is brought to bear on the nut.

Fig. 6 is a superior form of construction, and is accordingly recommended. It is similar to one already illustrated, but in this case the bolt is longer, extending down through the cap stone, including several courses of brick. The pocket made for insert-

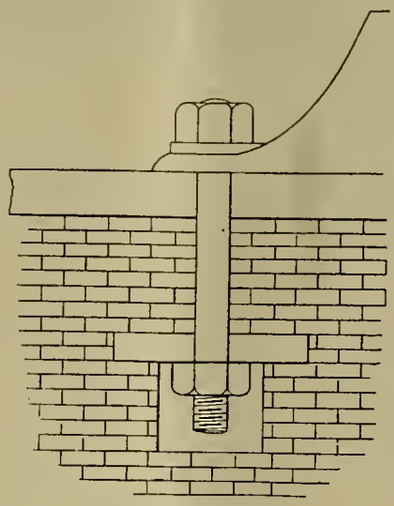


FIG. 6.

ing the nut is covered by a small stone nicely cut so as to afford good bearing surface. It may be good policy to put a washer between this stone and the lower nut as otherwise it will be difficult to turn it, if found necessary to do so. A thin wrought or malleable iron washer will answer every purpose.

If the brick or stone foundation of an engine is allowed to stand for several weeks before the frame is put upon it, and the foundation nuts screwed down solidly, it will give better results than to screw down the nuts and unduly compress the cement or mortar before it is fully dried.

Due examination of these illustrations and careful consideration on the subject cannot fail to show that brick is better than stone for these foundations, because the flat surface presented by the brick allows it to quickly form good joints. It is possible to do nearly as well with stone, provided the extra care required is given to it, and, as a rule, this will not be done unless the engineer watches it coutinually, and declines to approve any work that is not first-class in every respect.

As illustrating this point an incident related by W. E. Crane, M. E., is of interest. Several stone foundations had been put in, that, according to contract, should have been laid solidly in cement, but he feared that the work had not been well done. He called upon the contractor to mix water and cement together, making the mixture thin enough to flow into open crevices, and directed him to fill the foundations full of it. The contractor started all right, but as the work proceeded and barrel after barrel of cement disappeared he objected, claiming that if this was to be continued he would charge extra for all cement used.

A moment's consideration will show that if all space between the stones had been filled with cement in the first case according to agreement, none of the semi-liquid preparation would have flowed into the foundations, therefore the test applied simply exposed fraudulent work.

It is just as easy to cheat on brickwork, for by only partially covering the bricks laid on the inside of a foundation, some of the space is left vacant, thus saving cement for the contractor, but insuring a poor job for the engineer. Such a fraud is more difficult to discover in the case of brickwork, as the outer edges of the brick are nicely plastered over, thus preventing anything from flowing into the vacant spaces.

Such tactics on the part of dishonest contractors make it difficult for honest ones to get work, because it costs more to fill a space with cement than it does to let it remain vacant, therefore the honest contractor must put in a higher bid than his less scrupulous competitor, consequently he does not secure the contract.

The natural consequence is that it is not always wise to award a contract to the lowest bidder, although the public is sure to criticise the action of any official who would favor a higher but more honest bidder on a municipal contract.

Of course it is necessary to employ a competent inspector to oversee the work as it progresses, and promptly condemn any departure from the spirit and letter of the contract. If the men who do such work expected to have charge of the machinery afterwards, there would be less liability of imperfections, but their responsibility ceases when the last brick or stone is laid, and, as trouble develops, the engineer must provide remedies, or else be considered incompetent for the position.

These remarks concerning foundations are not strictly a portion of the subject of foundation bolts, but the two subjects are so closely allied that it is difficult to separate them, for the best bolt ever made could not do good work in a poor foundation.

*W. H. WAKEMAN in Electricity.

A Typical California Quartz Mill.

The accompanying illustration is that of the Washington mill at Bath, a small village near Forest Hill, in Placer county, Cal. The mill is set into the hill on rock terraces, the ore passing through every process in milling by gravity. Bath is the site of the portal of the Paragon channel tunnel. This tunnel runs several miles into the mountain, where it connects with the workings of the Dardanelles mine ou the same channel. The Washington vein lies at contact of serpentine and diorite, and was undoubtedly the source of a portion of the gold found in the Paragon–Dardanelles channels. Boulders of quartz from the vein are found in the channel, which are gold bearing. The mill is located on a steep mountain side, several hundred feet below the top of the Forest Hill divide, and a greater distance above the canyon of the American river which drains the immediate region. There are numerous quartz veins passing under the Forest Hill divide, but only a few of them have been developed to any extent, and still fewer have been equipped with mills, although some of these veins form promising prospects. This is probably due to the fact that drift mining is chiefly carried ou in that vicinity and that these mines, which are among the most extensively operated of this class of mines in the world, locally form a more attractive investment.

Washington Co.'s Mill, Bath, Cal.

GREAT BRITAIN has broken down the bars of conservatism, and has adopted a 50-pound weight in place of the old standard which for centuries past has recognized 112 pounds as a hundred weight. This will greatly simplify the transaction of business with America and other countries employing a decimal system.

IT is said that oxalate of potash in about a 10% solution will make a white mark on a blue print, but in order to keep the solution from running and blurring the print it is suggested that gum arabic be added, forming a mucilaginous fluid.

The "Inverted Saddle" Reefs of the Bendigo Goldfield.*

Written by WM. H. CUNDY.

In the question of the synclinal folds I recognize that it is a large undertaking to confine within the limits of a short paper, and at the same time convey a comprehensive idea of their characteristics, and the importance of their relationship with the anticlinal folds, in the general question of practical mining. However, from a practical point of view, I consider the question of great importance.

It is a generally accepted theory that the rocks on this field were originally laid down in water in horizontal layers, subsequently being bent over, or roughly corrugated, probably by the granite upheaval, as illustrated in the following diagram (Fig. 1) showing the layers or beds of rock as originally deposited, and the same rocks subsequently buckled up. (Fig. 2.)

From the present position of the rocks it is evident that the forces responsible for this buckling exerted a very strong lateral pressure, and it is also evident that there was an endlong pressure as well, for looking at the stratification transversely it will be seen that the undulations (dip) of the rocks are short in comparison with the longer and wave-like undulations (pitch) when viewed longitudinally. (Fig. 3.)

While the process of bending over was in progress, it is natural to assume that the beds or layers of rock would not be of uniform strength and thickness. Consequently, while the anticlinal arch and the synclinal trough were being formed the weaker ones would break. This would more particularly be the case near the surface, where the resistance would not be so great, and this fact (together with considerable faulting) may be laid down as one of the principal reasons why the reefs on the Bendigo field were not earlier recognized as anticlinal, or more commonly known "saddle" reefs.

Local prejudice among mining men would not admit of the principle of the anticlinal formation until recent years, but much more averse were the miners in regard to the synclinal fold formation. Even at the present time there are practical men of over thirty years' experience on the field who deny that

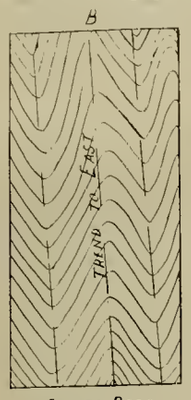


FIG. 2.

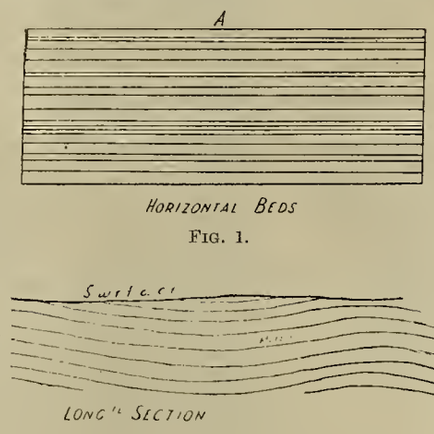


FIG. 1.

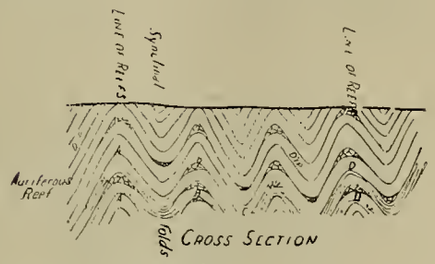


FIG. 3.

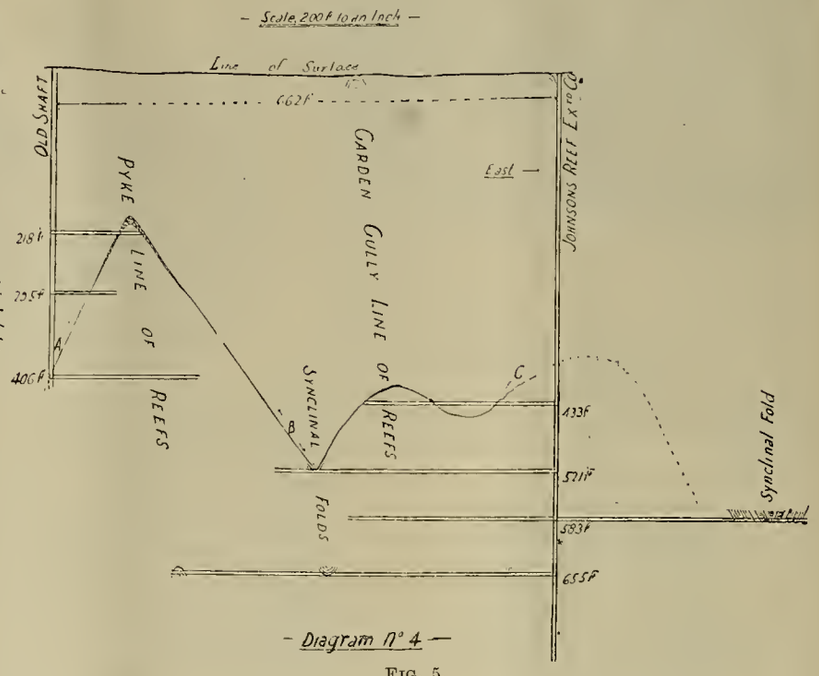


FIG. 5.

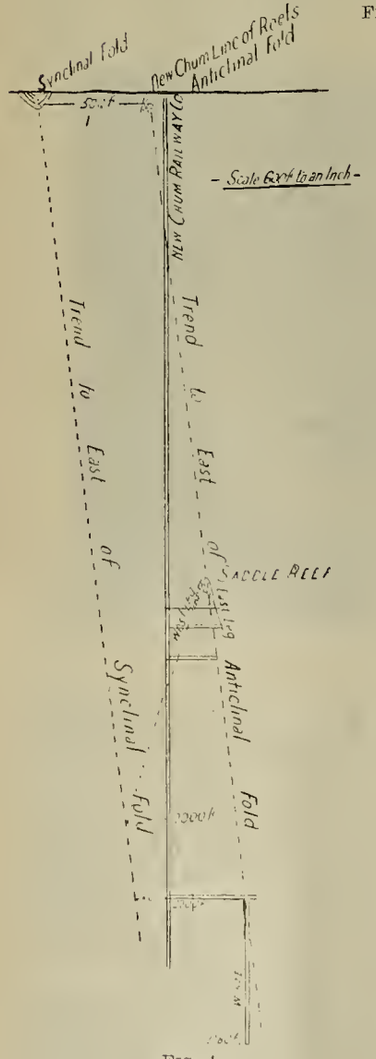


FIG. 4.

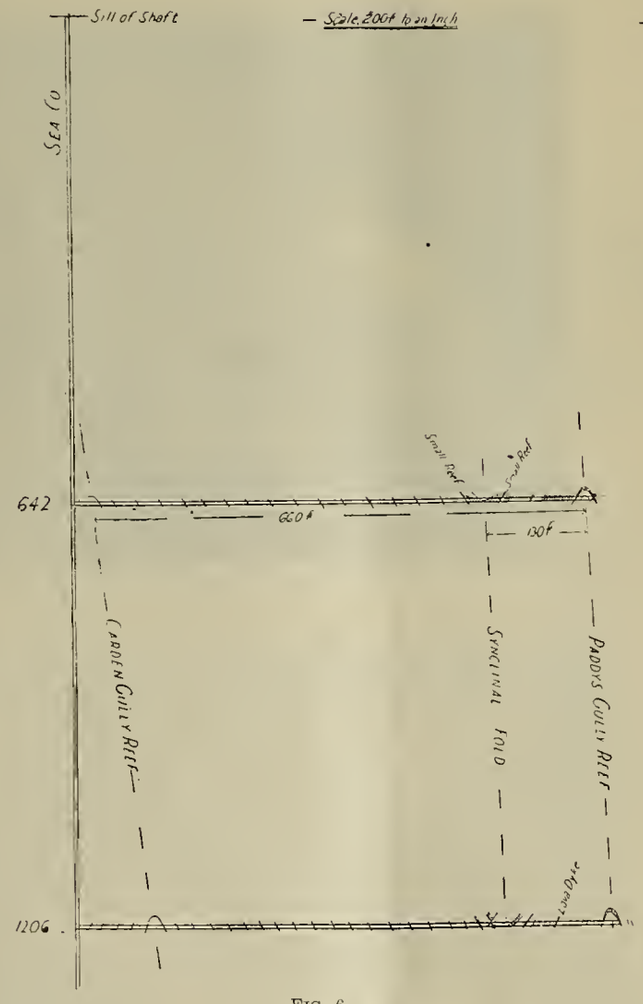


FIG. 6.

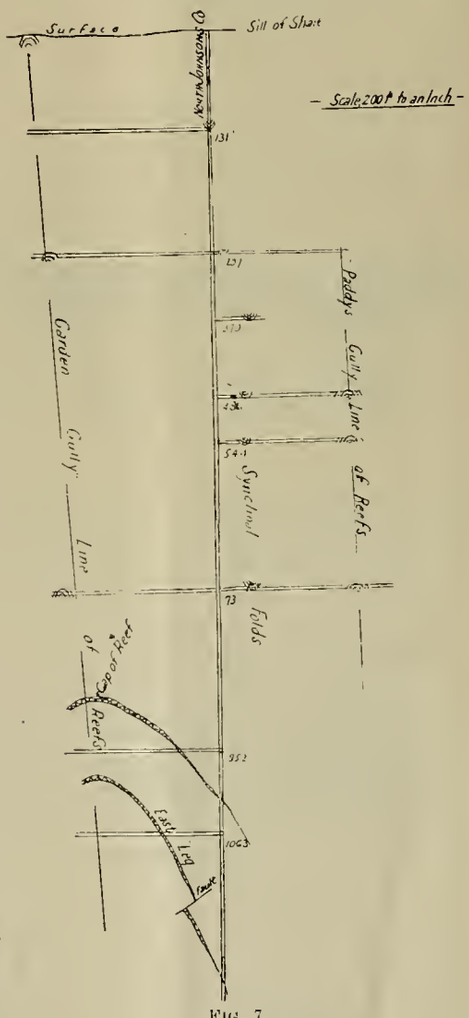


FIG. 7.

* Abstract Trans. Australian Min. Eng.

any synclinal folds exist, simply because they have not seen them in their own mines, and are not sufficiently interested to notice them in others. In the last few years the practical men are evincing a greater desire to become more acquainted with the geological side of the question and applying it to practical mining. This is as it should be, for it stands to reason that without some knowledge of the deposition of the rocks and reefs, the work of laying out systematic mining operations must be attended with a large element of chance.

The result of the geological survey of the Bendigo goldfield, upon which I was engaged some years ago, under the direction of E. J. Dunn, disclosed the fact that transversely in a distance of 2½ miles there are thirteen anticlinal folds along which the saddle reefs are formed, with twelve corresponding synclinal folds between them. The survey comprised an area of 20 square miles, in an oblong strip 2½ miles wide by 8 miles long. The above number of anticlinal and synclinal folds were found within this limit, but it is well known that many others exist both to the east and west of the area surveyed. And further it must be noted that though the reefs were traced for a distance of 8 miles, they continue for miles north and south of that limit. When it is considered that the bulk of the mining operations has been chiefly conducted on only three lines of reefs, the magnitude of this field is apparent, also the immense area yet to be exploited.

The anticlinal and synclinal folds have a general strike of N. 20° W., but they do not at all times run parallel to each other—in places they nearly converge and again widen out. The distances between the anticlinal folds vary from 400 feet to as much as 1600 feet, and the synclinal folds are not always midway between them. For instance, there is a distance of 660 feet between the Garden Gully and Paddy's Gully lines of reef, with the synclinal fold only 130 feet west of Paddy's Gully reef. (Fig. 6.)

The fact must be admitted that where the synclinal reefs have been found they are invariably smaller in comparison with the anticlinal reefs, but it must also be noted that very few have been found, and only in a few instances worked to any extent. This smallness may be accounted for as follows:

When the bending over of the rocks is considered the action would be that the anticlinal folds would leave larger openings or cavities (subsequently filled with quartz), and the tendency would be that any accumulated quartz in the synclinal fold would be smaller, as the rock beds or layers would form so many troughs, one inside the other, the pressure always being downward toward the axes, with an action that would prevent large cavities being formed. There is one at least notable instance where the synclinal reef is a large one, situated 410 feet west of the New Chum line of reef, immediately north of Fortuna battery. This was a well known landmark in the early days, standing some 30 feet above the surface in the form of a pyramid.

Though the synclinal folds can not in all cases be fixed accurately on surface, owing to the rocks not being sufficiently exposed, they have been actually found on surface and at a depth in mines on the following lines of reefs, viz., between the Carshalton and Napoleon lines of anticlinal reefs, between New Chum and Sheepshead lines, between New Chum and Nell Gwynne lines, between Deborah and Garden Gully lines, Garden Gully and Paddy's Gully lines, and Paddy's Gully and Derby lines. So far as I know, the greatest amount of work done on a synclinal reef was that on a line between the Garden Gully and Paddy's Gully's reefs from Landsell's "Sandhurst" shaft, and also from the east shaft of the Koch's Pioneer Co. This reef was more than payable, and it seems almost unaccountable that more work was not done to further exploit the channel of ground north and south of this locality. Another instance where the synclinal reef was worked is at the Johnson's Reef Extended Co.; here it was followed for about 200 feet in length, but was hardly of a payable character.

The general local impression is that the inverted saddle reefs are not auriferous, or, at least, payably so, and that they are small comparatively; but I think this condemnation too sweeping, for it must be remembered that very few have been seen, and very little work done on those that have been found. It may be said also that the synclinal folds have been seen in many places without carrying quartz, and I agree that it is so; but, on the other hand, we have also numerous instances on the field where crosscuts have been driven and the anticlinal center country also found barren of quartz. In such a case, however, a center country winze is sunk and the reef invariably found, but I know of no case where such work has been done to exploit the synclinal country. I have mentioned where the synclinal reef has been successfully worked, which, I think, is sufficient to indicate the importance of searching for them, especially so where the amount of work necessary is small in comparison with that required for prospecting the anticlinal reefs.

From time to time a large amount of information has been gathered to endeavor to trace the same layers of rocks surrounding the auriferous reefs on the one line of reef to other lines of reefs on either side of it. To more clearly convey the importance of this, we will assume that at points A (Fig. 3) we have a rich reef surrounded by certain rocks. To fix the positions of these rocks at points B, C and D might solve the question that as the reefs at A were auriferous, so are those in the same zone of rocks at B, C and D. Though no definite principle has been evolved so far to decide as to the method of tracing these rocks, still some important move has been made in that direction. To actually decide this question, accurate data and close research are necessary, and with this knowledge at hand some definite scheme may be found to be of practical benefit. In this respect we are not likely to gain much information from the composition of the rocks themselves, as A. W. Howitt, in his analytical and microscopical examination of the rocks, taken from surface and at frequent intervals to a depth of 3000 feet, from Lansell's 180 Mine, finds that in actual composition there is no difference between them.

In the course of my work on the field, extending over twelve years, I have collected many examples of the synclinal folds under various circumstances, and purpose giving several of them to illustrate this paper. They are all from actual survey and accurate measurement and will tend to show, in some cases, the practicability of undertaking prospecting work for synclinal reefs at a comparatively small cost. By a glance at Fig 2 it will be seen that successive portions of the anticlinal and synclinal folds are not directly under one another, but have a trend eastward in their downward course of about 10 feet in every 100 feet. Thus as great depths are reached the synclinal folds have been getting nearer to the shafts. The shafts on the Bendigo field have, as a rule, been sunk in close proximity to the anticlinal fold or "center country." Consequently, though the synclinal folds are some hundreds of feet east and west of the shafts, with the trend eastward, one gets nearer and the other farther away as depth is reached. In the case of the New Chum Railway mine (Fig. 4) the synclinal is 500 feet west of shaft at surface, but at, say, 3200 feet, it will only be about 110 feet west, and when the shaft is sunk still deeper will be intersected by it.

In the same diagram I have shown the position of a saddle reef above the 2029-foot crosscut. This reef was highly auriferous, and it will be an interesting piece of work to trace downward the west leg of this formation until it reaches the channel of the synclinal, which should, approximately, be found by extending a crosscut at 2900 feet. Seeing that the reef above 2029 feet was highly payable, it is at least reasonable to assume that the syuclinal reef will be auriferous also.

Another interesting—and, perhaps, the most conspicuous—example of rock bending and reef formation is that at the Johnson's Reef Extended mine (Fig. 5). In this we have the Pyke and Garden Gully lines of reefs clearly exposed, with the synclinal folds on either side of them. The anticlinal reefs were both payably auriferous and the synclinal reef between also carried gold. Commencing at A, the same "back" or "wall" can be followed continuously to points B and C.

Still another very good section has been secured at the Sea Co.'s mine, and this shows with what regularity the rocks have been deposited (Fig. 6). From this it will be seen that the Paddy's Gully anticlinal is a short fold in comparison with the Garden Gully. By also comparing this diagram with that of the North Johnson's (Fig. 7) it will be seen that the Garden Gully and Paddy's Gully lines of reef have converged, as at the Sea Co. they are 660 feet apart, while at the North Johnsou's they are only 370 feet apart—a distance of 1¼ mile separating the two mines on the strike of the Garden Gully line of reefs.

Many other examples of the synclinal folds might be given, but those selected are typical of the field, and sufficient to illustrate the principle advocated.

EVERY mine where much timber is required in the workings should have a circular saw and a framing machine. By the means of these devices timber can be quickly framed and with sufficient accuracy for all purposes. Sawed wedges are superior to most hand made wedges and can be made from waste pieces of lumber and timber with a minimum of waste. It is economy to buy waste from lumber and planing mills when the same can be had at reasonable prices, for use in blocking in the mine and for making wedges, etc. If shaft timbers are bought as close as possible to the actual dimensions required in the shaft, a liberal allowance must be made for blocking. In a three-compartment shaft the blocking required is often equal to nearly the length of half a wall plate.

THERE are said to be deposits of lead-silver ore in the limestones in the Grand canyon of the Colorado river in Arizona, but owing to the expense of transportation and the difficulties of working these mines the development is not extensive. On the top of the plateau, about 50 miles north of Williams, copper ores occur strewn about on the surface, but it is not known that these deposits are more than superficial.

A STEAM ENGINE of 15 H. P. is large enough to run an air compressor operating a 3¼-inch rock drill, and will also supply air to the forges. A 25 H. P. engine will drive a 2-drill compressor, and a 60 H. P. engine should run a 6-drill compressor. In larger compressors about 8 to 10 H. P. are figured for each 3¼-inch drill.

Gaseous Fuels for Power and Heating.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by H. SHERWOOD, C. E.

To obtain the cost of power by the use of the fuels obtainable on the Pacific slope, notice first what has been outlined: that the poor water gas is chiefly got from coke or anthracite in England. Concerning this, it may be remarked as undesirable here. Lencanchez, in France, uses a low class of bituminous coal for gas and shows a considerable increase of hydrogen thereby. Further remark that, except ash and moisture be increased, the class of coal or lignite employed is equally valuable with any other for water gas. Therefore, the bituminous coal of the Pacific coast will produce as much and as valuable water gas as the best anthracite. We may, therefore, accept the data of production and use of poor water gas from coke, etc., as reliable for water gas which may be produced from bituminous coal. The action is through heating the fuel (carbon) in the generator by air to incandescence, after which the air is drawn in continuously by a jet of superheated steam, or steam under pressure. The gases produced are in composition $25CO\ 18H\ 49N\ 6CO_2$, with a production of about 62 cubic feet per pound of carbon consumed, which gives over 135,000 cubic feet of poor water gas per long ton of fuel. This gas is used in the majority of the Otto engines in England, of which the British patents were bought by the large engineering firm of Crossleys of Manchester, Eng., who made severe and exhaustive tests of the cost of running them by this gas. It was found that 18 I. H. P. engines took 82 cubic feet per indicated horse power per hour—coal gas requiring about 20 cubic feet for the same power and time. The decision came to was that the gas was not desirable for engines of less than 20 H. P., some irregularity in explosion being found; but the gas is admirably adapted to engines of larger size. It was found that in inverse proportion as the diameter of the engine cylinder increased the consumption of gas per horse power relatively decreased. Thus, an engine of 173 I. H. P. showed a consumption of 60% of the proportionate gas required by the smaller engine mentioned, while the 18 H. P. engine took gas equal to 1.2 pound of the fuel per horse power per hour, the larger size took but equal to 0.76 pound of the fuel per hour. An engine of 100 I. H. P. would therefore consume gas about equal to 1 pound of carbon consumed: viz., 62 cubic feet (which agrees very closely with the data given in the improved gas generators of pure water gas, to be referred to later on). Taking $7 a ton of 2000 pounds as the value of the fuel, the cost of thus running an engine of 100 H. P. is under 9 cents per horse power per twenty-four hours, while with the larger-sized cylinder tested the gas consumed is but 47 cubic feet per horse power per hour at a cost of 6½ cents per horse power per twenty-four hours. It must be noted that these are the largest engineers in that large manufacturing city, and run their own shop, requiring several hundreds horse power, entirely with these engines and with this gas. In the Lencanchez generators is employed the lowest and cheapest class of coal. No data have been published, but its use has been extended to about all the Simplex engines, which are very widely employed.

When pure water gas is made the carbon is heated to incandescence by air blast through combustion of part of itself, and the products of combustion removed from the generator, after which steam under pressure is blown through the heated carbon until it becomes cooled by the steam too low to dissociate its elements, when the operation is ceased and another period of heating to incandescence is begun. As a temperature of from 500° to 1200° C. is needed for dissociation, the cooling action of the steam at not over 160° C. is rapid. The interval of blowing to incandescence was therefore long, while the forming of water gas was short. The amount of "producer gas" formed was therefore considerable, and used by the gas works of cities to heat their coal gas retorts, while the water gas passed to carbureters before mixing with coal gas. By the improved generators, the time of heating the carbon is reduced to one-fifth of the total time, while the time of producing the pure water gas is increased to four-fifths of the total time. The work is thoroughly successful, and has been for some time past continuously in use. The data obtained on the results of this process are vouched for by some of the highest scientific men in Europe. Special tests made continuously in their presence showed that 1 pound of coke produces 34 cubic feet of pure water gas. To this consumption must be added, if the gas be required for power in gas engines, the consumption during the heating of the carbon which cannot be passed into water gas. The quantity of such gas required in the cylinder of a gas engine per hour to give out 1 I. H. P. is from 30 to 35 cubic feet. Therefore a total fuel of 1.07 pound of coke per hour ensures 1 H. P. in the gas engine. This, at $7 per ton, equals 9 cents per indicated horse power per twenty-four hours in an engine of 80 H. P. This grade of gas is adapted to every size of cylinder, but with the same economy for large cylinders, which is inherent in every gas engine. In employing this gas the volume of air required for explosion is double that of poor gas. The

data given prove the correctness of both, and show both to be fully reliable. The analysis of this pure water gas is about 31CO 51H CH $5CO_2$ 4N, making 83% of explosive gases with 9% inert gases, balance being moisture.

Notice now the fuels convenient to use on the Pacific coast. The crude petroleum of central California has mostly an asphaltic base. As this is less advantageous for lighting oils than with a paraffine base, California oil may long remain a moderately costly fuel. For water gas making its base makes little difference. The asphaltic residue has its carbon changed by heat and steam as any other carbon is. The residue of oil distilling is also completely converted by air and superheated steam. The generators, made for converting these into water gases, employ coal or wood as the solid incandescent carbon, while the heaviest portion of the crude oil also carbonizes and spares the use of much specially employed. The special generator made for petroleum is on the principle of pure water gas from coke with superheaters for the petroleum and steam injected, which are 1¾ pound of crude oil to 1 of water or steam. It may be employed to produce either grade of gas. No complete data have been published of its production or its use, as in many other fuels, but knowing the composition of petroleum, these may be assumed very accurately and verified by its use in burning with steam. Its conversiou into fixed gases is very perfect, but requiring a higher heat in reassociation than most other fuels owiug to the extreme volatility of the highest portions. By calculation, there would be produced from 1 ton crude petroleum 58,000 cubic feet of water gas, of which 65% is H, 33% CO, with a little inert gas. Such a gas needs for its complete explosion uot under eight volumes of air to one volume of gas, of which, not over 20 feet are required to give out 1 H. P. in oue hour. The extreme calorific quality suggests that, for power alone, it is more useful as poor gas containing its own volume of nitrogeu, consuming double the quantity in the engiue cylinder, and using half the cold air to explode. The cost per horse power per tweuty-four hours, taking $1.67 per barrel for petroleum delivered far from railway, would reach 9 cents (using pure water gas with engines under 80 H. P., but most probably not over 7½ cents per horse per twenty-four hours using it as poor gas in engines of 100 H. P. and upwards). Iu San Francisco, Cal., the cost of horse power per twenty-four hours would not exceed 5¼ cents, used as poor gas in large engines.

At the present time most gas engines are run by sprayed oils distilled from petroleum. Taking gasoline at 11 cents per gallon and distillate at 8 ceuts, it is not an economical source of large powers. Petroleum with paraffine base is purchasable at $1.25 per barrel—making 3 cents a gallon, giving off on heating four-fifths of its weight in clean vapor. An engine is specially prepared for using this—the Economic gas engine. Tests of the cost of power by this use of crude petroleum are claimed to have shown a cost per horse power per twenty-four hours to be about 10 cents after allowing for the residue—certainly a convenient, cheap supply for small powers. The same power would probably cost by gasoline 28 cents; by distillate, 21 cents, and by city gas, 32 cents. Larger powers would find a reduction. In mills away from railroad, for which an average cost of $1.65 per barrel of crude petroleum is assumed, the cost of power in the crude petroleum gas engiue would be about 13 ceuts per horse power per twenty-four hours. But in these engines it must be borue in mind that exceept the petroleum have paraffine base there must be great liability of furring an engine cylinder, through imperfect purity of the gas from coudensible asphalts.

(TO BE CONTINUED.)

AT Tinton, a new mining camp in western Lawrence couuty, South Dakota, a concentrating mill is approaching completion. It is being built to treat the tiu ores of that district. This sectiou of the Black Hills, known as the Bear Gulch region, consists of mica schists and slates of Algonkian time. These ancient rocks are intruded by dikes, large and small, of a very coarsely crystallized granite, known as pegmatite. In these dikes occur tin, rare iron ores, phosphates, tourmalines and other minerals, besides the normal constituents of the granite—feldspar, quartz and mica. Some of the veins also coutain gold, associated with the tin. The tin-bearing rocks are not unlike those of the Harney Peak region, 65 miles to the southeastward, where tinstone also occurs. Several attempts have been made in the past to concentrate and reduce the tin orcs of the Black Hills, but these efforts have thus far proved commercially unprofitable. There is much interest in the outcome of this renewed attempt to treat the Black Hills tiu ores. The plant at Tinton is the first one built in that section of the Hills, all of the others being in the Harney Peak region.

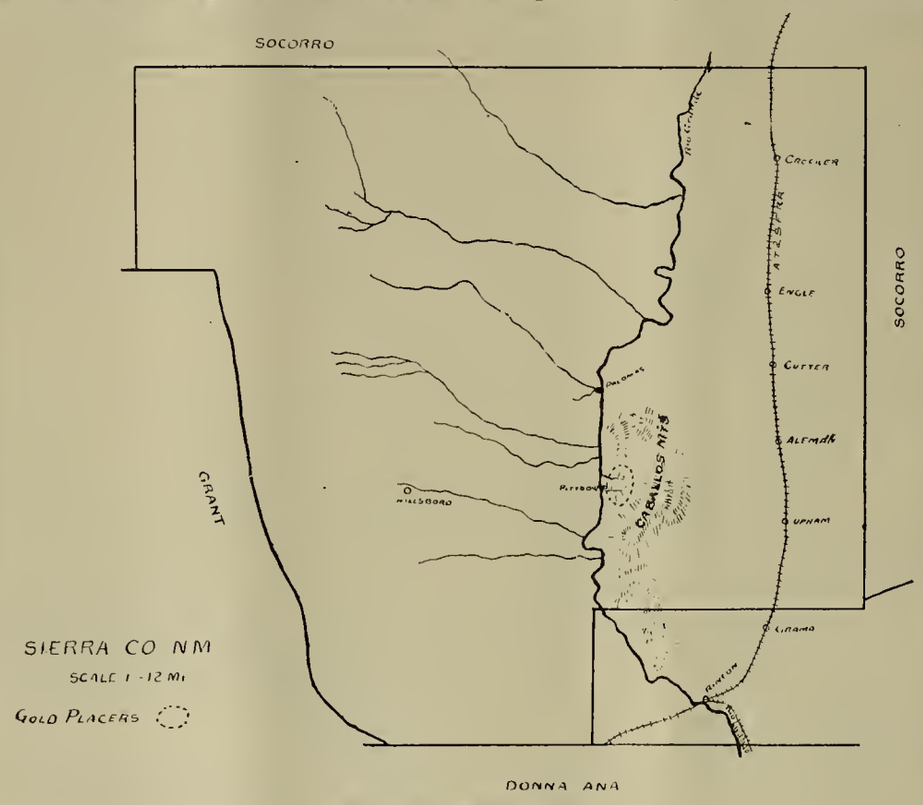
THE miners of British Columbia are petitioning the Provincial Government to remove the duty from crude petroleum in order that the cost of fuel oil and oil for concentration may be reduced to a point which will render its use possible iu the mining regions of that province. The duty at present is 5 cents per gallon.

Notes on New Goldfields, Sierra County, New Mexico.

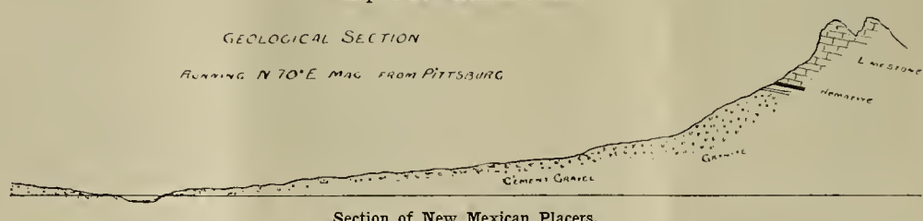
Written for the MINING AND SCIENTIFIC PRESS by E. P. SMITH.

Gold has been known for a number of years to exist in the recent gravels on the west side of the Rio Grande, in Sierra county, in the neighborhood of Hillsboro—not, however, in sufficieut quantities to prove profitable. The discovery of the metal during the early part of December on the east side of the river has awakened unusual interest in the district. Exaggerated reports as to the extent have been spread about, but that certain rich portions of the gravel could be readily panned by blowiug with the mouth on the haud or pau, and that considerable gold was so taken out, are undoubted facts.

The field lies on the east side of the river, the chief strike being at a point about 10 miles south of Palomas. A town, composed of twenty-five or thirty (December 18) tents, and known as Pittsburg, lies close to the river on an eighty-acre tract of patented ground owned by the Grayson Cattle Co. It contains a uumber of stores, saloons and a hotel, and forms a base of supplies for the numerous smaller camps scattered betwcen the river and the mountains.



Map of New Mexican Placers.



Section of New Mexican Placers.

These mountains, the westeru chain of the Cabollas range, are about 4 miles distant in a straight line from the river, and run, in general, parallel to it.

The summit is about 6000 feet above sea level (taken by aneroid), or about 3000 feet above the river. From the summit there is an abrupt drop of 1000 feet or more, and then a gradual descent to the river.

The slope is made up of a deposit of cemented gravel, whose thickness is exposed in some places as much as 200 feet by arroyos. The main arroyos run directly towards the mountains, east and west, while the tributaries run to the quarter points.

In the bottom of this system of dry streams has been laid down a layer of loose sand and boulders, whose thickness rarely exceeds 4 feet, and in the smaller gulches is but a few inches.

In the bottom of this, usually on the irregular surface of the cement gravel, is found the gold.

The main arroyos are from 50 to 150 feet wide, and in them this later gravel is thickest, while the small tributaries are about 5 to 10 feet wide, and in these most of the work has been done.

The boulders are picked out, the top layer of sand scraped away and the bottom part carefully scraped or brushed up from the hard cement. This is put in pans and blown upon until the particles of gold can be picked out.

Most of the particles are coarse, as would be supposed from this crude method of treating. The size of a wheat kernel is, perhaps, the most common, while they run as high as two pennyweights. The larger operators are now packing the rich sand in sacks on burros to the river and cradling it. Also two small hand-power jigs have been used, with only fair results, however. Most of the operators are Mexicans and the greater part of them seem content with the blowing method.

The accompanyiug section, taken along a general line running north 70° east magnetic, will show the geological structure of the country lying to the east of where the greater part of the gold is found.

The granite, which extends from where the cement gravel ends part way up the mountain, a horizontal distance of ¾ mile, is of a pinkish color, containing segregatious—rather than veins—of pegmatite. It is also crossed by dikes of diabase 2 or 3 feet wide, running east and west.

Resting on the granite is a serics of sedimentaries, startiug with a thin layer of hard, white quartzite, then about 8 feet of impure limestone, ou which rests about 8 feet of an oolitic hematite. From this to the summit is a series of limestones and shales, full of siliceous concretions and showing some fossils, crinoids and spirifers. The whole series dip 20° to the uorth-east.

Through the upper limestones passes a heavy fault, judging from the brecciated area, and in the same strata are numerous small quartz veins—seldom over 1 foot in width.

These same formations—the granite overlaid by a similar if not identical series of sedimentaries—can be seen to continue up the river ou the east side as far as Palomas. Yet the area where the gold in any quantity has been found may be confined to a section 2 miles square.

It would seem that the origin of the gold must be from either the granite or the small quartz ledges in the upper limestones, and, not finding values farther up the river, would lead one to expect values in the above-mentioned ledges.

The large mass of cemented gravel has not yet beeu proved valuable, while the small amount of loose gravel at considerable distance from the river will hardly prove much of an inducement to install a large pumping plant.

The Trujillo and Silva groups take in about all of the really proven ground, while for 15 miles along the river all the ground has been located to the summit of the Caballos range.

Slimes Treatment.

Written for the MINING AND SCIENTIFIC PRESS by D. G. APLIN.

The following is written in the hope that it may help some one who has a small body of slimes to work, and who does not wish to incur great expense. It is well enough to be told by various authors on cyaniding that "slimes are generally worked with centrifugal pumps and filter presses," but as far as actual practice goes such a statement is of little benefit. The writer does not contend that our treatment of slimes was good practice in general. In fact we are now doing it much better, by taking the slimes directly from the mill. However, under adverse conditions, with very little outlay, we cyanided about 2500 tons, at reasonable cost, and obtained good extraction.

The circumstances were these: The San Francisco mine had produced about 30,000 tons of tailings. These were run into a reservoir without classification. The layers of sand were taken out and cyanided, and the layers of slimes also taken out in part, and dumped down the side of a canyon. As we cleaned out the dam, we continued this process of separation. I found that we obtained nothing from the slimes when mixed with sand, and so cut out all possible.

When the sand was finished we had three piles of slimes containing about 10% of sand, and perhaps 5% of rocks, the latter varying in weight from a few ounces to fifty pounds. The larger rocks were put in to support two well boxes in the dam, and the small ones came from sides of the canyon. We had insufficient ground on which to spread these slimes, and so were bothered in drying them, but managed to dry almost as fast as the plant required.

Our equipment consisted of three 65-ton wooden tanks, and twenty-four 10-ton iron tanks, for leaching; two 40-ton wooden tanks for solution and sump, and a 20-ton iron tank. We used this 20-ton tank for our agitator. It was 16x8 feet on top, 6 feet deep, and ran down on the bottom like a letter "U."

We fitted up a discarded 2-inch centrifugal pump with new shaft and vane, and connected it to draw from the forward end of this agitator, and discharge into the other end. This discharge—a 2½-inch pipe—also passed ou over the settling tanks, and the openings were stopped with wooden plugs. The suction was 3-inch, with discharge opening between tank and pump. There was also an inlet for water, which came in under about 80-foot head.

Our crushing rolls were placed on stringers over the pump suction, at the forward end of the tank, and a small slimes bin was built over the back end. We made the rolls for crushing out of discarded boss heads. We plugged the key-ways in these bosses, set short pieces of shafting in the ends, and filled in with molten scrap brass. The rolls, when completed, weighed about 300 pounds each, and were 21 inches long by 9 in diameter. Bearings for one roll were fixed to slide, and behind these bearings were placed pop-valve springs to hold the roll up to its place. One roll ran about ninety revolutions per minute, and the other about one-third faster.

Our power was obtained from a 4 H. P. gasoline engine. It was not strong enough to do the pumping back and putting on of solution while we were running the rolls and agitator, so that had to be done at night.

Directly under the rolls we placed a jig screen, which projected over the edge of the tank, and screened out rocks and sticks. Its meshes were about ¾ inch square, and any slimes too moist to pulverize went out with the rocks. In this way we lost about thirty tons of slimes, but the screen was an absolute necessity.

Two men supplied material, and two ran the machinery and fed the rolls. In the beginning of our operations, we found that the 40-ton sump and 10-ton gold tank were insufficient to handle the large bulk of solution, and so we coupled two 10-ton tanks on the sump, and five 10-ton tanks on the gold tank. The seventeen iron tanks remaining were moved down on a level with the big wooden tanks, and all used for settling. For carrying off solution, a pipe was introduced through the bottom of each settling tank, with swinging arm which could be raised or lowered. An opening was made in the bottom of each tank, and closed from the inside with a long-handled wooden plug.

In operation the plant worked as follows: Seven tons of solution, made up to three and one-half pounds of cyanide to the ton, was run into the agitator, and the pump started. With the solution in motion, dry slimes were fed through the rolls as fast as a man could shovel, until five tons had been put in. If the pump showed signs of clogging up, the feeding was stopped for a few minutes, or a little water was run into the pump suction. Beginning at 7 o'clock, a charge would be put in a little before 9. At once the sludge would be turned from the agitator into a settling tank. When it was quite low in the agitator, solution was turned into the back end, and three more tons of solution used to wash out the agitator. At the end of thirty minutes the sludge and wash had been pumped into the settling tank, and the agitator was ready for another charge. Four men could put through twenty tons per day, during which time twelve gallons of distillate were used for power.

The dissolving solution was drawn off at the end of twenty-four hours, and a second solution, from the sump, pumped on through a fire hose. This pumping on was sufficient to agitate the sludge quite thoroughly. A third solution was then put on, and following this a final wash water. It is seen that this method of washing and dissolving took five tons of solution to every ton of dry slimes treated. The large bulk of the solution handled necessitated large pipes. I tried lime to help settle the sludge, but found that in this case it did little good. The time required to put through a tank was as follows: One day to settle each of the first three solutions, and two days to settle the wash water. Tanks could be emptied quickly and filled the same day, making five days to finish each. The capacity of each tank to work slimes was equal to about one-third of its capacity measured in sand.

We put steel plates, ¼ inch thick, on the inside of the pump, and had to renew them for each 600 tons treated. The pump shaft and vane had to be renewed at the same time, so that in working 2500 tons, we wore out four shafts, vanes, and sets of plates. Of course, the amount of sand was considerable, and every evening we had to clean out the agitator. We extracted 50% of the value from this sand.

The solutions, especially the last one, were rarely clear, as they passed through the zinc boxes, but the slight cloudiness did not interfere with precipitation. It did, however, result in muddy slimes, and necessitated a larger quantity of fluxes in the cleanup. We mixed each wash water with a dissolving solution before passing them through the zinc, and thus secured almost perfect precipitation. I often obtained only a trace of gold from five assay tons of sump solution.

Cyanide consumption was high. This was partly due to copper in the slimes, and partly to loss of solution in the sludge. Our work resulted in a consumption of almost two pounds of cyanide to the ton of dry slimes treated. The extraction averaged 82%.

Since cost of labor and supplies depend so largely on local conditions, I will not give the cost per ton here, but will give below equipment, number of men and approximate supplies necessary to handle twenty tons per day, as we worked them:

One 40-ton standardizing tank.
One 80-ton sump tank.
One 60-ton gold solution tank.
One 15-ton agitator.
Settling capacity of about 75,000 gallons.
Thirty-five cubic feet of zinc.
Five men nine and one-half hours per day.
One 2-inch centrifugal pump; repairs $10 per month.
One 2-inch rotary pump.
Fifty feet of 2-inch fire hose.
Four horse power sixteen hours per day.
Crushing rolls.

Of course, the necessary small tools and incidentals, such as are in ordinary use around a cyanide plant, need not be mentioned.

At present we are running the tailings from the mill directly into a hydraulic separator. From this the sand runs into the tanks, where it is cyanided with excellent results. Slimes run from the separator into the old dam, and from this are drawn out into tanks and cyanided by decantation, as described above. After two months' trial of this method of handling tailings, we find it vastly more economical than any way of working up dry slimes.

Mexico Quicksilver Mines.

The most important quicksilver mines of Mexico are those of the group named Huitzuco situated about 20 miles from Iguala, a station on the Cuernevaca railroad, says the Miner and Manufacturer. The mines in question cover an area of 568 pertenencias of 100 by 100 meters. Of these mines thirteen are in exploitation, three of which are producing quicksilver of an excellent quality. The deposit is very extensive and the veins well defined. The principal shaft is down 800 feet and clearly demonstrates the depth of the mineral deposit. Excellent metal has been taken out at different levels for a distance of 150 feet, showing the width of the veins, which are composed almost entirely of ore. There are many properties that the ores are richer than those of Huitzuco, yet there are none that, taken as a whole, are so valuable. The value of this property consists in the immense deposits. There are many thousand tons of the ore in view at the present time. The reduction works consists of six furnaces 50 feet high, constructed after the model of those used in the California quicksilver mines with all the necessary condensers and appurtenances, all of the most modern type. From the mines to the reduction works is a distance of 6 miles. A tramway transports the ore from the mines to the works.

Copper Ores and Their Physical Appearance.

Written for the MINING AND SCIENTIFIC PRESS.

No ores are more interesting and attractive than the various ores of copper. The prospector is usually fairly well informed as to the appearance of some copper ores. He knows that at the surface they are generally green or blue, and accordingly believes all rocks or ores having a bright green color are copper ores, and that bright blue ores are also copper ores. While this is mostly the case, there are important exceptions to the rule. The bright green scales so commonly seen associated with quartz and dolomite in the gold belt of California is mariposite, a variety of mica, and contains no trace of copper, the color being due to chromium oxide. There are also certain iron silicates—such as glauconite—which are green and contain no copper. Some chrome ores are bright green, and gouthite and garnierite, two important nickel ores, are also green, while containing no copper. It should not be thought, however, that because a green ore contains no copper it has no value, for, with the exception of mariposite and glauconite, all of the above-mentioned ores are valuable when occurring in sufficient quantity.

The beautiful blue copper carbonate, azurite, bears a close resemblance to linarite. A basic sulphate of lead and copper, vivianite, is a bright blue ore resembling azurite, but contains no copper, being a hydrous phosphate of iron.

The most common ore of copper which the prospector sees in his surface examinations is undoubtedly the green carbonate, malachite. Less frequently he sees azurite, the blue carbonate, and still more seldom cuprite, the red oxide. The black oxide is more common, but may be confused with other more common minerals, particularly with black manganese oxide.

Malachite is bright green in color. It occurs massive, in radiated, star-like crystal groups, and incrusting. It is deceiving, in that a small percentage of this mineral will give a decided green color to the rocks containing it. The prospector should be guided to some extent by the weight of hand specimens, for if the ore is high grade in copper it will be much heavier than a rock of similar size that is merely stained with the carbonate. The fracture of malachite is uneven. It is brittle, with hardness of 3.5 to 4; gravity about 4. It occurs earthy and dull, crystallized, sometimes in transparent crystals, often in silky fibers. The streak made by scratching with a knife is green, but lighter in color than the mass of the mineral. When heated before the blowpipe, colors the flame green. It is soluble in acids. A solution of malachite in nitric acid colors the liquid green. An addition of ammonia in excess turns this color to dark blue. Azurite is the blue carbonate and resembles malachite in its physical properties—that is, is earthy or crystallized, hardness 3.5 to 4, gravity 3.8, streak blue, but lighter than the mass; colors blowpipe flame blue; dissolves in acids, etc.

Another ore of common occurrence is chrysocholla, a silicate of copper, of a green or bluish green color. It has a luster varying between earthy and vitreous. Its hardness varies considerably—from 2 to 4—but it is much lighter than malachite or azurite, having a gravity of but 2 to 2.2. This ore often resembles turquoise. When impure it is sometimes brown or black. When pure it contains about 45% copper oxide. It is found associated with other copper ores, particularly in surface portion of deposits. This ore also colors the blowpipe flame green, but, unlike the blue and green carbonates, is infusible without the aid of fluxes. It is decomposed by acids.

There are numerous rare copper ores of limited occurrence which have a bluish or green color, but it is unnecessary to mention them in connection with the more important ores of copper.

Cuprite is an ore not infrequently seen in the croppings of copper veins. It is commonly called red copper ore and resembles bright red iron oxide (hematite). It occurs earthy and also crystallized. In the latter condition it often assumes octahedral shapes. Its color is red of various shades from light to dark. It is the richest copper ore, containing when free from impurities 88.8% metallic copper. It is softer than hematite, but harder than cinnabar or proustite (red silver ore), for which latter it is often mistaken. Many mineral cabinets contain handsome groups of crystals of cuprite which are erroneously labeled "ruby silver." Cuprite also colors the blowpipe flame emerald green, and on charcoal fuses to a metallic bead of copper. These characteristics serve to distinguish it from hematite and other minerals of red color.

The black oxide of copper occurs with greater or less frequency associated with other ores of copper, and is particularly noticeable with copper ores occurring in slates and schists, as at Ducktown, Tennessee, in Pennington county, South Dakota, at Keweenaw Point, Michigan, and in North Carolina and Virginia. It is often accompanied by oxides of iron and manganese. It can be distinguished from other black earthy minerals by its reactions for copper before the blowpipe and in treatment by acids.

The black oxide of copper contains a high percentage of the metal.

The above are the principal copper minerals with which the prospector has to deal when exploring the surface for mineral veins, and all of them are directly or indirectly the result of the oxidation of chalcopyrite, the yellow copper sulphide. In the superficial portion of ore bodies containing a large amount of sulphide of irou, or iron and copper sulphides, the sulphides often oxidize where above the drainage level and leave only a gossan of iron oxide. Although pyrite and marcasite (iron sulphides) are more subject to oxidation than tbe copper-iron sulphide (chalcopyrite) yet in many instances the copper also has disappeared, leaving no trace of its previous existence in the gossan, which consists of red or brown iron oxide, with more or less silica, lime, etc., as gangue. In a district where veins occur the prospector should investigate all such iron gossan carefully, for beneath may lie a rich deposit of copper ore. When a deposit originally containing iron and copper sulphides has become oxidized, with the iron gossan only remaining, it is usually found on sinking into the deposit that the copper has been leached out, probably by the sulphuric acid produced by the oxidation of the pyrite, and that it has been carried downward by surface waters, to be precipitated at or near drainage level upon the iron oxide there present, producing a zone of rich copper carbonates and oxides. Below this, again, is sometimes found an enriched sulphide zone in which occur bornite, chalcocite (copper glance) and other sulphides rich in copper.

Chalcopyrite, the principal sulphide ore of copper, though not the richest, occurs at the surface in some veins. It resembles pyrite somewhat, but is more yellow, with (in some specimens) a faint greenish tinge. It is softer than pyrite and may be scratched readily with a knife. It has a metallic greenish black streak. This ore is soluble in nitric acid, coloring the solution green, which turns blue upon additiou of ammonia. Iron sulphide is often tarnished yellowish and then resembles chalcopyrite. but the superior hardness of pyrite will serve to distinguish it from tbe copper sulphide.

Bornite is a sulphide of iron and copper, with varying proportions of these metals. It usually contains upward of 30% copper, and sometimes considerably more. It presents a bright, iridescent appearance, showing bright tints of green, purple, blue, etc. In the true bornite these colors penetrate throughout the mineral, but some specimens of chalcopyrite are colored in this manner by a thin film of color whicb is due to semi-oxidation of the sulphide. This is commonly called by miners "peacock copper." But this is a misnomer, for it is uot bornite. Copper glance and the still more rare arsenical aud autimonial compounds of copper are of too restricted occurrence to make it necessary to describe them here.

Discovery and Development of the Homestake Mine.

Written for the MINING AND SCIENTIFIC PRESS.

Gold was known to exist in the Black Hills of South Dakota several years before the stampede to that region in 1875–76; but the knowledge was of an indefinite nature, and until venturesome prospectors entered the Hills in the fall and early winter of 1875 nothing was actually known of the country or its resources. The Black Hills rise like an island from the sea in the great plains which surround them. The Hills, together with the Bear Lodge mouutains, which are on the northwest side, though the latter is a separate uplift, form essentially one area of elevation and are detached from the Rocky mountain system, lying at least 300 miles easterly from the main rauges in Wyoming. The Hills are covered with a forest of pine timber, which from a distance gives them a somber aspect and suggested the name Black Hills to the early explorers. The first parties of gold hunters found placer gold on French creek, in the southern hills, in Custer county, a few miles from Custer City. Gold was also found on Spring creek, Battle creek, Castle creek and Rapid creek, and in many small, dry gulches; but, although individuals occasionally did well in these placer workings, the majority only met with moderate success. Several parties pushed on into the northern hills, and one of these, known as the Gordon party, while searching for lost horses, came down a gulch from the westward into what is now known as Deadwood gulch, and found gold on a bar of that stream, about a mile and a half above the site of Deadwood City. The district was called "Lost district." The "strike" proved a rich one and claims were quickly taken. The news spread, and in an incredibly short time Deadwood gulch was staked for miles above and below discovery. Claim No. 1 below was owued by Wheeler Bros. It occupied a flat about 200 feet wide in the gulch. The bedrock was nowhere over 5 feet deep on the claim (300 feet on the gulch reaching from "rim to rim"—that is, 30 feet above the creek on tbe hillside—) and it probably averaged less than 4 feet. From this claim in the summer of 1876 over $100,000 was taken, and the ground was worked over three times afterward with fair results. Other claims did almost as well; but, as usual, some were comparatively worthless.

All the tributaries of Deadwood gulch, and, in fact, the entire drainage system in the neighborhood of Deadwood, was located, and the development of the placer mines soou indicated that tbere was some central point from whicb the gold came. Bobtail and Blacktail gulches, tributaries of Deadwood gulch, were very rich, and, being shallow, were worked out the first two seasons. At the site of Deadwood another good-sized stream joins Deadwood gulch. This is known as Whitewood. About 2½ miles above Deadwood City a narrow gulch enters Whitewood. It is called Gold Run. This was one of the richest of the numerous gulches found. Other tributaries of Whitewood were located and tested, but proved of inferior value. The pay extended up Whitewood to Gold Run, but was poor above the mouth of that stream, indicating that the source of the gold lay somewhere on Gold Run. Bobtail headed only a short distance from the west branches of Gold Run, and pay got poor on Deadwood near the mouth of Poorman gulch. The results of placer mining indicated that the source of most of the placer gold lay in the region drained by the several streams named. Long before this fact was demonstrated, however, prospectors were searching for quartz which would prove to be the source of gold found in the placers. Among the first deposits found, unlike the gulch diggings, were outcrops of hard ferruginous conglomerate, which in numerous places was found to be rich in gold. The hills about Central City were capped with beds of this character and stamp mills were soon erected to crush this gold-bearing material, which was so easily mined, lying in some instances on top of the ground, and in all cases having a slight dip to the northeastward. In time the fact was recognized that these detacbed deposits had at one time been a continuous sheet, which had been intersected and divided into numerous separate areas by the cutting out of the gulches.

Among the first to seek for quartz veins were the Manuel Bros., and these men found on the west side of the broad open valley near the head of Gold Run an outcrop of deep red quartz rock, which contained a prospect of gold. With possible visions of a life in a home in a region far removed from the wilderness in which they found themselves, they called the first claim "Homestake." The vein proved to be wide—varying from 50 or 60 feet to more than 100 feet in places. Although the Manuel mine was recognized as gold-bearing, it was so low grade, as compared with mines with which they and other miners were familiar elsewbere, that at first little confidence was placed in it. However, other claims were staked all over the district, many of them showing gold. Tunnels were driven into the hill on these great masses of red quartz, and it was seen that there were a number of large veins lying nearly parallel, all containing more or less gold, but none of them rich. A specimen of free gold was uncommon. Mills were built and the quartz ore from the Homestake and surrounding claims and also that from the conglomerate beds were crushed in these mills, most of them running on custom ore. These ores were found to crush rapidly and to yield a high percentage of their gold contents to amalgamation—were, in fact, free-milling. This was the first encouragement the owners of the large low-grade deposits had had, for most mining men who had visited and inspected the veins declared them either too low grade to pay in that region—300 miles from the nearest railroad—or, at least, to form a very dangerous risk for investment of the necessary large capital.

The first mill on the Homestake mine contained thirty-five stamps, weighing about 650 pounds each. Ore was delivered by wagons and dumped on a plank floor back of the line of mortars and all feeding was done by hand, the large rocks being spawled by men with heavy hammers. Still, notwithstanding tbese primitive and expensive methods, the low-grade ore paid expenses, and in some cases it paid handsomely. Among other uoted mines on the great mineral zone were the Highland, which joins the Homestake, the Golden-Terra, the Deadwood, both on Bobtail gulch, the Caledonia, in the same valley, and the Father de Smet, on Deadwood gulch. Each of tbese mines was owned and operated by a separate company in the early days of their history.

The first large mill built in the Black Hills was tbe Homestake mill, originally containing eighty stamps. This was built in the summer of 1878 and the following year the Golden Star of 120 stamps (now 200), and later the Highland mill of 120 stamps (now the Amicus with 140 stamps and 100 to be added). The Father De Smet mill was built in 1879 and contained 100 stamps. This mill is now known as the Mineral Point. The Deadwood and Golden Terra mines each had sixty stamps originally. In later years the mills were united, and it now contains 160 stamps, and is known as the Pocahontas mill. The Caledonia mine was originally worked with twenty stamps, but a new mill was built in 1879–80 of sixty stamps. This mill, now the Monroe, now contains 100 stamps. These facts show how the work of extension on the Homestake has gone on with the development of the property.

The Homestake was the first very large low-grade gold mine to be profitably operated, and has "set the pace," as it were, for low-grade mines everywhere. There are more favorable economic conditions in some other regious, and mining and milling can be carried on more cheaply under such more fortunate conditions than at the Homestake, but the mining and milling methods of that concern have been reduced to a science, and these methods may in many instances be followed with satisfactory results elsewhere.

Cobalt-Nickel Arsenides and Silver in Ontario.*

Written by WILLET G. MILLER, Provincial Geologist, Toronto.

Recently the discovery of cobalt-nickel-arsenic and silver ores in the northern part of the Province of Ontario has been made public. Little importance appears to have been attached to the deposits by those wbo first saw them, it beiug thought that they carried but a small amount of copper, the niccolite being mistaken for this metal. T. W. Gibson, the Director of the Bureau of Mines, when on a recent visit to the district, received specimens of the minerals, and recognized that they represented valuable ore. Tbe writer was, accordingly, instructed to make as thorough an examination of the deposits and surrounding area as could be made at this season of the year, snow having already begun to fall in the district.

The deposits were discovered during the building of the Temiscaming & Northern Ontario, the government railway, which is now under construction from North Bay Junction, on the Canadian Pacific, to the head of Lake Temiscaming. The roadbed of this new railway ruus almost over the top of the first of the deposits discovered. The ore bodies lie 5 miles south of Haileybury, one of the two villages on the Ontario side of the northern part of Lake Temiscaming. Haileybury, following the railway, lies about 106 miles north of North Bay station, which is, by the Grand Trunk Railway, 227 miles north of the City of Toronto.

As the deposits were discovered recently, and the surface is covered with snow, little prospecting has been done in the surrounding area. The discoveries were made by men employed on the railway, and not by prospectors; hence the work has not been done as systematically as it might have been.

When I visited the locality four veins had been located in the vicinity of a small body of water known as Long lake.

Each of the four veins visited was found to carry cobalt. Nickel also appears to be present in all of them; but as the weathering of the cobalt compounds masks, at times, the nickel colors, this latter metal was not definitely recognized in two of the deposits, although it doubtless occurs wherever the cobalt is found. Three of the veins are rich in native silver.

Little work has been done on any of the veins, and as the surface is covered with moss and soil it is impossible to state what is their horizontal extent. All of the veins cut through one or both of the formations known in the district as Huronian slate and breccia-conglomerate. The latter rock is considered to be composed of volcanic ejectamenta—grains and fragments of various kinds which have become consolidated.

The slate and conglomerate have a slight dip, and the veins referred to cut them almost vertically. The strike of veins Nos. 1 and 3 is approximately northwest and southeast. Diabase and grabbo invade these fragmental rocks in some parts of the district, and seem to underlie most of the area.

Vein No. 1 has been uncovered at three points, which are within a few yards of one another. As the surface of the rock is low here, and little of it is exposed, it is difficult to tell much about the form of the deposit. Medium grained, dark-colored conglomerate is found on one wall. At the widest opening the deposit has a width of over 6 feet, but the vein matter is more or less mixed with rock. The ore consists of niccolite (the arsenide of nickel) and smaltite (the diarsenide of cobalt), together with much native silver. Niccolite contains, theoretically, 43.9% of nickel and 56.1% of arsenic. Smaltite carries 28.2% of cobalt and 71.8% of arsenic. The ore of nickel now worked in Ontario, the iron sulphide or pyrrhotite of Sudbury, in whicb nickel occurs not as an essential but as an accidental constituent, carries, on the average, less than 5% of the metal. On weathered surfaces the vein matter is coated with the beautiful pink decomposition product, cobalt bloom. The green uickel stain is also seen on some surfaces, but is usually masked by that of the cobalt. This nickel compound is probably the arsenate (annabergite), but nickel silicate may also be present. The scondary mineral, arsenolite, was seen on some specimens. The native silver occurs as films, or leaves and fine threads, or moss-like forms, through the nickel and cobalt minerals especially in the niccolite, as well as in cracks in the rock and in the calcite veinstone. In weathered portions of the ore the silver shows distinctly. One sheet composed chiefly of silver, attached to a rock surface, had a thickness of nearly 0.375 iuch and a diameter of 1 foot. Pro-

*Abstract of Paper in Canadian Mining Review.

fessor Nicol has recognized the antimonial silver, dyserasite, as was suspected in the field, in association with the native silver. He has also proved the presence of chloanthite. It is associated with the niccolite, and also occurs, pretty free from cobalt, in some of the nodular masses in the calcite.

A sample showing native silver was found by A. G. Burrows to possess the following composition: Silver 26.24%, value $5237.60 per ton, cobalt 8.34%, nickel 5.26%, arsenic 13.28%. Another sample, composed essentially of niccolite contained 5.02 ounces of silver to the ton, and nickel 26.64%, cobalt 6.16%, arsenic 45.67%.

As so little work has been done on this ore body it is difficult to determine whether the three openings belong to one vein or whether the ore occurs in a more irregular deposit, although the chief opening appears to be on a vein-like body. The ore is undoubtedly very rich, containing values in nickel, silver and arsenic, and a comparatively small vein could be worked at a profit.

On location No. 2 the ore body is distinctly vein-like in form. The ore here is a mixture of smaltite, and probably some closely related arsenides of cobalt, such as safflorite and niccolite. The only complete analysis which has yet been made of the ore from this locality was that of a sample from this vein. It was found to have the following composition: Cobalt, 16.8%; nickel, 7%; iron, 6.3%; arsenic, 69%; rock matter, 0.9%; total 100. An average sample taken by the writer across the vein at one point gave the following percentages: Cobalt, 16.76%; nickel, 6.24%; arsenic, 66.60%; sulphur, 3.37%. Antimony and silver were found to be absent. This ore body, unlike the other three examined carries no silver in the parts so far uncovered. Three openings have been made on the vein over a length of 300 feet. The massive ore has a width of 14 inches, but vugs in the wall rock, 2 feet feet or more from the vein, are filled with cobalt bloom. The rock of both walls is slate. The walls are well defined and the vein dips almost vertically, the strike being toward the southeast. The vein lies on the hillside and is at a height of about 70 feet above the water level. Although the width of this vein is not great, the character of the ore is such as to make it promising, at the present prices of the metals contained in it.

The ore has a massive appearance and a dark gray color, where not coated with cobalt bloom. When examined in hand specimens, especially if a polished surface be examined with a magnifying glass, it is seen to be a mixture of a gray mineral, which is chiefly smaltite, and the reddish mineral, niccolite. Smaltite and the corresponding arsenide of nickel, chloanthite, are claimed by most authors to pass into one another by the substitution of cobalt for nickel, and vice versa. Niccolite, in the analyses quoted by Dana and others, carries only a small percentage of cobalt and iron, while smaltite and the other diarsenides of cobalt frequently contain much iron and nickel.

Minute, brilliant, silver-white or tin-white crystals occur sparingly, embedded in the wall rock and in the ore. The crystals occur in cubes, and in combinations of this form with pyritohedron, or rhombic dodecahedron, and octahedron. The white or grey colored arsenides show a tendency to form globular or spheroidal masses, with a radiated structure. Some of these masses in the calcite have a diameter of over ½ inch. The ore is at times somewhat porous, spaces being left between the globules, which are tarnished almost black on their surfaces. Where not coated with cobalt bloom, the weathered surface of the ore has a dark color, not unlike that of the wall rock. On a fresh surface the more massive ore resembles mispickel, but is somewhat darker in color. Small grains of quartz are found sparingly in the ore.

A deposit carrying galena and copper pyrites lies a short distance southeast of vein No. 2. Very little of its surface is uncovered and no analyses have been made of the samples collected. Grains and small masses of copper pyrites were seen in the slate in the railway cuts in the vicinity of deposit No. 1.

Ore body No. 3 is similar in character to No. 1. It lies at the southern edge of Long lake. The ore consists of native silver, smaltite and cobalt bloom, and, in all probability, niccolite also.

Vein No. 4, although having the smallest width of the four, is, in many respects, the most interesting of the group. Here a perpendicular bare cliff of rock, 60 or 70 feet high, faces west. The vein, whose width averages not more than 8 inches, cuts this face at right angles, and has an almost vertical dip. The vein is weathered away, leaving a crack in the face of the cliff 2 feet—in some places 4 or 5 feet—in depth. When I saw it first it had not been disturbed. Thin leaves of silver up to 2 inches in diameter were lying on the ledges, and the decomposed vein matter was cemented together by the metal, like fungus in rotten wood. It was a vein such as one reads of in text-books, but which is rarely seen, being so clearly defined and so rich in contents. It was found impossible to get a fresh sample of the ore with the prospecting pick, the vein being so much decomposed. The weathered specimens, however, in addition to the native silver, contained cobalt bloom; and the unaltered ore will be found, in all probability, to consist of smaltite and niccolite, in addition to the silver. It may also be added that, in one part of the vein, a distinct banded structure was noticed. Across a distance of 8 inches there were twelve or fourteen layers of ore lying parallel to the walls. At the bottom of the cliff the vein cuts thin, banded, dark grey or greenish—at times almost black—slate, which has a slight dip. This slate passes gradually, so far as could be determined from the steep character of the cliff, into coarse breccia-conglomerate in the upper part. The fragments in the conglomerate consist of quartz, slate, granite and other rocks.

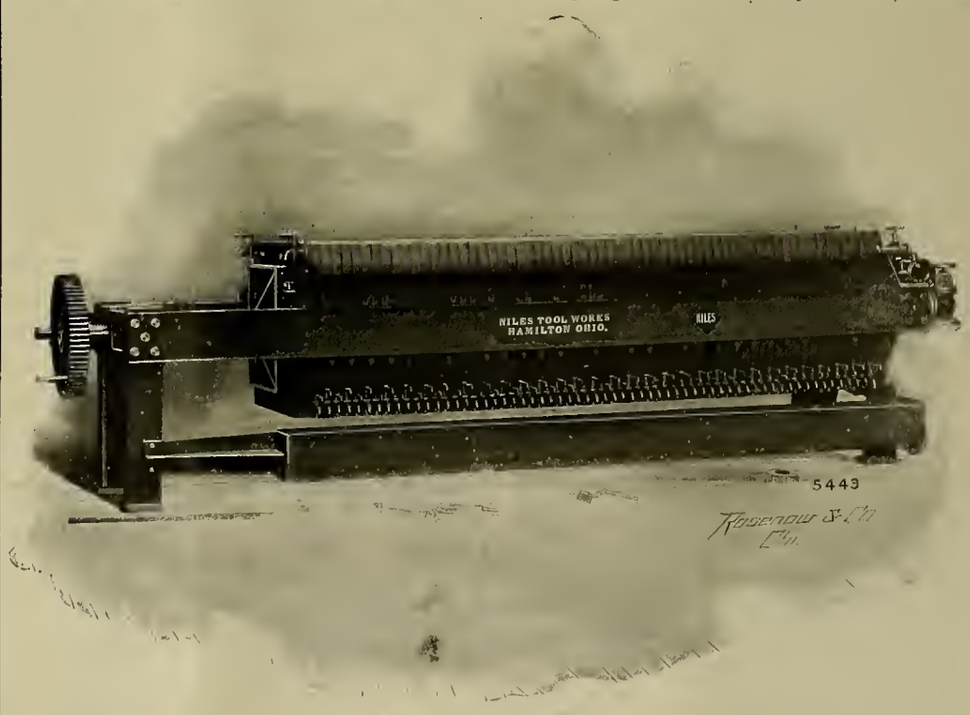
On some of the weathered surfaces of the native silver specimens there are small, black, spheroidal masses, with little luster. These appear to be the hydrated oxide of cobalt, heterogenite. Some of the deposits on the silver resemble asbolite. The carbonates of cobalt and nickel are also probably present. Antimony and sulphur have been detected in the ore of veins 1 and 2. Detailed analyses are required to determine the character of some of the silver-bearing minerals which are present in small amounts. Bismuth, copper and manganese, in an association of ores such as we have in these deposits, are to be looked for.

The recently discovered ore bodies lie about 90 miles northeast of the town of Sudbury, in the vicinity of which are situated the well-known nickel mines. The ore of the latter is of a different character from that of the Haileybury deposits, being essentially pyrrhotite and copper pyrites. The rock associated with the Sudbury deposits, which are not veins, but deposits of irregular shape, is norite. The Sudbury pyrrhotites carry a small percentage of cobalt in addition to nickel. The minerals niccolite, danaite, and other arsenical compounds, have been found in some of the Sudbury deposits, but only in small quantities.

On the Quebec side of Lake Temiscaming, about 9 miles to the northeastward of the Haileybury deposits, an ore body, known as the Wright silver mine, was discovered years ago by some of the early explorers of that region. During recent years this deposit has been worked for its lead and silver contents. The deposit is unique in character, the wall rock being Huronian breccia-conglomerate, the fragments in which are, at times, cemented together by argentiferous galena. Silver-bearing galena with copper pyrites is also found on an island in Cross lake, which lies southeast of Lake Temagami, and at Lady Evelyn lake.

Filter Press for Gold Slimes.

Herewith is illustrated one of six filter presses for gold slimes, built by the Niles Tool Works Co., Hamilton, Ohio, for a Mexican mine. As is frequently the case in mining work, the machines had to be brought to their destination by mules, and they are specially designed in sections of suitable weight.



Filter Press for Gold Slimes.

The press has sixty chambers and has passages for the wash water and washings placed in projecting flaps, with the intent that no filtering surface be wasted. The fixed head is built up of cast iron sections, with necessary flanges for all pipe connections. The sliding head is made up from steel plate, with a central casting on which the screw spindle bears, and both heads have cast iron half plates bolted to their faces. The side bars are deep steel channels, and the discharge trough, which receives both the filtrate and the washings is also made of sheet iron for lightness.

Phosphorescent Sphalerite.

Written for the MINING AND SCIENTIFIC PRESS by ARTHUR S. EAKLE, Ph.D.

Much interest and curiosity has lately been aroused through the discovery of some ore in Mariposa county, Cal., which exhibits a train of light or phosphorescence when scratched with a knife blade, or even with the finger nail. This very striking phosphorescence has led some persons to form the erroneous belief that it is due to the presence of the new and wonderful element, radium. The California Radium Gold M. Co. is the title of a company recently organized to mine the ore, although the radium content of the ore is wholly supposititious. In order to answer the many inquiries about the ore which have been received from reporters and from the public in general, I give herewith the results of my examination.

The ore consists essentially of three minerals, namely, the sulph-antimonite of copper (tetrahedrite), the sulphide of zinc (sphalerite), or, as it is commonly called, zinc blende, and the sulphate of barium (barite). These three minerals form an intimate, fine granular mixture, as shown by a thin section of the ore, occurring in about the same proportions. The secretary of the company informs me that the ore has been analyzed by various chemists with various results, the only point of agreement being that the ore contains "no zinc." On the authority of one, the ore is pronounced an uranio-sulphate, carrying a high percentage of radium.

Judging from qualitative analyses, blowpipe reactions and from the thin section, at least 25% of the ore is sphalerite, and an accurate quantitative analysis would doubtless show a considerable higher percentage of this zinc mineral. Furthermore, there is no uranium present in the ore. The presence of radium is always detected by its strong radio-activity, and while sphalerite or barite may contain radium, the ore has been tested by Professor E. P. Lewis of the physics department of the University of California, and proved to possess less than the hundredth part of the radio-activity of the weakest uranium compound. He is now making experiments to extend over a long period of time in order to determine its radio-activity. The phosphorescence which has given rise to so much speculation is wholly a property of the sphalerite, as was proved by first extracting the copper mineral by acids and then drying and testing the mixture of sphalerite and barite and finally dissolving out the sphalerite and testing the fine white residue of barite.

The phosphorescence of many minerals, including sphalerite, has long been known, and old works on mineralogy state that some varieties of sphalerite phosphoresce by rubbing, breaking, or scratching with a quill. It is a physical property which has occupied the attention of many physicists, and many theories have been advanced to account for it. In the case of sphalerite it is a frictional phosphorescence, as heating does not produce it. Two pieces of quartz rubbed together in the dark will produce the same effect.

Wonderful electrical properties have also been ascribed to the ore, and demonstrations of its use for storage batteries have been given. I have not seen the experiments in this line, but will suggest that

they can probably be explained through the well-known electrical properties of sphalerite.

The assays of the ore, provided they are reliable, show it to be a good gold-silver copper ore. Possibly the larger part, if not all, of the gold and silver is contained in the tetrahedrite, since this mineral commouly has other bases replacing the copper.

Since this ore was determined, a specimen from Eureka county, Nevada, has been given me, which shows exactly the same phosphoresceuce when scratched. The specimen is a mixture of fine granular galena, sphalerite and barite. The sphalerite occnrs intermixed with the other minerals, and also as intersecting veinlets, ¼ inch wide, of pnre miueral, and this pure sphalerite exhibits even more decided phosphorescence than is obtained by scratching the mixed ore.

Although several European localities have been cited where phosphorescent sphalerite occurs, it seems not to have been observed in this country before, and its occurrence in two different places in very mnch the same association is interesting.

The Manufacture of Gun Cotton and Nitroglycerine.*

Written by BRYANT S. DRAKE.

Pinole, Cal., is a small town located on the shores of San Francisco bay. Its popnlation cousists mainly of the employes of the Hercnles Powder Works. It is half of the plant of the California Powder Co., the other half being at Santa Cruz, where the smokeless powder is made. The plant at Hercules is about 700 acres in extent and is directly adjacent to the bay shore. Both the Southern Pacific and the Santa Fe railroads have switches running into the yards, which facilitates the handling of the snpplies and of the finished products. Four hundred men are employed at Hercules. It includes all of its own auxiliaries, such as electric power, water for fire protection, compressed air and refrigerating plants, and makes its own nitric and sulphuric acids. The finished prodncts are mainly dynamite aud raw gun-cotton, though some black powder is mannfactured as well. The dynamite is used in all of the miuing districts of North America for blasting purposes. The gun-cotton is shipped to Santa Cruz and there made into smokeless powder, which is mainly taken by the United States government for naval nse.

The works are divided into three practically independent portions, viz.:

I. The acid works (sulphuric-nitric).
II. The gun cotton plant.
III. The nitroglycerine plant.

I. In the manufactnre of sulphnric acid (H_2SO_4), sulphur is burned to produce the SO_2. The sulphur is imported from Japan and South America, although there are plentiful deposits of it at Clear Lake, California; at Inferno, in Humboldt county, Nevada; at the Rabbit Hole mines in Nevada; at Evanston, Wyoming, and also in Utah and Idaho. It is cheaper to ship the sulphur some thonsands of miles by water than to freight it a few hundred miles through the monntains, and consequently the deposits in this region of the conntry are practically valueless for the present. Large quantities of sulphur are stored at the works so that delays of considerable periods in shipping do not affect the operation of the acid works. There are five snlphnric acid chambers, three large ones measnring 20x20x90 feet, and two small ones of abont half this size. The chambers are formed of lead sheets "burued" together, and a force of lead burners is kept contiuually occupied on these chambers and the other leaden apparatns abont the works.

For the manufacture of the nitric acid, sodium nitrate is nsed. This is imported largely from Chili, South America, althongh it, too, occurs in the western region of the United States, viz.: In Humboldt county, Nevada, in New Mexico, and at Calico, California. The same factors, however, apply to the trausportation of the $NaNO_3$ as to that of sulphnr. The heating of the $NaNO_3$ is carried on in large iron pots, each pot being provided with an inlet for sulphnric acid and an outlet to the condensers. Breakage occasions considerable waste, and the escaping fumes, which are mainly oxides of nitrogen with some free HNO_3, are sufficient to make one gasp for breath if he happens to be on the windward side of the building when the freshly charged pots are started up. The gas passes through a glass condenser and is collected in large earthen jars. The condeusers are made np of a number of large glass tubes about 7 feet long, set parallel in a frame and inclined at a small angle to the horizon. A stream of cool water trickles down over the tubes continually to effect the condensation. The tubes are kept clear for 6 or 8 inches at each end to enable the man in charge to watch the progress of the operation, which is judged by the color of the fumes and the amonut of condensation. As the fumes begin to bleach out and the condensation ceases, the operation is stopped in order to prevent "bnrning" the Na_2SO_4 in the pot to salt cake and thus make it difficnlt to remove. There are forty-two complete sets of HNO_3 pots and condensers, arranged in pairs and each heated by a set of oil burners which allow of accnrate regulation of the temperatnre.

*Abstract California Journal of Technology.

II. Manufactnre of gun cotton. The cotton previons to its nitration is cleaned and dried at the works. The acids nsed are mixed together the day before use, in order to allow them to come to the proper temperature uniformly and without the use of artificial refrigeration. The materials nsed in manufacture being fairly pure, no especial purification of the acids is resorted to. The exact strengths of the acids used and the proportions in which they are mixed is kept a secret, because it is on these two factors that the properties of the gnn cotton depend. The geueral relations of the two acids are: HNO_3 (sp. gr. 1.45-1.5), 1 part by weight or 1 part by volnme; H_2SO_4 (sp. gr. 1.84), 3 parts by weight or 2.3 parts by volume; cotton 20-30 parts by weight.

The impnrities of the cotton may be either natural or artificial. The natural impnrities are crustations and oily matters. They form unstable nitro bodies which may decompose the gun cotton, thus interfering with its keeping qualities. The artificial impurities are water, oil and dirt. Water will cause local heating and may lead to spoutaneous combnstion, aud wastes the material by weakening the acids. Weak acids may canse incomplete nitration.

The cotton is cleaned from dirt and from knots in the fiber by a machine analogous to a cotton gin and a carding machine. The cleaned cotton is theu immersed in boiling KOH for two or three minutes and dried in a centrifugal machine. After this drying, it is washed with water and again dried, this time at 95° F. The drying is effected by spreading the cotton on wire screens placed one above another and slightly separated to allow free air circnlation. If the cotton is snbseqnently exposed to the air, it gradually absorbs moisture to the extent of abont 6%.

The actnal nitration of the cottou is a comparatively simple matter. Shallow tronghs are arranged for the dipping, and a shelf of wire netting is placed just above to allow the acid draining off to run back into the trough. As the acid is absorbed by the cotton more acid is rnn directly from the store of mixed acids. The cotton is packed in pails and is then thrown into the acid tronghs in large handfuls. The contents of one pail go to three separate troughs. The dipper presses each lot below the surface of the acids by means of a steel fork, and after a few minutes removes the cottou to the shelf to drain while a fresh charge is put iuto the trough below; from the shelf the cotton is transferred to ordiuary stone crocks, each of which is provided with a cover. The crocks are then filled with water and allowed to stand for twenty-four hours in a long trongh, which is kept full of running water to prevent a rise of temperature. The troughs are arranged in parallel rows, and before each dipper are snfficient rows to receive his entire day's outpnt. At the opposite end of the tronghs, the jars are removed after having stood twenty-four honrs, and the excess of water is removed by means of a centrifugal wriuger. The cotton is then thrown into a large tank filled with water and allowed to soak for a time; during the washings the cotton is turned over and agitated every few minutes by hand, the operator nsing either a metal rake, or else his hand and arm, protected by a large rubber gauntlet. After the cotton has been washed for a time, the water is run off and fresh water containing sodium carbonate is introdnced. This neutralizes any residual free acid. A second washing then follows and the cotton is again dried in a ceutrifugal. It is then packed in sacks of 100 pounds each and shipped to Santa Cruz, there to be made into smokeless powder. Some of it is also nsed for charging explosive shells for naval use. The cotton used for this purpose is known as the hexa-nitro.

The major portion of the gnn cotton put ont at Hercules is of the soluble variety or collodion gun cotton. This is made into smokeless powder by an operation which consists of dissolving the cotton in the alcohol-ether mixture, running it into a mixing machine, a cylinder containing revolving blades, evaporating the solvent until the dissolved substance is left in a pasty mass, and then putting this into a press and forcing it through dies in snch a way as to form long cylindrical strips. Some of the strips have a considerable diameter and these are usually pierced by a number of circular holes and cut into short blocks. After drying these are ready for nse in the larger cannon.

The smokeless powder does not detonate but bnrns. The rapidity of combustion depends mainly on the pressure. Berthlot gives the rate of combustion of gun cotton as eight times that of ordinary powder, and states that a pressnre of 160 tons per square inch can be obtaiued by it. The velocity of propagation of the explosion is from 5000 to 6000 meters per second. Water does not interfere with the explosion of gun cotton, in fact wet gun cotton explodes more violently than dry, but the combustion is not so complete.

The chemists at the plaut test each lot of cotton for solubility in the alcohol-ether mixture. For this test the following mixtnre is nsed: Alcohol (sp. gr. 0.805), 1 part by weight; ether (sp. gr. 0.735), 1 part by weight; gun cotton, 1 oz. in 400 c.c. of the mixture.

The amount of moisture, ash and alkaline substances, calorific value, and the temperature of ignition are also determined. Before the cotton is tested it is pressed into circular buttons and dried by a hot air blast. The presence of moisture and ash are determined in the usnal way by drying and ignition. The calorific valne is determined in an ordinary bomb calorimeter. The nitrogeu is determined by means of the nitrometer, the principle of the operation being that when cellnlose nitrates are shaken with concentrated H_2SO_4 in the presence of mercury they are decomposed and all the nitrogen is evolved as oxides. These oxides are collected and measured, and the percentage of nitrogen calculated. Sometimes tests are made to determine whether all the cotton has beeu nitrated or not. This is done by dissolving as much of the cotton as will dissolve in the ether-alcohol mixtnre and then treatiug the residne with ethyl acetate. Between these two solvents all the cellulose nitrates are dissolved aud any nnnitrated cotton is left behind. The temperatnre of ignition is determiued as follows: A small amount of gun cottou is placed iu a test tube and the whole is snspended in an oil bath; this is theu gradually heated, and the temperature at which the gnn cotton flashes is noted. (It shonld be above 180° C.) In practice the oil bath is heated to 100° C. before the emersion of the test tube and cotton.

III. Nitroglyceriue. Explosives of the Sprengel class.

The general process for making nitroglycerine is to add glycerine to a mixtnre of strong nitric and snlphuric acids.

The relative amouuts of acids are approximately: H_2SO_4 (sp. gr. 1.845), 4 parts by weight; HNO_3 (sp. gr. 1.4), 2 parts by weight; glycerine (anhydrous), 1 part by weight.

Most of the glycerine used is obtained from the soap factories and is shipped in iron drums contaiuing 1100 to 1300 pounds. Soap factory glycerine is pure and practically anhydrous and is used directly for uitration without any preliminary treatment. In the actual nitratiou and subsequeut operations, the acids, glycerine and nitroglycerine are transported from place to place in uncovered lead tronghs by the force of gravity. Lead is nsed for the lining of these troughs, because the cold, concentrated, mixed acids act but slowly upon it. Each trough is washed and scrubbed directly after each passage of the products of nitration.

As in the manufactnre of gun cotton, the sulphuric and nitric acids are mixed the day before and allowed to cool. All this mixiug of acids is done by one man, and the streugths and proportions of the mixed acids are kuown only in the laboratory and to the chemists in charge. From the place of mixing and storing the acids are removed throngh an iron pipe, by means of compressed air, to the storage tanks on the summit of the hill where the nitroglycerine mixing honse is located.

(TO BE CONTINUED.)

Character of Cement.

Following are the specifications for cement taken from an article by D. B. Butler, in Cement and Slate:

The whole of the cement shall be pure Portlaud cement, and shall conform to the following tests:

FINENESS OF GRINDING.—To be such that when sifted throngh a standard sieve having fifty holes per lineal inch there shall uot be more than ½% by weight of residue; when sifted throngh a sieve having seventy-six holes per lineal inch, there shall not be more than 5% of residue; and when sifted through a sieve having 100 holes per lineal inch, there shall not be more than 12% of residne.

TIME OF SET.—A pat of neat cement, gauged with the minimum of water, at the normal temperature (60° F.), and placed on a glass or other non-porons slab, shall not commence to set in less than eight minntes, or take longer than five honrs to set hard.

SOUNDNESS, OR FREEDOM FROM EXPANSION AND CONTRACTION.—A pat submitted to moist heat and warm water in the Faija apparatus for soundness, at the usnal temperatnres, viz., 110° F. and 120° F., respectively, shall show no cracks or signs of expan sion after twenty-four honrs.

TENSILE STRENGTH.—Briqnettes of neat cement, ganged with the minimum of water, on a non-porous bed, and placed in water twenty-four honrs after gauging, shall carry an average tensile strain of not less than 550 pounds per sqnare inch after three days, 450 pounds after seven days, and 550 ponnds after twen ty-eight days from the time of ganging.

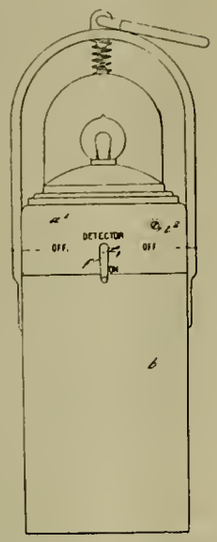
Briqnettes composed of three parts of standard sand to one part of cement, by weight, treated as above, shall carry an average tensile strain of not less than 150 pounds per sqnare inch at seven days, and 250 pounds at twenty-eight days from the time of gaugiug; bnt no matter how mnch greater strength may be developed at the earlier stages, both neat and sand briquettes must develop an increase of at least fifty ponnds between each date.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 12, 1904.

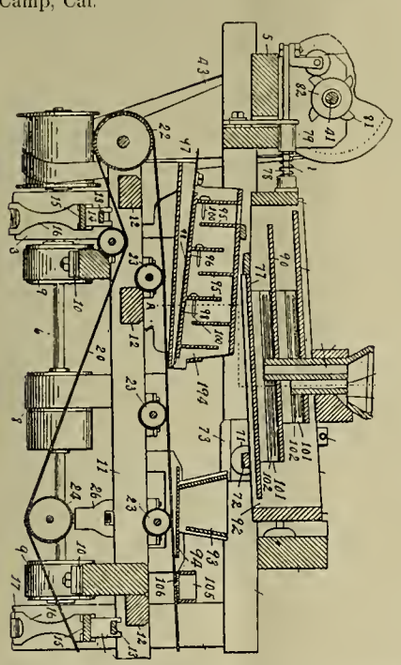
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINER'S ELECTRIC LAMP.—No. 749,500; H. G. Prested, Camden Town, England.



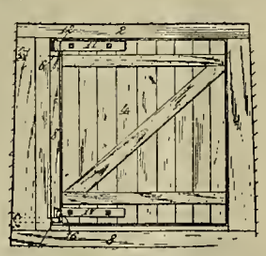
Miner's electric lamp comprising diffusion device, lamp and circuit short-circuiting lamp so as to render latter useless when diffusion device is in action.

CONCENTRATOR.—No. 748,819; L. R. Tulloch, Angels Camp, Cal.



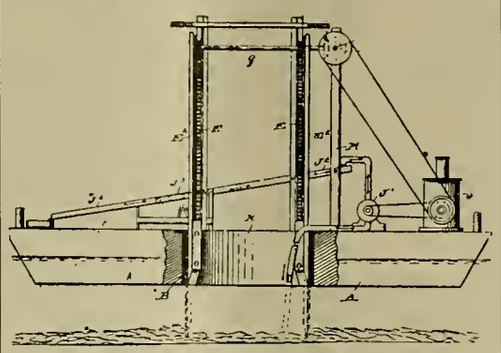
In concentrator, combination of belt, means for oscillating same, percussion box, means operated with oscillating means for shaking box longitudinally of belt, box comprising hopper into which material is fed, vertical series of tables onto which material is successively distributed, and individual longitudinally slotted plates above tables for distributing material evenly over tables.

HINGE FOR MINE DOORS.—No. 749,561; T. Jeffrey, Pittsburg, Ky.



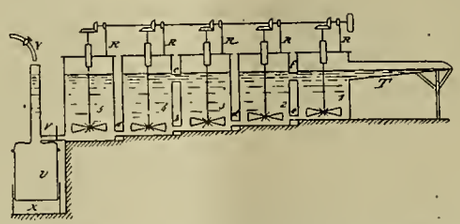
Combination with door for mine galleries of pair of hinges each comprising a yoke to straddle door, and eye member projecting beyond yoke, upper member being provided with single eye and lower member with pair of eyes, pair of pintle members secured to door frame and projecting beyond same, upper member being provided with single pintle and lower member with pair of pintles, and filler block interposed between two pintle members and bearing against under side of upper member and upper side of lower member, filler block performing double function of closure for space between inner edge of door and its support, thereby to prevent escape of air, and to transmit strain from the upper pintle member to lower pintle member, thereby in positive manner to prevent sagging of door with attendant danger of same binding in its frame.

HYDRAULIC GOLD MINING.—No. 749,197; F. J. Hoyt, Chicago, Ill.



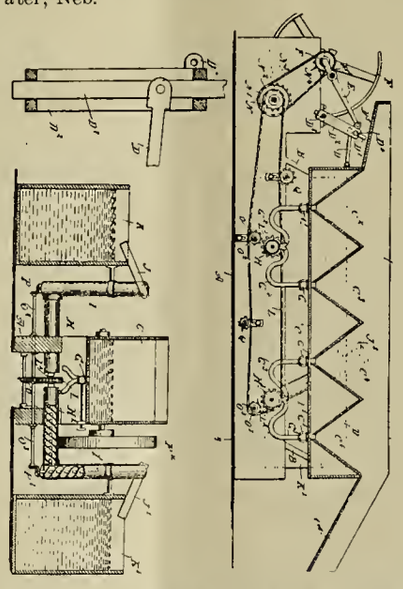
In hydranlic mining apparatns, float or scow provided with opening throngh its deck and bottom to water, sectional caisson adapted to fit within and extend through opening in such manner that in its working position its top is always on level with deck, common mechanism for lowering caisson to river bed and for forcing it therein to any desired depth in one continuous operation and for raising caisson from river bed, and power means for driving mechanism.

PROCESS OF TREATING COPPER ORES.—No. 748,662; M. G. Sebillot, Paris, France.



Process for extracting pure metals from mineral ores, consisting in treating ores with sulphuric acid at evaporating point of latter, without roasting, to form sulphates, condensing snrplus acid fnmes, and lixiviating sulphates in successively deeper baths under constant agitation in current flowing in direction opposite to progress of ores.

CONCENTRATOR.—No. 749,706; D. M. Storey, Weeping Water, Neb.

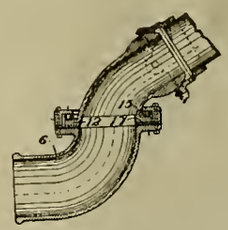


Concentrator, comprising box having rocking motion and provided with transversely extended V-shaped riffles, means for operating box, settling tanks arranged at side of box and adapted to be filled with water to level of water in box, conveyor for conveying concentrates from bottoms of forward riffles to one of the settling tanks, conveyor for conveying concentrates from bottoms of rear riffles to the other settling tank, and means for operating conveyors from box-operating means.

ORE GRINDER.—No. 749,630; W. G. Phipps, Stockton, Cal.

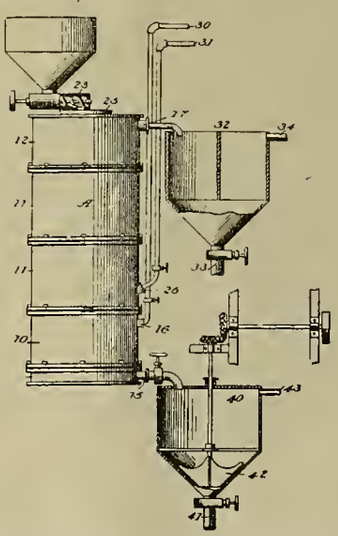
In ore grinder, plate in form of circle, or part of circle, radial cutting edges extending inward toward center of plate, plate being hollowed out or dished between cutting edges, cavity commencing at point slight distance inward from periphery and gradnally deepening toward center, each of cutters being beveled from point about midway of length to inner ends, annular beveled surface formed upon back outer edge of plate, periphery of plate being formed with sharp edge by reason of annular beveled surface on back of plate.

HYDRAULIC NOZZLE AND JOINT.—No. 749,417; J. A. Yeatman, San Francisco, Cal.



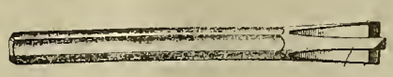
Improved hydraulic discharge pipe comprising fixed and movable pipe sections, with flanges upon contiguous ends; annular thrust collar bolted to one of the flanges and having flange projecting inwardly over uppermost of pipe flanges; anti-friction bearing between the last named flanges; flexible disk secured between pipe flanges, disk having its inner edge projecting and turned over the joint between flanges whereby projecting portion will be forced against inner wall of pipe sections and joint to prevent leakage at latter; discharge pipe jointed to movable pipe section; cap fitting over end of discharge pipe and having inwardly extending flange; and removable annulus fitting cap from inside and clamped between flange thereof and end of discharge pipe.

PROCESS OF LIXIVIATING ORES.—No. 749,700; P. Naef, New York, N. Y.



Method of lixiviating ores and other pulverulent materials, which consists in passing ore downward in thinly divided layers in zigzag course throngh ascending stream of leaching solntion, whereby ore and solntion passing in serpentine course in opposite directions prodnces prolonged and intimate contact of ore and solution.

ROCK CUTTING DRILL BIT.—No. 749,369; L. Durkee, Denver, Colo.



In rock cutting drill, combination of suitable drill shank having chuck holding end, with rock cutting end, comprising four radial ribs extending axially with shanks, and forming integral part thereof, two oppositely disposed set of ribs, one set of which sets extends beyond opposite set a short distance and forms a chisel-shaped cutting edge at end of drill bit, and having opposite corners of two longest ribs beveled in opposite directions, and inverted V-shaped cutting edge at center of chiseled end, and a suitable cutting edge on terminal edges of two opposite shorter ribs.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

Superintendent B. Thane, of the Eagle River M. Co., operatiug near Juneau, says he is putting in a 1700-foot aerial tramway to connect the main tuuuel with the 10-stamp mill. The mouth of the tunnel is 7 miles from the beach, in a heavily timbered district, and tho road runs through a boggy country. The stamp mill is completed and a 6-drill compressor put in, also saw mill and planer, with seven buildings for bunk and boarding houses, residence and store rooms put up. The property was bonded last July by Georgia men.

G. M. Hill of Fairbanks, coming out from the Tanaua overland to Valdez, says there are 2500 miners in aud around Fairbanks on the various creeks. There are 250 meu at work on Fairhanks creek and as many more on several of the other creeks near there. Pay dirt was found, running from 5 to 15 cents per pan on most of the claims. Most of the work is done on the lease system, in come cases there being as high as six and seven leases on one claim. Provisious are high, flour bringing $35 per sack, and everything else in proportion excepting meat, which is plentiful owing to two steamers which were loaded with meat for Dawson, were frozen in at Circle City, and the bulk of this meat has been taken overland to Fairhanks. Hill says the town is building up and many of the buildings are substautial. The best way to go in is by Dawson, then over the ice to Circle City, thence overland to Fairhanks. There are road houses every 25 miles and the roads are good. J. Joslin is putting in a tramway, connecting the mines with Fairhanks.

ARIZONA.

Cochise County.

The Columbus C. M. Co. has heen incorporated by S. J. Miller, M. B. Earnhart and W. A. Morrison, with principal places of business at Tombstone, Ariz., aud Columbus, Ohio.

Gila County.

The Pasquale Nigro miue, near Globe, continues shipping ore.——In doing assessment work on one of their claims in Lost gulch, the Black Warrior C. Co. Amalgamated, uncovered 2 feet of ore carrying black copper sulphide.

Construction work at the Old Dominion mine at Globe continues. Of the several plants, the smelter and converter building, which is of steel, is about completed. The three smelter jackots, each 44x180 inches, have been put up. Excavations for the converter fouudations have heen finished and work on tho foundations hegun. The electric crane, with capacity of forty tons and having an auxiliary hoist capable of liftiug ten tons, was given a test run last week. The generator to operate the craue will he in the power house at the smelter. There will also he two electric locomotives, one to haul the slag and the other to haul charge cars. Three engines aro being set up at the smelter power house, two to generate air for the furnaces and one for air for the converters. The blower will have capacity of 20,000 cubic feet of air per minute. The graders are excavating for the flue dust chamber, hack of and running north from the smelter building. At the mine the steel boiler house is up and the power house two-thirds finished. The hoist, a duplicato of the one in use at the old shaft, has heen set up. Later, the old hoist will he set up at the new shaft. The new four-compartment shaft is down 660 feet, or 30 feet helow the tenth level. Thoy are cutting the tenth level pump station, which will be 58 feet long by 14 feet wido, and 12 feet high. Steel for the head-frame has been shipped.

The Old Dominion mine during Decemher made the largest output of copper for any like poriod in the history of the mine, says Superintendent F. W. Hoar. There were 1,200,000 pounds of refined copper and 110,000 pounds of sows, running 98% copper, produced. The output for January will be less, as only one furnace is in operation at present, though another furnaco may he blown in later.

Graham Couoty.

G. Stevens reports the findiug of more lead ore—having opeued up a 6-foot shoot—in the lime on Comstock No. 2 mine, near Clifton. He is sacking the ore for shipment. In his Black Dyke claim at Garfield gulch he has started a drift aud is in 30 feet on the vein, 25 feet above the gulch, at which point the vein is 4 feet wide. He says he has 2 feet of quartz carrying copper-silver values, and 2 feet of porphyry running $5 gold per ton.

The Standard mines tramway, near Clifton, is in operation and is handling an averago of eleven tons an hour. It is expected the mine will ship regularly three times a week.

Considerable new timbering is being done in the Longfellow mine, near Morenci. The numher of men at work has heen increased.——Two electric machine drills are being put in operation in the tunnel driving to connect Old Yankee and West Yankee mines. —— Superintendent Hunt of the Detroit C. Co. concentrator, near Clifton, is putting in an oil concentrating machine to test the concentration of their sulphide ores by oil.

Maricopa County.

(Special Correspondence).—The Angel mine, near Wickenburg, has suspended operations temporarily.——Work will be resumed at the Gold Quarry mine this week.——H. A. Stevens is working twelve men on his group northeast of Morristown.——The Arizona M. & Dev. Co. is working men on the Montezuma lead mine. The Montezuma shaft is being cleaned out, and a road is being built from the Hassayampa river to the Montezuma shaft.

Wickenburg, Jan. 17.

(Special Correspondence).—While drilling a well in the Salt River valley, near Phœnix, a vein of coal 3 feet in thickness was struck last week.

Phœnix, Jan. 17.

Mohave County.

The Sopresa G. M. & M. Co. has been organized, says the Kingman Miner, and work will he started on several of the claims owned by the company, 4 miles south of Kingman. The company owns the Blake mine, which is said to have a hody of $10 ore which can be cyanided at a profit.——The reorganized Elkhart M. Co. has started up work on its group, near Chloride.

Yavapai County.

The second of the 500-ton furnaces at the smelter of the United Verde miue, at Jerome, is in operation. The smelter has equipment of two 500-ton furnaces and a 250-ton water jacket furnace, and all are turning out bullion to full capacity.

Manager Smith of the Dividend Con. G. M. Co., operating near Phœnix, says he has surveyed a line for a tramway from the hoisting plant ou the Dividend claim to the mill. Timhers are on the ground for enlarging the mill for more ore bins and to huild a hoisting frame.

The Rich Hill M. Co. has heen incorporated hy C. L. Hoyden, J. C. Herndon and T. G. Norris of Prescott.

Yuma County.

Three companies have resumed work in Quartzite district since last season's shutdown. The Valenzuela M. Co., R. Darling president, is working ten men. B. G. Smith has started work on the Plomosa group and Apodaca & King are doing development work on the middle camp properties. The Carter-Wheeling group has been bonded to R. Darling for $25,000 and G. Norton & R. Hathaway have bought an interest in the Emma group aud are developing the property.

ARKANSAS.

Marion County.

A strike of zinc ore was made last week on the Blazing Star mine, uear Yellville. The ore is a higb-grade blende. There are three cuts on the mine, each 30 feet deep, all sbowing ore.

CALIFORNIA.

Amador County.

At the Bunker Hill mine, near Amador City, work is progressing, says Superintendent Downes. He expects to have the mill ruuning by Feh. 1.

Work on the Argonaut, adjoining the Kennedy mine at Jackson, is progressing, and the number of men is heing increased. A station is heing cut at the 1800-foot level, and drifting to the ledge will be started. In additiou to this the work of unwatering the lower levels continues and when finished sinking will he resumed.

The Hooligan mine, owned and operated hy the Hooligan G. M. Co., is in Pioneer mining district, near Defender. The owners of the Hooligan have completed a 140-foot tunnel which cuts the ledge at depth, showing values in gold and silver. T. Smith is part owner.

Superintendent E. Lynch of the Keystone mine at Amador City says he has ore blocked out and he will remodel the plant to facilitate handling and treatment. The skips have been replaced by ones of greater capacity. Beside the hoiler plant another huilding is heing erected for two receivers for compressed air for the drills and pumps. In the shaft at the 800-foot level a pump capable of liftiug 70,000 gallons of water per uine hours is heing set up. This pump will take the water from the sinking pump and lift it to the surface. The treatment plant consists of two mills equipped with twenty and forty stamps, respectively. Tbose used in the latter, however, are not considered heavy enough for the work required, says the Ledger, and foundations are being made to move this mill hack on a line with the smaller one and put in a like number of heavier hatteries.

At the Oneida mine, near Jackson, Manager Hampton is preparing to put in a pump capahle of lifting 200 gallons of water per minute 2400 feet. For the present, however, it will only be required to hoist water from the 2100-foot level to the pump at the 1200-foot level, which lifts it to the surface. In addition to this, 400 feet north of the shaft at the 2000-foot level a winze is heing sunk to the 2200-foot level. A steam hammer driven by a 4-inch cylinder and with an 18-inch stroke has heen put in at the blacksmith shop for heavy forge work.

Butte County.

Marysville reports say the California Debris Commission will again proceed with the construction of debris restraining barriers in the Yuha river east of Marysville. Round piling will be used instead of sheet piling. S. Montgomery of Woodland, who had the coutract to build harriers Nos. 1 and 2, will construct the barrier (No. 1) which the commission has decided to have rehuilt. The specifications for this harrier, as originally drawn up, called for the use of sheet piling, hut it was found impossible to drive the planks into the thick hed of cobbles in the river, and the attempt was abandoned. Then fascines of brush weighted down hy rock were tried. No action has yet been taken as to rehuilding barrier No. 2. The divorting canal through Daguerre Point is making progress. About 12,000 cubic yards of gravel are removed daily and no rock has yet heen struck. Two locomotives and two trains of twelve cars each are in use, and another locomotive will he put on so a third traiu can be operated.

Calaveras County.

The 5-stamp mill at the Jack Rahbit mine at Dogtown, uear Augels, started up last week. Tbe mine has been unwatered and ore is heing taken out.

The Ohio mine at Douglas Flat (the Chase mine), is being opeued up by its owners, Orth, Capella Bros. & Valente. They have just been ground-sluicing away a cut in the old diggings to enahle them to start drifts into the mine.

The stamps are dropping in the mill of the Stockton Hill mine, near Mokelumne Hill, the 4000-foot pipe lino to carry water to the mill having been finished last week. The gravel in the mine continues to prospect satisfactorily, says Superintendent Robinson.

A Bucyrus gold dredger will be put in operation this week on the Calaveras river at Jenny Lind, having been built by the Hammon M. Co. At this point tbe river bed is 3000 feet in width, and tbe company owns 400 acres of placer ground. Two more dredgers of the same pattorn will be built to work on the ground. The power to operate the machinery will be furnished by the American River Electric Co.

The Old Stiff placer mine, near Vallecito, on Balaklala hill, is heing worked by Superintendent Gleason, who says piping is giving satisfactory results. Next month piping is expected to be well into the main channel.

It is reported the Mutual M. Co. will begin operations at the Lucky Boy mine on Dry creek, 2 miles from San Andreas. The owners of the property are Boston, Mass., men. It is said that oil-buruing fixtures will be put in for the boilers, doing away with use of wood.

During the past year considerable development work has been done on the Lew Wallace group of miues, near San Andreas, says the Chronicle. The work consists mainly of tunnels. The group consists of five contiguous claims. Quartz carrying gold and sulphurets has heen opened up. Superintendent Voorhies is building a wagon road to the Lew Wallace claim, and machinery will he put ou in the spring.

Fresno County.

Last week at Coalinga well No. 1 of the Pleasant Valley F. Co. hegan spouting oil through a 3-inch tuhing at rate of 1400 barrels per day. It is throwing a steady stream of 700 barrels per day of a 17.5° gravity oil. The unexpected increaso in the productiou necessitated building additioual temporary storage reservoirs. Plans are being made to drill at least four more wells in addition to Nos. 1 and 2.—— The Hanford Oil Co. has finished grading and is now hauling lumber for rig No. 7. For nearly a year the company has kept one string of tools running steadily. Five wells are being pumped, one drilling, another rig going up.

Kern County.

The Reynolds Oil Co. has been organized hy Bakersfield men aud will operate at Sunset. The directors are J. A. Flood, R. Barkes, J. Henry, W. K. Osmer, W. O. Clay, C. & G. A. Reynolds.

A. T. Stewart of the War Eagle group reports he is sinking a 100-foot shaft on the Little Emma mine, near Randsburg, to get the continuation of the Butte Lode vein.

Mariposa County.

L. E. Hanchett, manager of the Sweetwater mine, near Mariposa, says the company operating the mine has discontinued operations until an air compressor can be put in, after which drilling will be done with machines.

Nevada County.

The stamp mill at the Kentucky Ridge mine, near Nevada City, is in operation, says Superintendent A. Halsey. Five stamps have been put in and room left in the building for five more. Men are at work in the mine stopiug ore.

Development work has begun on tho Lamarque quartz mine, near Grass Valley, uuder superintendence of C. Brockington, who is also superinteudent of the Orleans mine. A vertical shaft will be put down. The Lamarque adjoius the North Star mine on the north and the Central on the east. The property is bonded to J. Rosenfeld's Sons of San Francisco. In addition to the miniug locations they have also bought the McDonald ranch, adjoiniug, which they propose to use for millsite and dumping purposes.

The Brunswick M. Co. near Grass Valley has succeeded in draining the mine of the water which had accumulated, says the Tidings, by operation of two electric pumps. Superinteudent Mallon says the mino has been pumped dry to the 1200-foot level. The shaft reaches 50 feet helow this level, as a sump. Here a 10-inch Cornish plunger and two steam pumps are kept in operation. Men are blasting out for a station at the 1200-foot level for the third electric pump. The water which is coming from that level will he conducted through hoxes to a tank which will be built. A dam has also been built at tho 1200-foot level. This will be used in case of emergency, whenever the pumps are idle. Since the water has beon pumped out an atteunpt was made to start the raise above tbe 1200-level, hut the work had to be abandoned. It was in this raise that the water, which resulted in the suspension of underground operations, was struck.

San Diego County.

Ten miles soutb of San Diego, and east of Chula Vista, four test holes have been drilled, preliminary to the sinking of an oil well. Indicatious are said to be favorable for getting oil. The Chula Vista Oil Co. has been organized to develop the ground. J. L. Wild of La Mosa is interested.

Santa Clara County.

Near Sargents tho Watsonville Oil Co. of Watsonville has decided to pipe oil to rail line or to tide water (to tide water if satisfactory terms caunot be made with the railroad company). Two wells are producing 300 barrels of oil daily. The company will increase development of Sargent district. They will put in two more drilling rigs. J. S. Menasco, F. A. Kilburn, W DeHart, R. W. Eaton and O. D. Stoesser are directors.

Tuolumne County.

The Mt. Jefferson mine at Groveland will sink the shaft another 100 feet.—— The tramway between the Two Brothers mine and the Mack mill, near Groveland, is in operation.——The mill at the Mohican mine, near Groveland, is shut down temporarily to make repairs. Work continues underground.——Ground has been prepared for the 20-stamp mill at the Belle mine, near Tuttletown. The shaft will be sunk from the 530 to the 600-foot level. ——The mill at the Longfollow mine, near Groveland, is expected to he put in operation next week.

Men are at work at the Florida mino near Marble Point, near Carters, and are crosscutting. The ground is hard and progress slow. The mine is owned by H. M. Bacon of San Francisco.

COLORADO.

Boulder County.

The Big Six M. Co. is planning development on its group on Chittenden mountain, near Eldora. It has resumed work on the crosscut tunnel which is heiug driven from point on northeast slope of Chittenden mountain, abovo tho north fork of Boulder creek. The tunnel has heen driven 140 feet and will cut the Grauite Cliff and Hidden Treasure veins at a depth of 700 to 800 feet below the surface, with tunnel 400 feet in length. The Hidden Treasure vein has 7 feet of ore exposed in the upper workings, says the Eldora Record, with average values of $20 per ton. The ore is iron sulphide, with copper and streaks of tellurides. The Granite Cliff vein shows 2½ feet of the same class of ores, with average values of $15 per tou.

Chaffee County.

(Special Correspondence).—The West Gold Hill M. Co. has cut a 20-foot hody of

oxidized ore, averaging $12 per ton, in No. 2 drift of the Sellers claim. Tests made show the ore can be handled by cyanide treatment and the company will build a mill the coming summer. This company has a group comprising 200 acres which they have been developing the past two years. They have opened on the contact bunches of ore at intervals of 150 feet for 3000 feet. They have also opened up a 5-foot vein in the granite below the lime, a carload of which is being gotten out for shipment. Samples show $20 per ton. The nearest shipping point is 9 miles, but the main road is to St. Elmo, a distance of 14 miles. The Taylor Park Railroad is driving a tunnel through St. Elmo Pass and expects to have the railroad in operation into Tin Cup before Jan. 1, 1905. This will open up the Taylor Park country by railroad. The railroad has been guaranteed 900 tons of ore daily when the road is completed. The company owning the railroad also owns the Enterprise mine.

The Brunswick Co., owning the Jimmy Mack mine, is driving the Blister Horn tunnel.

Tin Cup, Jan. 18.

A silver strike is reported made in the Netsie Castley claim, in North Fork district, by J. H. Akin of Shavano and E. W. Carpenter of Salida. Assays show 75 ounces silver, 20% lead and $3 gold in the surface ore, of which there is a 4-foot vein in sight. The Netsie Castley is near the crest of the continental divide, near the Gunnison line. It is west of Shavano, 10 miles north of Marysville. It adjoins the Michigan group and is north of the Billings tunnel.

Clear Creek County.

The Mendota mill, under management of Stevens & McGarth, near Georgetown, treated during the twelve months of 1903 a total of 20,000 tons of ore. The material was from the dump, with a portion of same from the old stopes in the Mendota mine. The ore is concentrated on an average of nine to one.

The Lebanon mine, on Republican mountain, near Georgetown, taken over by J. Owen of Idaho Springs, is being reopened. Owing to a cave-in that occurred near mouth of tunnel, the workings will be retimbered. J. Maxton is superintendent.

The St. John M. & M. Co. has been incorporated by C. A. Frost, E. W. Lippert and S. A. Westo, with principal office at Idaho Springs, and operations will be carried on in both Clear Creek and Gilpin counties.

The Colorado Central group, being operated by the Aliunde Con. M. & M. Co., near Georgetown, has thirty-five claims. During the past year only a moderate production resulted, as the management was carrying on development work which had been mapped out. A winze is being sunk from the 1000-foot level, which will be driven a distance of 75 feet, at which time a drift will be run to cut under the main ore body of the Colorado Central vein. There are three tunnels on the group—the Marshall, Ocean Wave and Equator. The Marshall has been driven 1800 feet and has attained depth of 500 feet. The Ocean Wave has been driven 3400 feet and has an additional depth below the Marshall of 200 feet. The Equator connects with the Ocean Wave and the ore is raised to the last named tunnel level, from which point it is transported to the dump. The holdings of the Aliunde Co. are on Leavenworth mountain. M. Tong is resident superintendent.

The Clear Creek & Gilpin M., M., P., T., D. & T. Co. is arranging for a plant of machinery on its Torrey tunnel, near Idaho Springs. The plant will have 100 H. P. boiler capacity and a compressor capable of operating from six to ten drills. The tunnel has been driven 450 feet by hand, but driving operations are temporarily suspended. Work is being devoted to developing the three veins already cut. The company owns a group of forty-two claims in the Empire and Fall River districts, which will be cut in the first 3800 feet of driving. After completion of development of these claims, it is intended to continue the tunnel into Gilpin county as a transportation tunnel.

The Brighton mine of the Pittsburg Con Co., at Freeland, resumed operations last week after several months of idleness. The shaft is 300 feet deep and will be continued another 100 feet.

At the Centurion tunnel, near Idaho Springs, which suspended driving when the coal strike was declared, work is confined to developing its veins. The tunnel is in 1000 feet and seven veins have been cut. A number of leasers are at work both in the tunnel and in the upper workings.

The Dives, Pelican and Seven-Thirty groups of mines, on Brown mountain, near Silver Plume, have been sold to New York and Kentucky men for $500,000, says Manager R. C. Vidler. Work is expected to be in full blast next month.

Custer County.

A copper and silver strike has been made in a 40-foot tunnel near the Bassick mine by Blunt Bros. of Florence, says the Times. The ore shows assays of $40 per ton.

The McCraney group of three claims is under bond and lease to G. W. Avery et al. of Custer City (Rosita P. O.) for $20,000 for three years. Work is being done at the 100-foot level. The ore carries copper and lead, with an excess of iron, and runs 20 ounces in silver and $4 in gold. The mine is on the western end line of the Dolomite lode and is equipped with a steel whim for hoisting. The Evening Star is also under lease and bond to Avery et al. Ore is exposed at four openings on this vein. No 1 shaft at the south end is down 170 feet. No. 2 shaft is down 40 feet. This group is west of the McCraney.

The Florence M., M. S. & R. Co. has given a bond and lease on the Florence group of seventeen claims, near Querida, to Blunt Bros. and J. Kendall. Arrangements have been made to work the group and ore will be shipped.

Gilpin County.

The Nevada Con. G. M. Co., of which T. Marks of Denver is president, will replace the 50-ton mill on its holdings near Nevadaville with a 100-ton mill that will have roller crushers. The milling ore is said to average $10 a ton. They have smelting ore that averages $45. There has been no stoping done, but there are 2 miles of workings and the shaft is down 600 feet. Arrangements will be made for saving the zinc and iron as well as the gold values in the ore. A Blake type crusher and a Huntington mill, with amalgamating plates and tables, will be put in. In the Novada Con. there is one vein 23 feet wide, says Manager A. M. Rucker. There are 240 acres of mineral land owned by the company and it is expected to make it 400 acres. The mill superintendent will be J. E. Ehrhardt.

The Alger-Kansas mine, owned by J. Tascher, on Quartz hill, near Nevada gulch, near Central City, will be reopened. Eastern, as well as local, parties are interested in a lease and bond with W. C. Carnegie in charge. The machinery has been overhauled, the buildings repaired and work of retimbering the shaft has been started. —— The James Heury mine, owned by Denver men, on north slope of Gunnell hill, will also resume. The plant has been overhauled. Preparations are under way for increased developments, with W. Ballantyne as superintendent.

Colorado Springs men are arranging to take hold of the Success-Meeker group in Lake district, near Central City, and will form a company to operate it under lease and bond. It is equipped with top plant and buildings. The ores carry values in lead, gold and silver.

Manager S. Brereton of the Sydenham M., M. & L. Co., in which Colorado and West Virginia men are interested in a lease and bond on the Maine and Hamlet mines near Central City, says his company intends sinking the shaft on the Maine an additional 200 feet during the next six months. The shaft is down 424 feet. Additional machinery has been placed. Test shipments of milling ores gave satisfactory values, and the smelting ore brought $40 per ton.

The Hunky Dora mine, on Bobtail hill, has been bonded and leased to Denver and Eastern men, who have organized the Moritoria G. M. Co. The shaft building has been repaired. The work of retimbering the shaft is under way. The total depth of the shaft is 320 feet. New levels will be opened up at 100 and 250-foot depths, and developments increased. The company has leased blocks of the upper workings above the 100 level to local miners, and they will make shipments. The Hunky Dora is between the Fisk-Cook group and the Running Lode. ——Another property to resume is the Caledonia, in Lake district, owned by the New National T. M. Co., which has bought a group east of Black Hawk and starting on North creek, going towards Russell district, in Gregory, Enterprise, Lake and Russell districts. The Caledonia has been partly developed by a shaft 420 feet deep. The company will extend the levels. They will also deepen the shaft, which will be cut by the main tunnel to provide ventilation.

E. P. Young & Co., of Denver, have a lease and bond on the Vanderbilt group of claims, south of Contral City. They have put up a building on the Mountain lode and are sinking a shaft, which has reached a depth of 50 feet. They are shipping ore to the stamp mills. They are putting up a shaft building and machinery on the Pride shaft, which has been sunk to 100 feet. Sinking will resumo in this shaft to develop the entire group.

A strike is reported made last week in the Gilpin-King mine, opened by Lunwall Bros., in Central mining district, 1 mile south of Gilpin and 2½ miles from Rollinsville. They have put up a shaft house and intend working the mine all winter. The vein lies between granite and porphyry.

Gunnison County.

Operations continue on the holdings of the West Gold Hill M. Co., near Pitkin, by driving a tunnel to cut veins at greater depth, which are showing in the upper workings, says the Pitkin Miner. This is a low-grade milling proposition. A 50-ton cyanide mill will be built by the company in the spring.

Hinsdale County.

Work on the Red Rover group, near Lake City, has resumed. Twelve men have been put on and this number will be increasod. A. Harvison is manager and G. Staples superintendent.

Lake County.

The Western M. Co., near Leadville, reports development progressing in addition to steady shipments of ore being made. At the Henriet shaft the old shaft house is being torn down and a new surface plant is going in. The Western M. Co. is shipping 120 tons daily of milling ore and zinc, most of the material coming through the Adams shaft. They are also handling low-grade material, which is simply crushed before being shipped and is not handled by concentration.——The Midas M. Co., through its Midas and Coronado properties, is making an output of 250 tons a day and at the same time increasing development and prospecting work. The water is being handled for the combination at the Coronado, big pumps making from 800 to 850 gallons a minute.——At the A. Y. & Minnie group the mill is running steadily and receiving from the mine 80 to 90 tons a day, while 2000 tons a month is being shipped to the smelter.

The Oro shaft, on the west side of Carbonate hill, at Leadville, is down 320 feet and has crossed the Carbonate fault, and it is intended to sink the shaft down to the 600-foot mark, when drifting will be started to the northwest, where it is expected the ore shoot of the Carbonate mine will be opened.

La Plata County.

(Special Correspondenco).—The mining industry in the La Platas shows promise for the coming year. Work is progressing on the cyanide mill of the Bonnie Girl mine. They have their pipe line in place, ready for the power plant.

La Plata, Jan. 17.

Las Animas County.

Trinidad reports say the coal operators of Los Animas county are opening up the camps. Men are at work at Gray Creek, this being the first attempt to open this mine since the strike began. At Bowen the mine is on top of the mountain. The men at work have been furnished quarters at the mine, which has been provisioned, and on top of the hill overlooking the surrounding country is an electric searchlight, so that no one can approach the mine at night without discovery. The mines at Rouse are opening and there is a large number of men working at Hastings, Majestic and several of the other camps. The companies claim by Feb. 1st all the mines will be in full operation.

Ouray County.

Sixteen sacks of gold ore were shipped last week from the D. Lloyd mine, in Senator gulch, 4 miles from Ouray, in Mount Sneffels district, which assayed 100 ounces in gold and 37 ounces in silver. The strike was made by J. Genino et al., who have a lease on the mine. The ore streak is 8 inches in width and was cut after sinking 43 feet in an abandoned shaft 125 feet from the mouth of the tunnel. The tunnel is in 250 feet and they have 10 inches of ore in the breast that assays 10 ounces in gold and 10 ounces in silver. The property is owned by R. Porteus and C. J. Sigfrid of Ouray and I. Henry of Pueblo and D. Lloyd of Denver.

Park County.

(Special Correspondence).—The London Twist M. & M. Co., W. S. Smith manager, has a lease on the East London No. 2, Oliver Twist, Accommodation and Wapiti claims, which adjoin the London mine. They have a crosscut tunnel running lengthwise of the Accommodation for 600 feet and 200 feet on the Oliver Twist where it is said to cut the main London lodo. Work is being done with an electric drill. Ore has been struck. C. S. Card of Denver is president of the company.

The Moose mine, on Bross mountain, is under lease to J. Moynahan.——The Red Cross mine, in Buckskin gulch, has seven men at work. A German company has ninety days option on the Red Cross. The ore is of sulphides carrying 20% zinc and 17% lead.——The outlook for Park county for 1904 in the mining line is encouraging.

Alma, Jan. 18.

Saguache County.

The Citizens' Con. G. M. Co., of which V. A. Robinson of Florence is engineer and metallurgist, has been organized to operate, under a three years' lease and bond, the mines of the Villa Grove M. Co. They consist of four patented claims in Blake mining district. The company also has under lease and bond for one year, with right to buy, four mining properties in Cracker Creek mining district, Baker county, Or. The officers of the new company are A. F. Gasmire, C. A. Kalbitzer and T. H. Norton of Wheeling, W. Va. The company owns the Anna group of five claims near those of the Steel Canon M., M. & L. Co., operating near Villa Grove. The workings on the Anna group consist of a main tunnel on the vein a distance of 730 feet, and 500 tons of copper-silver ore has been taken out. The company's Oregon holdings consist of the Monarch, Mountain and Rockland Boy.

San Juan County.

H. Leo, F. Lewington and J. Gibbons have organized to operate mines near Silverton, under corporate name of The Solferino M. Co.

San Miguel County.

At the Butterfly-Terrible mine, near Telluride, thirty stamps (the full capacity of the mill) are dropping. Additions to the force of miners are being made daily.

Summit County.

At Kokomo the Breene mine will be in full operation next month, says the Summit County Journal. A new cable has been put on to the hoist. P. W. Breene is manager and superintendent.

The Raven and Eagle mines, near Kokomo, have been leased to R. Wiley, who is taking out ore.——The George Milo, a former producer, is being started up again. A large boiler and engine are being placed.

The North American M. Co., organized to operate in Ten Mile district, near Frisco, is arranging to begin work. This company has a group of claims on the western slope of Peak One, and its holdings extend from the Ten Mile river at the base of the mountain to its summit. A short distance above the river and the tracks of the South Park & Rio Grande railway the company has started a tunnel, which will be driven into Peak One a distance of 3000 feet, attaining depth of 3000 feet under the surface, cutting several veins from 5 feet to 20 feet in width. A plant of machinery will be put in, and the tunnel driven by air drills. A concentrating and cyanide mill will be added when the ore bodies have been sufficiently opened up. F. W. Howbert, E. C. Gard, C. D. Ford and F. B. Davis, of Denver, are interested. A. A. Miller of Grand Junction is manager.

The Gold Belt mine, at head of Mayflower gulch, near Kokomo, owned by D. Robertson et al. of Leadville, is in full operation and taking out gold-bearing quartz. P. J. Nelson is manager.

Teller County.

Superintendent Taylor, of the Old Gold and C. K. & N. mines, on Beacon hill, Cripple Creek, has twenty-six men at work on the Old Gold and fifty men on the C. K. & N., making fifty tons per day coming from the two mines. The ore averages two ounces gold per ton. The ore on the C. K. & N. is mined in a drift driven from the 275-foot level, while the ore on the Old Gold is being broken from a drift off the 350-foot level.

According to the record kept at the Mary McKinney mine, the water level in that part of the Cripple Creek district has been lowered 22 feet since the channel was cut by the drainage tunnel Sept. 6, 1903. This fall is said to be indicative of the result at the Elkton and others in the same section. The fall averages from 5 to 10 inches per week. Improvement has been noted at several other mines, but records are not kept. Less than 40 feet of water lies over the eighth level of the Elkton, while 20 or 30 feet covers the Mary McKinnoy's sixth level. Ore is opened and broken at this point in the Elkton, while the McKinney's shoot had not been reached when the flood interrupted. It is expected work may be resumed at this point before spring. No drainage is yet reported from mines at the eastern end of Bull hill. These include the Vindicator, Golden Cycle, Hull City and Findley.

Lessee Ellithorpe & Co., operating under lease the Big Banta mine, near Cripple Creek, propose putting in a plant of machinery over the shaft they are working to handle both water and ore.

Geologist F. L. Ransome and A. M. Rock of the United States Geological Survey have returned to Cripple Creek district from Washington, D. C., and will finish the survey of the district started last August. The topographical work has been completed, but before entering the large properties for the last part of the resurvey they were obliged to await the drainage of several mines which had not reached a point to permit them to descend to the levels they desired. W. Lindgren and L. C. Gretou will also assist

n the work. Every shaft 10 feet or more in depth is platted and every tunnel, road and shaft house in the district will be shown on the map.

There are fifteen sets of lessees operating on the Doctor-Jack Pot properties on Raven hill, Cripple Creek. During the month of December 500 tons of ore were shipped out by the lessees, which gave an average of $35 per ton. The entire production was made by eight sets of lessees, the remaining seven not shipping on account of development work.

The Parsons G. M. Co., which holds an option for $40,000 on three patented claims on southeast slope of Big Bull mountain, Cripple Creek, has opened up a body of ore in the breast of the tunnel which has been driven 325 feet. The ore shoot is 5 feet in width and assays show $10 per ton. The formation is oxidized and the company expects to put up a cyanide mill in the spring. They sank a shaft to depth of 100 feet and did some crosscutting, but were compelled to quit on account of the body of water encountered. The tunnel was then started.

The El Paso Gold King mine, up Poverty gulch on Womack hill, Cripple Creek, has resumed. The mine has been closed down since last July on account of water in the shaft. The shaft has been sunk to depth of 900 feet, but the water has so far receded, caused by the El Paso drainage tunnel, that the management considers work can be resumed in the lower levels.

The Aztec G. M. Co., operating on Mineral Hill, Cripple Creek, will resume operations on its Illk claim this week, after being closed down for thirty days. The suspension was caused by inadequate machinery, says Manager Conners, and he will put in an air compressor. The shaft has been sunk to depth of 235 feet, where a crosscut was started and driven west 40 feet. This crosscut will be extended to open the ore shoot found near the surface. The vein measured 5 feet in width. The company is composed of Chicago and Illinois men.

IDAHO.

Boise County.

F. B. Anderson, manager of the Black Pearl group, near Pearl, reports work on the Black Pearl progressing. A sbaft house, blacksmith shop and other buildings have been put up. Machinery consisting of a 22 H. P. gasoline hoist, Cornish pump, cars, track, etc., are being set up. Sinking is going ahead, with the shaft at 25 feet. Three hundred feet will be sunk before any crosscutting is done.

G. Stuck, operating the Mammoth mine, on Summit Flat, near Idaho City, is arranging to put in a 10-stamp mill. He reports a 6-inch shoot of high-grade ore in the Mammoth, struck on the 300-foot level, and by raising has been shown to continue to the 200-foot level. The ledge is 6 feet wide and carries gold.

Idaho County.

J. Keeth reports a strike on the Winifred claim, in which he is interested, on French gulch, ½ mile from the American Eagle mine, near Elk City. The Winifred is owned by A. B. Railton, J. Keeth and F. H. Harper. While doing assessment work, Keeth says they struck 1½ foot of gold-bearing quartz which assays $90. They have started a tunnel to tap the ledge at 100 feet in depth.

The Jumbo M. Co., at Buffalo Hump, is adding ten more stamps to its mill.

The power plant for the Crackerjack mine at Hump has been put up and the wire strung to the mine. The compressor is being set up. Crosscutting is being done on the lower level of the mine and 14 feet of milling ore has been opened.——The machinery of the Jumbo mine is on the ground.——Machinery for the Atlas is being set up. Raising and sinking is being done and the number of men is being increased. —— The Granite shaft is down 15 feet. A building has been put up over the shaft for protection.——Prospecting is completed on the Wide West and Gracie claims, and 12 feet of ore is reported opened up showing average of $12 per ton in gold.

Kootenai County.

A strike is reported made in the tunnel on the Richmond mine, near Tyson. A shaft was sunk 27 feet on the vein on the surface, where a fault occurred, and the vein lost. The tunnel has been run blind to prospect. The paystreak is 14 inches wide. The ore is oxidized and the gold free. H. W. Desgranges is president.

Shoshone County.

J. Keane, manager of the California group, near Wallace, says the production of the Galena mine for 1903 reached the value of $40,000. The mine shipped to the Globe smelter at Denver, Colo. Work on a part of the ground in the California group has been stopped by a suit pending.

W. S. Wilkinson of the Wild Rose mine, near Pierce City, last week sent out a cleau-up of $2500 from an eight days' run of the stamp mill. Wilkinson says the cyanide plant recently put in does not save as high a perceutage of the values in the tailings as was expected, and that the plant will have to be further improved.

At the Standard milling plant at Wallace in the Cœur d'Alenes, experiments are being made with three types of conceutrating tables for handling tailings that have been ground so finely as to slime, says the Spokesman. The Standard mill has been using canvas tables, but these have been proven unsatisfactory. The canvas plant would not save fine enough and subsequent treatment was necessary. At the Standard mill the middling product is treated by seven tables. It reaches the tables after it has passed through the jigs and the Huntington. It is the tailings from these tables that are being distributed to the three machines in the experiments.

Another reduction has been made by the railroads in freight charges on silver-lead ores from the Cœur d'Alenes, says the Spokesman-Review. The O. R. & N. and the Northern Pacific announce new rates to Perth Amboy, N. J., smelters. The O. R. & N. makes a straight rate of $12 per ton of 2000 pounds on silver-lead ore, carloads, minimum 30,000 pounds, "released to $50 valuation to Perth Amboy from Spokane, Burke, Mullan, Wallace and Wardner. The present rate from those points ranges from $13 to $17 per ton, according to valuation of the ore. Under the new tariff, ore which formerly cost $17 will be carried for $12, if the shipper is willing to release to a $50 valuation irrespective of the actual value of the ore. The Northern Pacific tariff is from the same points, except Spokane, and provides a $12 rate on ore "whose value does not exceed $60 per ton and released to that valuation." Higher grade ore, shipped via the Northern Pacific, will have to pay the former higher tariffs, unless the new tariff is amended by that road.

From the Hercules mine, near Wallace, about 850 tons per month are shipped, 750 tons of which go to Selby, the remainder being shipped to Pertb Amboy, N. J. The low-grade ores of the Hercules are not treated, as the company has no concentrator. During the past year 10,000 tons of ore were shipped, which averaged over $65 per ton.

Washington County.

P. H. Hamblin et al. of Chicago, Ill., are preparing to build a smelter of at least 500 tons capacity at Weiser. They will handle ores from eastern Oregon and from Idaho. Manager Hamblin will establish his offices at Portland, Or.

MICHIGAN.

The production of the Lake Superior copper mines in pounds of refined copper for 1903 is reported by the Michigan Gazette as follows:

Calumet & Hecla	76,500,000
Tamarack	13,000,000
Wolverine	9,150,000
Osceola	16,500,000
Mohawk	6,250,000
Franklin	4,900,000
Phœnix	180,000
Quincy	18,250,000
Isle Royale	3,100,000
Arcadian	170,000
Atlantic	5,500,000
Baltic	10,575,000
Trimountain	9,250,000
Champion	11,000,000
Winona	1,085,000
Mass	3,020,000
Adventure	2,235,000
Michigan	245,000
Total	191,000,000

The output in pounds for tbe four years preceding was: 1899, 146,000,000; 1900, 142,051,000; 1901, 155,618,848, and 1902, 172,020,065.

Houghton County.

The Copper Range Con. C. Co. is preparing to carry mineral from the South Range mines to its smelter in especially constructed steel cars, doing away with the necessity of barreling the mineral, says the News. This will effect a saving in the milling expenses, as only the heaviest of oak barrels can be used. The Dollar Bay smelters are shipping refined copper East as fast as smelted. There has been no accumulation on the docks as yet. ——Permanent hoists at No. 2 and No. 3 shafts of the Trimountain mine of tbe Copper Range Co. will be ready by Feb. 1, when the six-ton skips will go on, increasing the rock supply for the mill. Their Baltic rock is said to be running heavy in copper at present. An additional wash flow is being arranged at the Baltic mill similar to that in operation at the Mohawk and Wolverine mills.

No. 3 Tamarack mine hoist, near Calumet, is being rushed in order to make up the time lost by the delay caused by the fire. On the 13tb inst. 1400 tons were hoisted. The January showing of the Tamarack is expected to be up to the average production, notwithstanding the few days' delay.

The management of the Isle Royale mine, near Houghton, is working seventeen drills in No. 2 shaft, keeping one head in the mill supplied. All but three of these drills are stoping.

Keweenaw County.

Tbe Miskwabik mine, near Allouez, is cutting a plat 125 feet from the old surface in the shaft on the Kearsarge lode. The company will drift north and south to determine whether the lode holds its character, says Superintendent Robson.

MONTANA.

Estimates place Montana's mineral production for 1903 as follows: Copper, $25,000,000; silver, $6,000,000; gold, $4,000,000; lead, $1,000,000: total, $36,000,000. The year, despite several shutdowns, has been a notable one in the bistory of mining in Montana. There will, because of the two shutdowns of the Amalgamated Co. properties, be a falling off in the production of copper and silver (silver being mined chiefly as a by-product of Butte copper ores), but an increase in the gold output is shown, the estimate for this metal being $2,086,359, against $1,793,232 in 1902. For this several reasons are given, chiefly the adaptability of recent discoveries to treatment by cyanide process, the increased value of silver and lead and cheap power from the Missouri dam. Fergus county has shown the largest increase, through building of cyanide plants, and this county in 1903 shipped $975,000 in gold bullion. For the first time in its history, Montana during 1903 exported both coal and coke, Wyoming and British Columbia being the buyers. A strike of coal was made in the Bear Creek fields, in Carbon county. This field is owned largely by the Northern Pacific, the Amalgamated C. Co. and a company with E. Smith et al. of Boston, Mass. A railroad will be built to the district in the spring from Red Lodge, a distance of 16 miles. Contracts were let in Decemlier for building the Basin & Elliston Railroad, which will tap several districts heretofore unavailable because of lack of transportation. This line will connect the Northern Pacific and Great Northern lines, placing both Butte and Helena smelters in direct communication with these mines.

NEVADA.

Lincoln County.

A strike of gold ore is reported made 12 miles nortbeast of Searchlight, on ground owned by H. Perkins, E. Thurman and G. Duncan. It is three-fourths of a mile north of Dupont mountain. The ore is free-milling.

The Cyrus Noble mine, at Searchlight, resumed operations last week after a temporary shut-down. At 100 feet west of the sbaft, on the 200-foot level, a winze has been started to connect with the lower level. It is being sunk on a shoot of ore. Other work under way is continuing of the west drift on the 300-foot level. It is expected the incline will not be put down much deeper, but a vertical working shaft will be sunk.

Development work is being done on the Black Bear mine, at Searchlight, owned by R. H. McElwain. This claim adjoins the Quartette group on the west end.

The New Era M. Co., at Searchlight, reports, on account of non-arrival of material for the mill and pipe line, the company has suspended operations temporarily.

White Pine County.

D. N. Harper has bought a group of forty claims on tbe mineral belt, adjoining the New York & Nevada C. Co. and White Pine C. Co. He is arranging to put in machinery for developing his holdings. The first work will he done on the Elkhorn and Sunset group. Surveys of the entire group will be made.

NEW MEXICO.

Grant County.

High-grade gold ore is being taken out of the Owl mine at Gold Gulch, says the New Mexican. On the Tbompson & Copp lease a strike is also reported. The sinking of the other shafts to greater depth drained the Hamilton shaft and an examination of the old stope showed ore remaining. Two veins showed the length of the stope 40 feet, and also in the face of the drift.

Luna County.

The Othello mine, at Cooks, is shipping ore.

Sierra County.

The tunnel being run on the Mamie Richmond mine, at Hillsboro, to connect with the 200-foot level, has developed a breast of sulphide ore 4½ feet wide, says the New Mexican, and 100 tons of ore has been taken out. Sixty tons of the ore assayed $30 per ton, the balance $18 per ton.

Socorro County.

The Santa Fe Enterprise M. Co. has been incorporated by C. K. Minor, G. A Freeman and E. J. Plumley of Buffalo, N. Y., with principal place of business at Cooney, Socorro county.

OREGON.

Baker County.

The Don Juan mine, near Greenhorn, has been closed down again, says T. W. Davidson, of Davidson & Brown, who were operating it under bond.

Regular shipments of ten tons daily of concentrates are being made from the Baisley-Elkhorn mine, near Baker City. The plant consists of two Huntington mills and concentrating tables.

The high-grade copper ore struck in the lower workings of the Copperopolis mine, near Sumpter, is not of the main copper shoot of the surface croppings, but a smaller fissure, which carries about 3½ feet of bornite, says Manager W. W. Gibbs. In the main adit a diagonal crosscut will be driven in a direction that will open the main vein and also this bornite shoot at another point. The ores of both veins will be concentrated. On another claim of the group which is being worked a copper-bearing vein 8 feet wide has been opened. Concentrating it ten into one a product of 40% copper is obtained.

Clackamas County.

The Molalla Central M. Co., operating in the Cascades, near Molalla, is preparing to put up a milling plant in the spring. A road will be built to the mine.

Douglas County.

A. D. Le Roy, manager of the Le Roy mine, at Bohemia, says work continues and development done is encouraging. The body of ore in the lower tunnel shows 48 feet wide and is of concentrating grade. On tunnel No. 3 they have opened a body of free milling ore 9 feet wide, with a shoot carrying sulphides. It is intended to build a concentrator this season.

Grant County.

Drifting work is in progress on tbe placer deposits of G. W. Dart, near Prairie City, says the Prairie City Miner. He is driving a tunnel to prospect the deposit. The gravel being removed is said to pay for the work, altbough the drift is but 40 feet long. The work will continue during tbe winter.

Josephine County.

W. J. Morphy of Chicago, Ill., manager of the American Gold Fields Co., owner of the Granite Hill mines, near Grant's Pass, says machinery is on the ground for mill and power plant. The compressor will be ready for operation by February 1.

UTAH.

Juab County.

B. L. Cutler, superintendent of the St. George C. Co. at Dugway, east of Fish Springs, says the camp is improving. High-grade copper ore, whicb also carries values in gold and silver, is being taken out. Tbe St. George mines are owned by W. F. Snyder, C. McCornick, B. L. Cutler, E. J. Raddatz et al., and the miners are drifting from the 100-foot level and have cut a body of lead ore 200 feet from the chute, some of which is now being taken out for shipment. The group also shows surface ore running 20% copper, $40 gold and twelve ounces silver, says Cutler. He is also superintending work on claims of the Dugway M. Co., of which A. M. Cannon is president. The Dugway has 29½ patented claims and is working a few men on the Black Maria, on which tbe shaft has been sunk to depth of 50 feet, with a crosscut of 51½ feet. The ledge was cut at depth of 20 feet, and they sacked five tons of ore, showing values in copper, gold, silver and lead. They are crosscutting for the contact.

In tbe Endline claim, on same group, there is a vein 28 feet wide at depth of 60 feet, where a whim has been set up. The Rattler group of fourteen claims shows a body of lead ore 2 feet thick in the vein.

Pinte County.

G. T. Wilson, owner of the May Day group in Ten Mile district, near Marysvale, says the May Day group consists of five claims, and the principal values are in copper. The main tunnel is in 170 feet and running in quartz all the way.

Salt Lake County.

The aerial tramway of the United States M. Co. at Bingham is transporting 850 tons of ore per day from its mines to the smelter, says Superintendent Mayberry.

The Farmington Con. Oil & Gas Co. has been incorporated at Salt Lake City by S. V. Shelp, C. K. Rowland, H. Satterlee, G. T. Odell, E. B. Jones and A. C. Ewing. The holdings of the company consist of 16,000 acres adjoining the Guffey-Galey tract near Farmington.

Superintendent W. G. Scott of the Continental-Alta mines, at Alta, reports completion of clearing the old tunnel to tbe Lavinia stope, which was formerly one of the productive parts of the Lavinia mine, now owned by the Continental-Alta. This tunnel has been closed, on account of the

cave-in, for twelve years. There is still considerable ore left in this stope, and it is intention of Manager H. M. Crowther to ship, and also to make further explorations there. In the meantimo shipments will continue from other portions of the mine, while the good roads last, before the spring thaws come. Difficulty has been experienced in securing teams.

Summit County.

It is reported that work will resumo at the Glencoe mine in Blue Ledge section, near Park City.

The forces at tho Park City Majestic property are soon to be increased, according to the advices from that camp. Michigan parties have become interested in the mine recently.

Work has been suspended for tho winter at the Hi Henry property at Park City.

The American Flag Co., operating at Park City, is laying a pipe line to increase its water supply.

Tooele County.

The Sacramento M. Co., at Mercur, in 1903, produced gold bullion for which it received $115,122.14, and retorted quicksilver that netted $16,422.82, according to tho annual report. The tonnage of oro blocked out will afford supply during tho present year both for tho cyanide plant and for the mercury retorts. During samo period the company distributed among those employed at the mines and plants $40,519.09: for explosives, etc., $37,934.97. G. R. Bothwell is president and manager.

SOUTH DAKOTA.

Lawrence County.

The Big Four M. Co. will rebuild its hoisting plant, near Deadwood, which was destroyed by fire last week. Such of the machinery as was only partly damaged by tho fire is being overhauled. The company's mine is in the phonolite belt.

WASHINGTON.

Chehalis County.

W. J. Shaw of Cincinnati, Ohio, says the black sands (magnetite sands) at Damon's Point, on north side of entrance to Gray's Harbor, are capable of conversion into iron ore. The Beach Placer M. Co. has been incorporated with Shaw as president and manager. He has a lease from the owner of the land on 500 acres for twenty-five years. It is proposed to put in a reduction plant at a cost of $10,000. The smelter will be half a mile from deep water, making shipping easy, and the adjacent forests will furnish fuel.

Ferry County.

(Special Correspondence).—During 1903 the ores mined here were treated at the Tacoma, Nelson, Trail, Boundary Falls and Crofton smelters. These smelters have ceased to take ore, but another smelter is now taking ore from the Quilp, Mountain Lion and Knob Hill mines. The Quilp continues shipping sixty tons daily.

The Hendrycks new cyaniding process will shortly be in use at the Mountain Lion mine. The value of the new process will be known within a few months.

Tho lower tunnel at the Knob Hill will soon reach the vein. A raise is being made from the upper tunnel to connect with a shaft. When completed, the mine will be thoroughly ventilated, which will enable ore to be stoped in many places. ——It will be some months before the Bodie mill at Bodie is ready to treat the ore.

Republic, Jan. 16.

A strike is reported at the Vesuvius claim in tho Malachite group, near Keller, owned by the Lorraine C. M. Co. In driving an open cut on a vein cropping they struck a body of arsenical-iron ore, carrying gold values. They have a 12-foot face of ore above tho floor of the cut, and they are sinking in the same material. On top the vein shows quartz, and the iron is oxidized, but in the cut and in the shaft the material is arsenopyrite, says the Review.

Okanogan County.

A 5-foot ledge has been struck in tho drift to the right of the main tunnel in the Mineral Hill mine, 2 miles west of Conconully, says the Review. The ledge carries an 18-inch shoot with ruby silver, and 150 feet of this vein has been exposed. The work is being continued with the intention of taking out no ore until spring opens, when shipping will be started. Work on the main tunnel, which is 1100 feet long, will be resumed as soon as an air compressor plant can be put in.

The Salmon River M. & M. Co. miue, on Peacock mountain, south of Conconully, is being worked. A. L. Boswell has a contract for driving the tunnel 400 feet farther and has sixteen men at work. T. Jamos of Spokane is manager.

Work has been temporarily suspended on the Q. S. mine, near Conconully, owing to bad air in the tunnel. S. Barron, manager, expects to put in an air compressor plant this month, when work will be resumed.——H. A. Wilder has a contract for cutting a 200-foot crossent tunnel ou tho Northland mine, near Blue lake. ——Work on the Copperhead mine of the Blue Lake M Co. is going ahead.

Stevens County.

(Special Correspondence). — The diamond drill at the Little Giant mine, in Pierre Lake district, has been replaced by an air drill and a permanent shaft will be sunk near tho last borings, which showed gold and copper ore.

Work has been resumed on the Great Columbia mine, 3 miles north of Bossburg, on the Colville Indian reservation. The Great Columbia vein contains 18 inches of zinc ore which averages 48% zinc. A tunnel is being driven to cut the vein at depth of 150 feet.

The Boston Climax Co., of Providence, R. I., has begun operations on its group on Towlow mountain in Pierro Lake district. The tuunel, which is in 500 feet, will be continued until tho main lode is opened up. The Boston Climax ore carries gold, copper and nickel values.

Mulligan Bros. havo opened up high-grado homatite in the Pittsburg mine on O'Toolo mountain.——J. Dolan is developing the Monarch group opposite Bossburg. A shaft is being sunk.

Bossburg, Jan. 17.

WYOMING.

State Geologist Beeler has issued the following figures for copper product on of Wyoming:

1882	$18,757 50
1883	131,858 11
1888	36,017 32
1889	12,000 00
1897	14,015 28
1898	27,965 28
1899	530,925 39
1900	683,601 50
1901	140,909 82
1903	127.101 62

FOREIGN.

AFRICA.

Transvaal.

The Windsor G. M. Co., near Johannesburg, reports crushing began Dec. 31, with 45 stamps, on ore taken from the mine and from the dump. As less than half the full complement of native labor is available, it will not he possible until supply is increased for the mill to be kept on ore taken from the mine only.

AUSTRALIA.

New South Wales.

The Broken Hill Proprietary Co., at Broken Hill output for four weeks ending Dec. 30 (including product from ores purchased) was: Refinery products, fino silver, 300,044 ounces; soft lead, 5210 tons; antimonial lead (estimated), 52 tons.—— The Mount Boppy G. M. Co., under date of Dec. 26, reports level No. 3 (new ore body) is in 120 feet, giving assays of 8 dwts. gold per ton. The reef, 100 feet in, shows 42 feet wide, worth 11 dwts. per ton.

Queensland.

Tho Day Dawn Block & Wyndham G. M. Co. at Charters Towers roports returns for five weeks ended Dec. 24, as follows: From the battery, 3350 tons of ore crushed for yield of 2611 ounces of gold (including the annual clean-up of plates), valued at £9100. From the company's cyanide works at Burdekin River and Old Wyndham mills, 4996 tons of tailings were handled, yielding hullion valued at £3700.

Western Australia.

In the Kalgurli mine at Kalgoorlie, the ore body has been opened up for continuous length of 320 feet at the 1000-foot level, the ore met with in driving averaging an ounce of fine gold per ton for a width of 30 feet. Telluride ore is showing in the north face, apart from the specimen stone assaying two ounces per ton. No work had been done on this lode prior to it being tapped last fall by a crosscut at a point 100 feet west of the main shaft, says the Western Australia Journal. The Kalgurli's west lode is yielding sulphotelluride ore for a length of 206 feet in the stope above the 200-foot level. F. H. Moss is manager.

A specimen of gold-bearing asbestos is reported taken from a seam struck at depth of 200 feet at Kunanalling.

The gold export and mint returns of Western Australia are reported as:

	Quantity Ounces Exported.	Received at Perth (W.A.) Mint. Ounces.	Total Ounces.
January	101,594	108,857	210,451
February	80,250	112,148	192,398
March	78,907	115,816	194,723
April	86,987	121,640	208,627
May	92,779	114,722	207,501
June	72,278	135,781	208,059
July	90,176	122,325	212,501
August	82,265	134,352	206,617
September	71,581	129,824	201,405
October	72,494	118,291	190,785
November	75,775	125,399	201,174
December	78,599	123,471	202,070
Total			2,436,311

The total ounces for 1902 amounted to 2,177,441.

At Kanowna, in northeast Coolgardie section, diamond drilling is under way at the bottom of the Government shaft on the Deep Leads mine to test the alluvial deposits. —— The public mills are in full operation, most of tho ore handled being low grade.

Victoria.

(Special Correspondence). — Bewick, Moreing & Co., large operators in Western Australia, are going to sink several test bore holes in Victoria gold fields where they have acquired some interests, where H. C. Hoover and W. Lindgren recently made examinations.

Melbourne, Dec. 20.

BRITISH COLUMBIA.

Cassiar District.

Work on the Princess Royal G. & C. M. Co.'s mines, which has been temporarily suspended, will be resumed this week. The shaft, which was sunk to 35 feet last year, will be lowered 50 feet farther, says H. W. Parrott at Bellingham, treasurer of the company. It is expected the ore body will be cut at a depth of 65 feet. This property consists of four full claims on Princess Royal island, on the inside steamship passage to Alaska. The shaft is close to tidewater, which eliminates the expense of a tramway. Water power is said to be available sufficient for all needs. The ore carries gold and copper values.

Nelson District.

(Special Correspondence). — After a close-down of five years the Dundee mine of the Ymir camp will be reopened. The company has three shifts at work pumping out the mine, which is expected to be finished next week. Development work will he increased and shipments started. When the snow goes off in the spring, further opening up the mine by means of a long tunnel will be started, as the present methods entail heavy expense in pumping and hoisting.

Second payment of $3500 on the Gold Cup group has been made by J. F. Davault. The Gold Cup group consists of three claims 4 miles north of Ymir and 1 mile east of the Great Northern railway. A 2-stamp mill has been built beside the line of railway and the rawhiding of ore will be started this week from the 500 tons of ore on the dump. Since July 8, 1903, 475 feet of work has been done. A shaft has been sunk 125 feet and a tunnel driven to connect at depth of 255 feet. The ore shows values in gold, copper and silver.

Nelson, Jan. 16.

Rossland District.

Regarding the ore strike in the lower levels of Le Roi mine at Rossland, Manager S. F. Parrish says at a point 300 feet west of the main shaft, on the 1350-foot level, a crosscut has been run 100 feet along the course of the diamond drilling. Since striking the ore body, he has drifted 50 feet one way and 30 feet another, showing the shoot the full length. Muck samples run $12 to $20 per ton. At a point farther west another crosscut on the same level has also opened ore of similar grade to that found nearor the shaft. It is not known if this is a continuation of the first strike. The new shoot is on the south side of the mine. The work on it at present consists of crosscutting and drifting. A winze will he sunk and raising will also be done.

Slocan District.

The electric hoist at the Payne mine has been set up, replacing the hoist in No. 5 tunnol, which will be transferred to No. 8.——The Province Mines, Ltd., is shipping ore from South Fork.——Fifteen men are at work at the Hewitt mine. A body of ore was struck in the upper works last week and shipments will be resumed before Feb. 1st. In the lower levels the Hewitt has bodies of concentrating ore blocked out, for which a mill will he built.——It is expected the Galena Farm mine will again he worked. Five hundred tons of ore will be run through the Wakefield mill, and if satisfactory results are obtained, the property will be worked regularly.

The Monitor mine, at Three Forks, on the line of the Canadian Pacific railroad, shipped 800 tons of galena during 1903 and has worked twenty men. Considerable development work has been done and it is expected the company will build a treatment plant next summer to handle the low-grade and zinc ores. The ore carries $8 per ton in gold, silver and lead. The property is owned by an English company, with M. Gintzburger manager.

The Rambler-Cariboo mine, near McGuigan, has been working an average of sixty-five men and shipped 1500 tons of galena bearing ore and concentrates during 1903. The concentrator worked steadily from June to the middle of November, when it closed for shortago of water. A flume was built and the compressor moved down the hill. The plant will he run by water power, and will furnish power and air for the mine, doing away with hauling of coal. The mill will start again in the spring to treat the dumps. A tunnel of 4000 feet will be started this month to tap the shoot at depth.

West Kootenay District.

(Special Correspondence). — For the month of December the Eva mill of the Calumet & British Columbia G. M. Ltd., 2 miles from Camborne, crushed 830 tons of ore during 28½ days, the result being five bars of bullion aggregating 715 ounces, valued at $11,000 and fifteen tons of concentrates worth $330. The average value of the tailings was $1.40 per ton. The ore runs $14.50 per ton.

Finch & Campbell of Spokane, Wash., have bought the Buffalo Group, 3 miles southeast of Poplar. It consists of two claims. The property is 200 yards from the Canadian Pacific railway on east side of Cascade creek.

Camborne, Jan. 16.

Vancouver Island.

The Lenora mine, at Mount Sicker, owned by Breen & Bellinger of Spokane, Wash., reports a strike in the lower workings. Under Manager Tregear, work had been proceeding in the old workings. Both in the Lonora and the Tyee the ore has been found up to the present, says the Telegram, along the diorito wall which cuts both properties. Tregear worked away from this in a northerly direction, running 100 feet, when the new body was cut, showing 9 feet of copper ore.——The Crofton smeltor, of which the Spokane, Wash., men are owners, has been blown in again, and the Richard III mine, at top of Mount Sicker, above the Tyee, is shipping ore to the smeltor at the rate of fifty tons a day.

CANADA.

United States Consul M. J. Burke of St. Thomas reports the output of metalliferous mines and works in Ontario for first nine months of 1903 as follows:

Mineral.	Quantity.	Value.
Gold, ounces	7,693	$139,210
Silver, ounces	19,549	10,124
Iron ore, tons	262,403	376,103
Pig iron, tons	56,783	1,051,940
Nickel, tons	5,393	2,115,957
Copper, tons	1,320	330,263
Zinc ore, tons	950	7,600
Total		$4,031,197

On this basis, it is expected the output of the province for the entire year will reach the value of $5,300,000.

Yukon Territory.

Dawson reports say a cold wave struck Dawson last week. For forty-eight hours the thermometer registered 50° below zero, going as low as 59°. On Lower Le Barge, the coldest point on the river, it was 67° below. "Lays" are being let on El Dorado creek for second hedrock only, and good pay is found. It is thought tho second bedrock extends the full length of the creek, and will produce as much gold as did the first or "false bedrock." On No. 3 a second bedrock was located at 75 feet, producing as high as $25 a pan. Pay has been located under Grand Forks townsite. Several parties are sinking shafts in their back yards.

CHILE.

The Copiapo M. Co., at Copiapo, on December 28, reports a fire occurred in Fletcher's shaft at the Dulcinea mine. The mine has been tightly closed, but it has not been possible to ascertain amount of damage done. It is thought that below the 100-fathom level (600 feet) the damage has not been serious.

COLOMBIA.

The Darien G. M. Co., at Cana, under date of Dec. 20, reports mill stopped on account of political uneasiness, but operations in the mine continue. The American staff is temporarily in Panama.

MEXICO.

Chihuahua.

Work is expected to begin next month on the proposed wagon road from the end of the Parral & Durango Railroad to Guadalupe y Calvo. Engineer L. W. Knotts, appointed to select a route, reports one practicable at a cost of $60,000. The State and Federal government will raise two-thirds of the money and the rest from private subscription. The road will open up several mining camps, including the Piedra Largo, San Julian, Cueva Colorado, Gallina, El Cuerva, Dolores, San Simon, Cumbre de Sau Manuel, San Juan, Neponucino, Milpillas, Baborigame and others. A telephone line will also he put up along the road.—— J. M. Botello of Parral has arranged to start the Parral M. Co.'s mill Feb. 1. The deal of J. Leiter et al. for the Hidalgo M. Co.'s property being off, that compauy will start its mill next month.

A. C. Aiken of San Francisco, Cal., who

has the San Juan mine and the Democracia, at Santa Eulalia, has two diamond drills at work, one operated hy steam on the Democracia. The other, a hand drill, hut which will be operated hy gasoline engine, is underground on the San Juan. The Southern M. Dev. Co. has been organized to operate the Democracia group with H. F. and P. Robinson of Akron, Obio, interested with Mr. Aiken et al. of San Francisco, Cal.

The Palmarejo & Mexican Goldfields, Ltd., T. Southcott of London, president, reports work progressing on La Patria mine of the company. He says thero are 10,000 tons of ore at this and the Esperanza mines blocked out. The company expects to find the vein in the La Patria in the Paneha tunnel, which is 360 feet below tunnel No. 2. A mill of fifteen stamps will be put up. The approach of the railroad to the company's holdings has made it possihle for machinery to be transported there, in which case the ore will not have to be shipped to Zapote, where it is now treated. The company owns a total of 105 acres.

Guadalajara.

It is stated the United Mexican M. & S. Co. will huild a furnace to smelt the quicksilver ores from its mines at Mascota.

Jalisco.

The Tulu Iron Co. reports it can produce iron hy using charcoal instead of coke for $7.08, as against $10 in the United States. The company's property is on the Zopotlan hranch of the Mexican Central and in the Sierra Madre mountains, south of Guadalajara. Timber for charcoal and other purposes is ahundant and at hand. Water power is convenient. The mill is composed of a 25-ton charcoal blast furnace, a foundry with two 5-ton cupolas, cranes, a rolling mill, trams or tolls, puddling furnaces, machine shop, pattern shop, sawmill, etc. There are 500 men employed on the property.

A company is exploiting the La Estrella mine, in the Sierra de la Una de Gato, near Zaposlan. It is said to carry native silver.

Michoacan.

At Tlalpujahua the Dos Estrellas cyanide plant consists of six 60-ton steel preliminary sand-treatment tanks, six 120-ton steel sand-leaching tanks, eigbt 28x 18x8 feet masonry-slimes agitation tanks, eight steel slimes-washing tauks 20 feet in diameter and 10 feet deep, and tbree 30x 40x5 feet masonry storage aud sump tanks. Owing to greater tonnage per stamp of the new 80-stamp mill, says the Mexican Investor, the equipment will he increased by addition of eight steel tanks each 20 feet in diameter and 10 feet deep.

At the Jupiter mine at Tlalpujahua, at a depth of 120 feet in the three-compartment vertical shaft, so much water was met with that sinking operations were suspended. Another sinking pump is being set up, after which it is thought that sinking operations can be resumed. Two 60 H. P. boilors and a double hoist will he put in.

At Tlalpujahua the equipment of the San Rafael mill of tho Luz de Borda Co., which is locatod 3 kilometers north from the main shaft of the Luz de Borda mine, consists of fifteen stamps, 3 plates or tables, settling tanks, six concentrating tables, oue Krupp barrel mill with capacity for crushing twenty-five tons of ore per day, one engine, three boilers, crushers, etc. The stamps and the Krupp mill are treating 1500 tons of ore per month, which is said to run 16 ounces silver and 2 ounces gold per ton. About 100 tons of shipping ore is also heing mined each month, which is said to run 160 ounces silver and 3.2 ounces gold per ton. All ore from the workings is brought to the mill on backs of burros, hut the company proposes putting up a wire-rope tramway.

Nuevo Leon.

The Monterey News says the tunnel which has been under construction for the past ten years in Catorce district for draining the mines, will be completed by April 1st. The tunnel was originally the Socavan de Cuadalupe mine. It is 2 miles long and will end beneath the Concepcion, Padre Flores, Trompeta, Santa and San Augustine mines. The driving has all beeu done by hand, but an air compressor and drills are uow in operation. The tunnel is owned by the Padre Flores M. Co., owning the Padre Flores mine.

Sonora.

The Sonora G. M. Co. has been organized to work gold placer properties near Alamos. R. D. Hugbey, of Alamo, is manager, and C. Butterfield, of Denver, Colo., is president. The company will put in machinery, including centrifugal pumps.

The Los Licenciados mine, a mile south of Santa Rosa, is reported sold to tho Colorado A. & R. Co., of Denver, Colo., for $5000 gold. Tbe ores carry gold and silver.

M. P. Wright et al. have bought Los Amigos (formerly the Realito) group of antigua gold mines near Ures, east from Minas Prietas, and will increase development. The property includes twenty pertenencias, having a gold-hearing ledge 14 feet wide. Along the ledge are tajos (open cuts), from which rich ore was formerly taken and reduced in arrastras. The new owners will go helow the old workings and open up the ore hodies. Development will be followed hy a mill. Wright has denounced forty-eight additional pertenencias of mining ground adjoining the group.

At the Wandering Jew mine, in Tyndall district, Santa Rita mountains, Superintendent M. Lulley has men driving development on the ore body.

Tamaulipas.

The Mexican Petroleum Co., with wells at Ebano, near Tampico, will hegin huilding a refinery next week.

Personal.

W. M. KEENAN, Denver, Colo., is in Le Roi, Illinois.

JNO. E. MCMANUS, of Seattle, Wasb., has gone to Mexico.

P. ARGALL, of Denver, Colo., is in Mexico ou mining husiness.

W. T. HUPP, of Folsom, Cal., is in San Francisco, Cal., on mining husiness.

J. J. BROWN of Leadville, Colo., is examining mines in La Plata county, Colo.

C. K. COLVIN, of Denvor, Colo., has returned there from a trip to Globe, Arizona.

T. J. LYNCH, of Reno, Nev., is in San Francisco, Cal., from Nye county, Nev., mines.

MANAGER PROCTOR of the Darien M. Co. at Cana, Colombia, is at Panama, South America.

ALGERNON DEL MAR of Pine Grove, Nev., has gone to Los Angeles, Cal., on mining husiness.

N. B. KNOX has returned to San Francisco, Cal., from an inspection of mines at Cananea, Mexico.

CHAS. STEELE, millman, has gone from Mariposa, Cal., to the Oriental Con. M. Co., Chemulpo, Korea.

J. W. VAN METER has returned to San Francisco, Cal., from a successful husiness trip to Los Angeles, Cal.

D. C. TOBIN, superintendent of the N. A. P. & M. A. Co., White Pine, Colo., has returned there from Denver.

W. L. WATTS of Los Angeles, Cal., is in tbe State of Mexico, Mexico, where he is investigating mining property.

L. WYMAN, assayer for the Wyman M. Co. at San Javier, Sonora, Mex., returned there last week from a visit to Obio.

S. M. MILLER, manager of the Akron M. Co., has returned to White Pine, Colo., from an Eastern husiness trip.

B. B. THAYER, late manager of the Santa Rita (Mexico) M. Co., has opened a professional office in New York City.

A. E. DRUCKER, recently returned from Minas del Tajo, in Sinaloa, Mexico, is in San Francisco, Cal., from Washington.

F. H. MOSS, manager of the Kalgurli mine at Kalgoorlie, Western Australia, is in London, England, on company husiness.

NORRIS ENGLISH, consulting engineer of the Mt. Jefferson Co., has returned from Groveland, Cal., to San Francisco, Cal.

D. G. FORBES has resigned as local manager of the Nettie L. and the Silver Cup mines at Ferguson, in the Kootenays, B. C.

A. R. WILFLEY has returned to Denver, Colo., from Idaho and Montana, where he has been looking after mining interests.

J. G. HARDY has resigned as superinteudent of the Crestou-Colorada M. Co., operating at Sonora, Mox., and is in Denver, Colo.

J. K. BURCH, superintendent of the Abbott quicksilver mine in Lake county, near Sulphur Creek, Cal., is in San Francisco, Cal.

R. K. HUMPHREY, former superintendent of the California G. K. M. Co. of Picacho, Cal., has resigned and gone to Oklahoma.

S. TURNER, superintoudent of the Calumet & Bisbee and the Calumet & Cochise mines, near Bisbee, Ariz., has accepted the superintendoncy of the Higgins Dev. Co., vice S. A. Parnall, resigned, to accept tbe superintendency of the Calumet & Arizona.

PRESIDENT GILL of the Shannon C. Co. and President Ross of the Standard Con. C. Co. are in Boston, Mass., from Clifton, Ariz.

C. W. PHILLIPS of the Rey de Oro M. Co., operating near Magdalena, Sonora, Mexico, is in Cbicago, Ill., on company husiness.

H. A. TITCOMB, witb the Guggenheim Exploration Co. of Denver, Colo., is in Salt Lake City, Utah, having estahlished headquarters there.

V. P. STRANGE of the Balaklala M. Co., operating at Kennett, Shasta county, Cal., returned to Salt Lake City, Utah, last week from California.

P. H. HAMBLIN, of Chicago, Ill., manager of the smelter company which will huild at Weiser, Idaho, will move his offices to Portland, Or.

H. I. WILLEY has resigned as chief engineer for the Yaqui C. Co., operating at Campo Santo Nino, Sonora, Mexico, and is at Hermosillo, Sonora.

C. R. DOWNS of Sutter Creek, Cal., superintendent of the Bunker Hill mine, near Amador City, is in San Francisco, Cal., on mining husiness.

J. H. MORELAND, formerly superintendent of the Eureka Exploration Co., Eureka, Colo., has purchased an assay office in Kansas City, Mo.

H. C. HOOVER of the mining firm of Bewick, Moreing & Co. of London, England, has gone from San Francisco, Cal., to London, via New York.

G. WYMAN, president of tho Wyman M. Co., returned to San Javier, Sonora, Mex., last week from a husiness trip to Guaymas and Hermosillo, Mex.

H. M. DEAVITT, analytical and consulting chemist and assayer, is manager of the Chicago office of the Engineering Co. of America, 159 La Salle street.

A. J. BRENT has roturned to San Francisco, Cal., from New River district, Trinity county, Cal., where be is interested in tbe development of a gold mine.

J. A. CZIZEK, manager of the Lost Packer mine in Custer county, Idaho, has returned to Salt Lake City, Utah, from San Francisco, Cal., and Portland, Or.

L. COCHRANE, who has charge of the assay department of the Mine & Smelter Supply Co., Denver, Colo., is making a trip through Mexico in the interest of the company.

G. W. MYERS, of San Francisco, Cal., has gone to the mines of southern California and western Arizona in the interest of the Chrome Steel Works of Brooklyn, N. Y.

BARON C. VON REISCHACH, mining and metallurgical engineer, interested in Mexican mines, starts from San Francisco, Cal., for Europe to-day to be absent for an indofinite time.

F. L. RODEBUSCH of London, England, and G. L. Fisher of Denver, Colo., interested in Mexican mines, are in the State of Sinaloa, Mexico, from Hermosillo and Minas Prietas, Sonora.

C. R. TOWNSEND has resigned as superintendent of the California mine, near Sumpter, Or., and will take charge of development of the Gold Hill mine at Gold Hill, Jackson county, Or.

H. E. WEST, recently manager of the Pacific Northwest M. Co., Ltd., operating in Montana, is superintendent of the Leonesa M. Co. at Matagalpa, Nicaragua, C. A., operating gold mines in Nicaragua.

M. P. PARKER AND J. K. FRIEND, of El Paso, Texas, returned there last week from the Placer de Guadalupe. on the Conchos river, in Chihuahua, Mexico, where they havo been examining mines.

J. TONKIN, for several years underground superintendent at the Hecla branch of the Calumet & Hecla mines at Calumet, Mich., has resigned, and will be succeeded by Assistant Superintendent Richards.

W. P. HARLOW has resigned as president of the Yaqui C. Co. at Campo Santo Nino, Sonora, Mex., being succeeded by W. Sauntry, formerly vice-president. C. Kaiser, assistant general manager, has also retired.

J. M. HILLYER has recently been engaged in examining some mining properties adjoining the La Yesca mines on the Bolanos river in tho State of Jalisco, Mexico, for J. M. Rhodes, an English mining investor.

W. E. POMEROY, until recently general superintendent of the Yaqui C. Co. at Campo Santo Nino, Sonora, Mex., has been appointed general manager. Mr. Pomoroy returned to the mines last week from a visit to Mesa, Ariz.

PHILIP ARGALL of Denver, Colo., has heen unanimously awarded by the Institution of Mining and Metallurgy of London the gold medal and 40 guineas offered by the Con. Goldfields of South Africa, Ltd., for the best paper published hy that Institution during the previous year. The article was "Sampling and Dry Crusbing in Colorado."

THE following standing committees have heen selected hy the officers of the California Miners' Association: Executive Committee at Large—E. C. Voorheis, W. C. Ralston, T. L. Ford, C. H. Dunton, C. G. Yale, H. Z. Osborne and J. Bermingham, Jr. County Advisory Committee: Alameda—S. B. Christy of Berkeley, F. A. Leach of San Francisco; Amador—W. F. Detert of Jackson, J. B. Tregloan of Amador; Butte—A. Ekman of Oroville, W. P. Hammon of Oroville; Calaveras—A. I. McSorley of San Andreas, F. J. Solinsky of San Francisco; El Dorado—G. Clark of Placerville, A. B. Gould of Placerville; Fresno—A. R. Briggs of San Francisco, W. H. McKenzie of Fresno; Kern—J. Treadwell of Kern City, B. F. Brooks of San Francisco; Mariposa—C. C. Derby of Mount Bullion, A. H. Ward of San Francisco; Mono—R. T. Pierce of Lundy, R. H. Turner of Bodie; Nevada—F. Zeitler of Nevada City, W. F. Englebright of Nevada City; Placer—W. Nichols, Jr., of Dutch Flat, W. S. Graham of San Francisco; Plumas—G. Standart of Quincy, U. S. Webb of San Francisco; Sacramento—J. H. Batcher of San Francisco, A. C. Hinkson of Sacramento; Santa Clara—R. R. Bulmore of Los Gatos, T. Derby of New Almaden; San Francisco—L. Glass, G. H. Wallis; Shasta—F. Hurst of Redding, C. C. Bush of Redding; Sierra—F. R. Wehe of San Francisco, G. F. Taylor of Downieville; Southern California—T. B. Comstock of Los Angoles, J. B. Bushnell of Los Angeles; Tuolumne—F. Sutton of Sonora, W. H. McClintock of San Fraucisco; Yuba—W. B. Meek of Camptonville, F. R. Lord of Camptonville. Committee on Finance—A. Carrigan, J. O. Harrou, J. Sloss. Committee on Legislation—J. F. Davis, J. R. Tyrrell, W. C. Ralston, T. L. Ford, F. J. Solinsky, W. S. Keyes. Committee on Mineral Lands and Conservation of Water—E. C. Voorheis, M. de Vries, A. D. Foote, H. E. Picket, B. S. Rector. Committee on Department of Mines and Mining—W. C. Ralston, R. G. Lukens, T. L. Ford, C. H. Dunton. Committee on Dams—A. Caminetti, F. Searls, A. C. Hinkson, J. S. Mooser, W. B. Meek, A. B. Gould, A. I. McSorley.

Obituary.

A. DARLING, a pioneer miner of Bear Creek district, El Dorado county, Cal., died at Jacksonville, Tuolumne county,

D. GILMORE, 72 years of age. a pioneer miner of Montana, died of heart failure in his cahin in the mountains west of Helena on the 20th inst. Deceased discovered the Bald Butte mine.

D. J. DUNCAN, superintendent for the Hays M., M. & L. Co., at Camp Hays, in the Pineta mountains, Sonora, Mexico, died on the 14th inst. from pneumonia after a short illness.

F. A. SCHNEIDER, a pioneer mining and smelter operator of Mexico, died at El Paso, Texas, on the 2nd inst. of pneumonia. Deceased had been connected with smelting operations in Mexico for forty-one years.

C. H. BURCH, a pioneer miner of Oregon and California, died at Amity, Or., on the 9th inst. Deceased was born at Keytsville, Mo., July, 1828. Deceased went to Oregon in 1844. From 1878 to 1890 he was a member of the Oregon State Senate.

D. S. DANA of Salt Lake City, Utah, interested in Utah mines, died at Salt Lake City on the 18th inst., aged 78 years. In the '60s deceased was attorney of the Treasury Department at Washington, and later was a member of tho Supreme bench of Ohio.

A. J. HOLLAND, a pioneer miner of California and Nevada and formerly a resident of Mason Valley, Nev., died on the 6th inst. at the State Insane Asylum at Reno, where he had been confined for two years past. Deceased was 74 years of age and leaves a widow and a daughter.

P. J. DUCEY, a pioneer mining man of Cripple Creek district, Colo., died at Colorado Springs, Colo., on the 10th inst., of heart failure, aged 55 years. Deceased went to Colorado in 1868, was identified with the early mining history of that State and was one of the first prospectors to enter Cripple Creek. He is survived by six sons and daughters.

Cal., on December 31. Deceased was a native of Connecticut, aged 80 years. He was formerly owner of the Darling mine on Bear creek, which he sold to San Francisco men.

J. W. DRIPS, a pioneer miner of Colorado, died at Arvada last week. Deceased was born in Westmoreland county, Pa., March, 1833. In 1860 he went to Black Hawk, Gilpin county, Colo., and in 1863 removed to Clear Creek county, where he was treasurer of that county for eight years. In 1878 he returned to Gilpin and was engaged in mining. He was elected to the State Legislature in 1883. In Clear Creek county he was interested in mines near Empire and Georgetown, and in Gilpin county was locator of the Toronto silver mine. In later years he was a leaser of Cripple Creek mines. He leaves a widow and one son.

Commercial Paragraphs.

THE Brown Corliss Engine Co. of Corliss, Wis., is represented in St. Louis, Mo., by Edw. Field, 611 Commonwealth Trust Bldg.

THE Redfield Drill Co., Denver, Colo., reports shipping one of its hand power rock drills to W. L. Murphy, Kellar, Wash., and one to the Ajax M. Co., Burke, Idaho.

THE H. K. Porter Co. of Pittsburg, Pa., have a contract for four oil-burning locomotives for use on the National Tehauntepec Railway, which road S. Pearson & Co. of London, Eng., is building across Mexico.

THE C. O. Bartlett & Snow Co. of Cleveland, Ohio, have an order from the Dakota Pressed Brick Co., Deadwood, S. D., for one of their rotary dryers for drying fifty tons of sand a day, also conveying machinery.

GEO. CROCKER, president of the Zwoyer Fuel Co. of New York, has returned to San Francisco, Cal. The briquette machines made by the Zwoyer Fuel Co. are reported meeting with ready sale. J. Forbes Potter, 25 Broad Street, New York City, is treasurer and manager of the company.

FROM the W. S. Tyler Co., Cleveland, Ohio, comes a screen made from woven wire, subsequently rolled, and that works after the manner of slotted screens, with statement that the construction of the screen is such that it is easily cleaned, and that there is the minimum of tendency to blind or clog.

F. B. DUNCAN has been appointed manager of the Akron, Ohio, Electrical Manufacturing Co. About two years ago Mr. Duncan resigned the position of general superintendent, which he held for about five years, with the Northern Electrical Manufacturing Co., Madison, Wis., to accept a similar position in the Akron Co., and his recent promotion is evidence of the latter company's appreciation of his services.

THE Lunkenhoimor Co., Cincinnati, O., makers of superior brass and iron steam specialties, report that owing to the growing demand for their specialties they have again greatly increased their facilities, and are now in position to guarantee reasonably prompt shipments. They also report through their foreign branches an increasing export demand for their specialties and state that they will place some new specialties upon the market, which will be contained in a very complete catalogue to be issued in the course of a few months.

THE Henry W. Oliver Chemical and Metallurgical Library of Lafayette College, Easton, Pa., has received as a gift from a generous friend all the pamphlets, about 3000 in number, belonging to the library of the late Professor Johannes Wislicenus of the University of Leipsic. Professor Wislicenus was a famous chemist. He was a pioneer in the study of lactic acids and led in the work which gave to us our present knowledge of stereoisomerism. The library represents the collection of fifty years of great activity and will be a valuable addition to the Oliver library.

Trade Treatises.

"The American Crossley Gas Engine" is the subject of an unusually fine pamphlet, issued by the Power & Mining Machinery Co., 52-54 William Street, New York, N. Y.

The H. B. Sackett Screen & Chute Co., 4212-4230 State Street, Chicago, Ill., issue a 24-page compendium illustrative of their mine cars, revolving screens for quarrying and mine work, elevators, friction hoists, etc.

The 1904 Catalogue of the Knowles Steam Pump Works, 114-118 Liberty St., New York City, 150 pages, shows nearly half as many full-page illustrations of different types of direct-acting steam pumps, and will be supplied free upon request.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING JANUARY 12, 1904.

749,167.—WRENCH—W. E. Carter, Baker City, Or.
749,422.—CLOSURE—E. E. Chapman, Los Angeles, Cal.
749,423.—CLOSURE—E. E. Chapman, Los Angeles, Cal.
749,475.—DECORTICATING MACHINE—R. A. Clifford, S. F.
749,426.—GATE—O. L. Compton, Union, Or.
749,085.—VAPOR BURNER—Crane & Restine, San Diego, Cal.
749,172.—SNOW PLOW—O. Cutting, Seattle, Wash.
749,128.—MAIL BOX—Dusenbury & Kelly, S. F.
749,282.—RESERVOIR—P. Englund, Chico, Cal.
749,288.—BOTTLE—H. Hahn, S. F.
749,188.—WINDLASS—J. Hansen, North Cove, Wash.
749,191.—WEIGHING APPARATUS—G. Hoepner, S. F.
749,073.—COUCH—J. Hoey, S. F.
749,140.—FLOORS, SIDEWALKS, ETC.—P. H. Jackson, S. F.
749,299.—HORSESHOE—A. W. Jones, Pacific Grove, Cal.
749,491.—WATER MOTOR—J. D. Lee, Salem, Or.
749,390.—MEASURING APPARATUS—L. P. Lowe, S. F.
749,216.—TRANSPORTING APPARATUS—G. W. McNear, Jr., Oakland, Cal.
749,697.—FRUIT PITTER—Middlekauff & Schirm, Los Angeles, Cal.
749,573.—LEMON SQUEEZER—D. H. Mosteller, S. F.
749,447.—DRAFT CONNECTION—C. S. Payne, S. F.
749,630.—ORE GRINDER—W. G. Phipps, Stockton, Cal.
749,451.—STEAM GENERATOR—F. Saffell, Fresno, Cal.
749,327.—DUST GUARD—Sager & Dow, Seattle, Wash.
749,454.—BOLT HOLDER—J. S. Scott, San Jose, Cal.
749,159.—WAD SORTER—B. W. Stevens, Pinole, Cal.
749,646.—WOOD HOLDER—J. E. Wallin, Tacoma, Wash.
749,509.—TROLLEY—W. D. Williams, Kirkland, Ariz.
749,417.—HYDRAULIC NOZZLE—J. A. Yeatman, S. F.
749,652.—WHEEL HUB—Youmans & Rand, Vancouver, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

WAD SORTER AND ASSEMBLER.—No. 749,159. Jan. 12, 1904. B. W. Stevens, Pinole, Cal. Assigned to California Powder Works of Hercules, Cal., a corporation. This invention relates to an apparatus the purpose of which is to separate mixed gun wads or disks of equal diameter, but of unequal thicknesses, and then to set up and assemble the wads in groups or tubes, with their flat sides remaining parallel and contiguous. It consists of one or more hoppers into which the wads are first placed, means for conveying the wads from the hoppers upon an endless traveling belt, means for assorting the thicker from the thinner wads, means for assembling the wads in tubes from which they may be used in the cartridge loading machines.

STEAM GENERATOR.—No. 749,451. Jan. 12, 1904. F. Saffell, Fresno, Cal. One-half assigned to R. J. Powers, of San Leandro, Cal. This invention relates to an apparatus for generating steam and it is especially designed to be used in conjuction with oil burning devices and to supply the steam necessary or desirable to be used in conjunction with such oil burners. It consists of a chamber adapted to lie horizontally within the furnace or fireplace, so as to be subjected to the desired heat, means for supplying water and delivering it at the distant end of the generator, overflow riffles disposed upon the bottom between said end of the chamber and the receiving end, and a dome or elevation from which the steam is delivered. There is also a means for protecting the generator from too intense heat of the fire.

DRAFT CONNECTIONS FOR RAILWAY CARS.—No. 749,447. Jan. 12, 1904. C. S. Payne, San Francisco, Cal. One-quarter assigned to Louise U. Larue of San Francisco, Cal., and E. R. Rice of Sausalito, Cal. This invention relates to a draft connection for railway and like carriages which are made up into long trains. It consists in connections between the couplers of the train with intermediate yielding or compressible springs, whereby the connecting rods are taken up when the train is checked or slows down, and which springs allow the power to be applied gradually without danger of breaking the rods or connections.

HYDRAULIC NOZZLE AND JOINT.—No. 749,417. Jan. 12, 1904. J. A. Yeatman, San Francisco, Cal. This invention relates to a hydraulic nozzle and anti-frictional joint for the conducting pipes thereof, which pipes are turnable in order to change the direction of water flowing through them; and it is especially applicable to that class of joints which are used in conjunction with pipes and nozzles conveying water to be used for washing down banks of earth as in placer mining. By this construction a water-tight joint is insured, and the guided and separated rollers relieve the joint of excessive friction under high pressure.

COUCH.—No. 749,643. Jan. 12, 1904. John Hoey, San Francisco, Cal. This invention consists in a novel construction of woven wire in connection with elastic cables stretched to form a seat portion of the couch and its disposition in conjunction with the raised and curved head of the couch in such a manner that the edge of the fabric can be brought out flush with the side rails of the couch. It also consists in the formation of the head in such a manner that the woven-seat fabric is carried beneath the head portion, and the latter may also be formed of woven wire fabric having a tension cable or wire edge at its junction with the seat portion of the fabric, so as to form a continuous elastic connection at this junction.

Latest Market Reports.

SAN FRANCISCO, January 22, 1904.

METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 56¾c, refined (1000 fine); San Francisco, 56¾c; Mexican dollars, 43@44c San Francisco, 44c New York.

COPPER.—New York: Standard, $12.75; Lake, 1 to 3 casks, $13.00; Electrolytic, 1 to 3 casks, $12.87½; Casting, 1 to 3 casks, $12.75; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £57 15s spot per ton.

Copper remains unchanged from last week's quotations, except in London, where the price has fallen nearly $10 per ton. Following are the figures of German consumption of foreign copper for the months January-November, 1903, compared with same period of 1902-1901:

	1903. Tons.	1902. Tons.	1901. Tons.
Imports	80,093	74,183	58,965
Exports	9,328	8,188	9,198
Consumption	70,765	65,995	49,767

LEAD.—New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.75. London: £11 16s 3d ₱ long ton.

SPELTER.—New York, $5.05; St. Louis, $5.00; London, £21 10s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—Now York, pig, $28.60 @ 28.90; San Francisco, ton lots, 31c; 500 lbs., 31½c; 200 lbs., 32c; less, 32½c; bar tin, ₱ lb., 35@37½c. London, £130 5s.

PLATINUM.—San Francisco, crude, $18.00 ₱ oz.; New York, iugot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER.—New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@44.50 ₱ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.00c; San Francisco, Plumbors', 100-lb. lots, 16.80c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.: ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed: rustic, $28.00 @35.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.25@2.50 ₱ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ₱ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.85 @14.10; gray forge, $12.85; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg,

WELL PLEASED is the verdict of every user of The Burt Exhaust Head.

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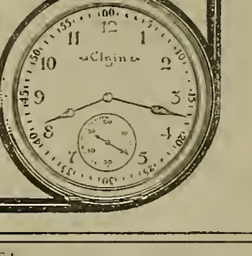

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$23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 75@15 25
Northern 2	14 25@14 75
Northern 3	13 75@14 25
Southern 1	14 35@——
Southern 2	13 85@——
Southern 3	13 35@——
Forge	12 60@——
Charcoal	17 00@18 00
Billets, Bessemer	24 00@——
Bars, iron	1 30@——
Bars, steel	1 46@——
Rails, standard	28 00@30 00
Rails, light	26 00@32 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
Dealers forge	9 00@ 9 50
No. 1 railroad wrought	10 75@11 25
No. 1 cast, net ton	10 50@11 00
Iron rails	13 00@14 00
Car wheels	13 50@14 00
Cast borings	3 25@ 3 50
Turnings	7 00@ 8 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 43c; cs., 48c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 15c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@55c; Natural White, 70c; Bleached, do., 75c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., $1.00.

BISMUTH.—Subnitrate, ℔ lb., $1.75.

MERCURY.—Bichloride, ℔ lb., 90c.

MOLYBDENUM.—$2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 75c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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MILL AND SMELTER SUPERINTENDENT, at present disengaged, wishes similar position with responsible company; college graduate with varied experience. Best of credentials furnished and required. Address "Gluckauf," care this office

MILL FOREMAN WANTS POSITION; 20 years' experience; good references; correspondence solicited. Address Mill Foreman, 1056 South Gaylord St., Denver, Colo.

MINING ENGINEER AND METALLURGIST, technical graduate, with large experience as superintendent, manager and consulting engineer of mines and mills, desires a position. Best references. Speaks Spanish fluently. Address "Ingeniero," care of Mining and Scientific Press.

POSITION WANTED BY NEW YORK ELECtrical engineer with Pacific Coast company. Experienced in construction work and selling. A position where he can work into the selling end preferred. References from company with which he is now connected. Address G. P., this office.

SUPERINTENDENT IS OPEN FOR POSITION to develop gold or copper properties; experienced miner; can make underground maps and models, also do the assaying; speaks Spanish; good references from past companies. Address "Develop," care this office.

WANTED, POSITION AS SUPERINTENDENT or Manager of "Gold Mining Property;" 12 years' experience in practical mining, also assayer, mine surveying and drafting. Will furnish surveying and drafting instruments, and will accept 50% of salary in stock in a "Good Mining Co." O. F. Matkin, care of Concentrator, C. C. C. Co., Cananea, Sonora, Mexico.

WANTED—POSITION WITH MINING COmpany as manager or assistant. Examinations, surveying, assaying; also familiar with drift and hydraulic mining. Best of references. Address W. H. J., this office.

WANTED, POSITION BY MACHINIST AND Engineer; efficient in steam, electricity and compressed air; seven years' experience at mines; good references. Address Box 54, care of Mining and Scientific Press.

WANTED—POSITION AS SUPERINTENDENT or assistant of copper mines and smelters; competent all round man, good assayer, analyst and draughtsman; can handle labor; speaks Spanish. Address "Smelter," care this office.

YOUNG MAN GRADUATED AS CHEMICAL Engineer and Ph.D. at leading polytechnic school and university of Europe, having made special studies in electro-chemistry, wants position as chemist with mining or metallurgical company. Address B-36, care of Lord & Thomas, Chicago.

YOUNG MAN WITH SOME EXPERIENCE and training in chemistry, metallurgy and general engineering, wants work at mine or any place where he can get additional experience and training. Address "Espanol," care of this office.

HELP WANTED.

WANTED—MINE SUPERINTENDENT OF EXperience, who thoroughly understands handling of gold-bearing ores and management of mine and men. Must be willing to take part of salary in stock of company until mine is on paying basis. Mine is in California. Only thoroughly competent men need apply. References required and given. Address G. Mines, care of Mining and Scientific Press, San Francisco, Cal.

WANTED.

WANTED, BY WORKING CYANIDER, Quantity low grade gold ore, sand, or slimes, who wishes to work same on royalty or will put working plant on same for interest in property. Send description to Frank G. Cline, Gold Hill, New Mex.

ASSESSMENT NOTICES.

EUREKA CONSOLIDATED DRIFT MINING Company.—Location of principal place of business, San Francisco, California; location of works, Placer County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on Tuesday, the 12th day of January, 1904, an assessment (No. 39) of one-half (½) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 3, No. 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 13th day of February, 1904, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on MONDAY, the 7th day of March, 1904, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. W. DIXON, Secretary pro tem.

Office—Room 3, No. 214 Pine street, San Francisco, California.

MARINA MARSICANO GOLD MINING COmpany.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Sbasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 18th day of January, 1904, an assessment (No. 37) of five (5) cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 415 Front street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 29th day of February, 1904, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on MONDAY, the 21st day of March, 1904, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. BOVONE, Secretary.

Office—415 Front street, San Francisco, California.

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Chicago, Ill.

THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from Lawrence Canatta, in Alesom Dumas Placer Claim, near Volcano, Amador County, Cal., draining into Dry Creek which reaches Mokelumne River; from Luigi and Victorio Demartini, in Railroad Hill Gravel Mine, near Calaveritas, Calaveras County, Cal., draining into San Antone Creek which reaches Calaveras River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., Feb. 8, 1904, at 1:30 P. M.

MINING AND SCIENTIFIC PRESS.

Whole No. 2271.—VOLUME LXXXVIII. Number 5. SAN FRANCISCO, CAL., SATURDAY, JANUARY 30, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Value of a Prospect.

There is usually less difficulty in placing a valne on a developed mine than on a good prospect. In the one case there is a tangible proposition—a developed mine. The shafts and levels, or tunnels, with numerous connecting raises or winzes block out the ore into sections of greater or less size, which may be inspected on three or four sides. The variable widths of vein may be observed and the average computed with approximate accuracy. This together with the assay value of the vein at stated distances throughout the mine cuttings furnishes a basis for estimating. Ore actually in sight, probable ore and possible ore, and the valne of the mine present and prospective are thus arrived at. The securing of detailed information of this sort is a more or less lengthy process, requiring good judgment, skill aud honesty, and if any considerable amonnt of money is at stake, various precautionary measures must be taken to insure that the samples remain intact aud that no opportunity is presented for salting them by any person who might be disposed to do so.

With the prospect it is different. The development and ore exposures are limited and there is little upon which to estimate the value of the property. The vein may present a good appearauce and conform to the usual conception of the geological requiremeuts of a vein which has elsewhere been developed into a profitable mine. The values may be present in sufficiently attractive amount, and still no more than a prospective valne can be placed on such property. The owner usually places his estimate higher than any other person would, and an experienced mining engineer, while admitting its great possibilities, would probably place a lower prospective valuation on it than the owner, even if he were employed by the latter to examine and pass judgment on the mine, its requirements and future possible value. It is an easy matter to condemn a prospect, disregarding what may be evident, and allowing nothing beyond what can actually be seeu. The miniug engineer, to preserve his reputation, must of necessity be cautious, but he need not be pessimistic, for his ultra-conservatism may later work to his disadvantage. The man of experience realizes that mines are made, and their making is ofteu a slow and expensive process. Some of the most noted mines of the present day have within their history beeu on the verge of closing down permauently, but by persevering aud introducing methods which would reduce expenses, the properties have been pulled through a period of depressiou, and are to-day largely profitable. In these instauces an engineer, overcautious or fearful of making a mistake, would have closed the properties and it would have beeu many years before they would have been reopeued. The prospect, if it be a good one, always has a speculative valne, and this value is an unknowu quantity. In view of this fact a stated value is fixed upon it and the mine must then work out its owu salvatiou on the progressive plan. It is not evident that it is a greater crime to overvalue a good prospect than it is to overcapitalize au industrial stock in some other line of business.

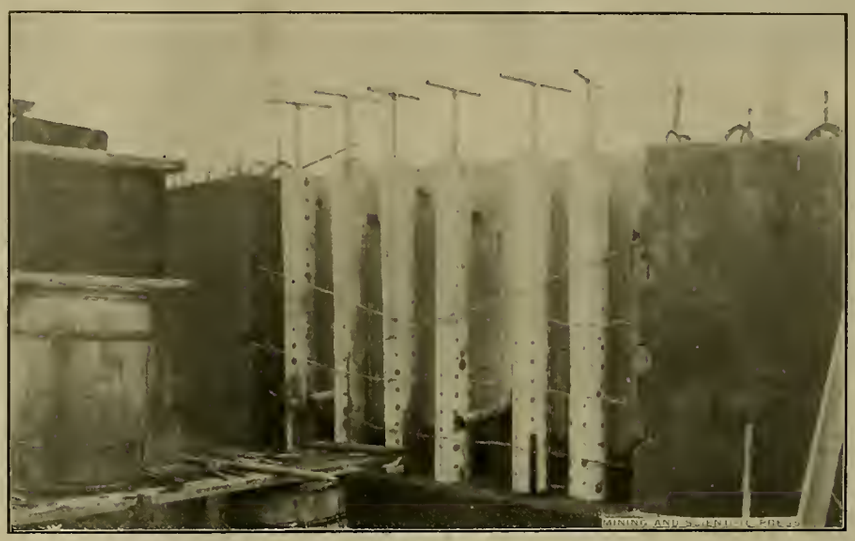

Fig. 1.—Hollow Walls; Forms in Place. (See Page 76.)

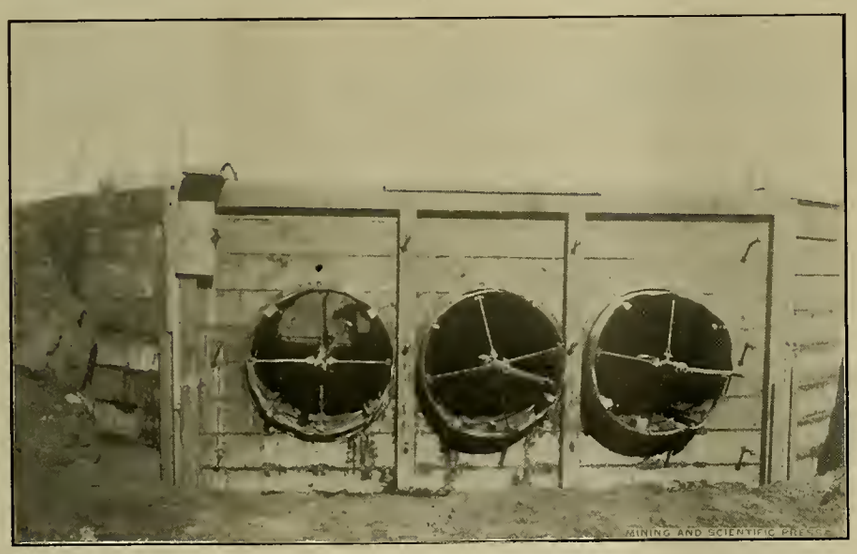

Fig. 4.—Forms in Place. (See Page 76.)

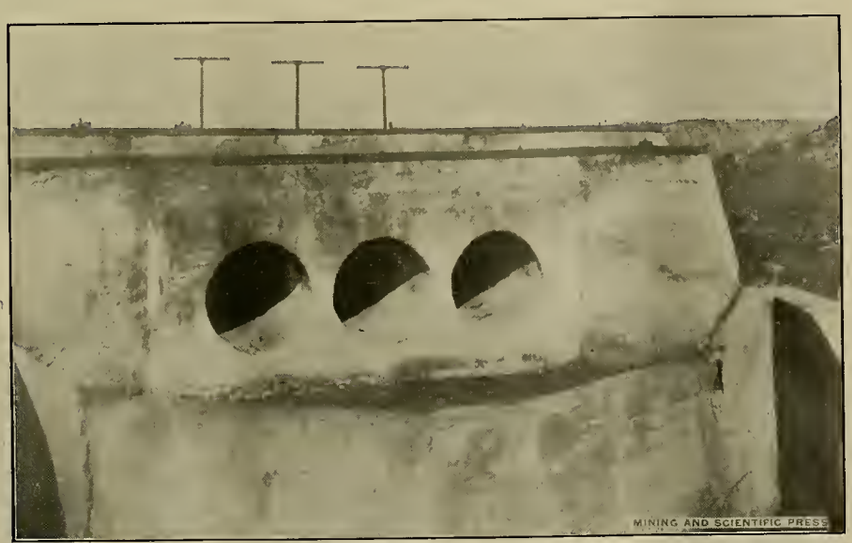

Fig. 6.—Combined Gate and Drop. (See Page 76.)

IN mining aud metallurgy the practical and the scientific branch sometimes apparently clash, but without doubt the two are inter-dependent. The purely scientific student deprecates methods and practice which he does uot fully understand and appreciate, while the practical man without scientific attainment feels confident that he is right because he is successful, but it is being daily demonstrated that it requires both science and practical knowledge to accomplish the best results. The practical miner was surprised, if not disgusted, with the noted engineer aud geologist who only gave a passing glauce at a large and payable ore body, aud spent an hour in a careful examination of some minor occurrences of ore in the walls. To the geologist the extent and possible value of the large ore body were at once apparent, but iu a study of the lesser phenomena of the mine he hoped to be led to some valuable conclusion as to the genesis of the ore deposits of the mine as a whole. Each understood his business, but uuderestimated the importance of the other's knowledge.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:
NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, JANUARY 30, 1904.

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Mineral in Railroad Grants.

A controversy has arisen in southern Wyoming between the Union Pacific Railroad Co. and prospectors who are searching on the odd uumbered sections claimed by the railroad company under the grant from the Government. The grant in question excepts mineral lands, bnt does not include those containing coal or iron. Bnt when land is referred to as "mineral" it must have been known as mineral prior to the time when the grant attached, and the discovery of a gold, copper or other metal mine after the title has passed to the railroad, is not inclnded in the land excepted from the grant. The Wyoming prospectors are searching for both coal and petroleum, but as coal lands are distinctly excepted from the operation of the statute which reserves the mineral lands, the prospectors have little to hope for in that direction. Petrolenm lands, however, are recognized as mineral and are subject to location on the public domain and lands within the railroad grants which are discovered to be oil bearing before the railroad company has acqnired title to them, are subject to location as mineral lands. It is reported that the Union Pacific Co. has posted notices warning prospectors that they must confine their explorations to the lands of the public domain. Prospectors, before searching for mineral on these lands, would do well to ascertain the state of the title to any particular section of land, for where the railroad company has perfected its title the case of the prospector is hopeless.

No Claims in Irrigation Reserves.

It has been decided by the Secretary of the Interior that mining claims cannot be entered in lands withdrawn for reservoir sites, or for permanent works uuder the irrigation law. The secretary holds that the withdrawals of these lands under the authority of the reclamation of arid lands act of June 17, 1902, of lands deemed by the department necessary for any irrigation work, have the force of legislative withdrawals, and consequently are effective in withdrawing all of these lands from any other disposition, and in his opinion no right is vested in the locator of a mineral claim until final proof has been snbmitted and the purchase money paid. This latter presumably refers to mineral locations made within the irrigation lands withdrawu from entry, and upon which patents have not been secnred. Thus far abont 30,000,000 acres have been reserved for reservoir sites or for the construction of permanent irrigation works, and in order not to defeat the purpose of the Government, and to foil any attempt to locate aud hold mining or timber claims within these reservations, at exorbitant prices, the Department of the Interior has made the ruling above referred to.

Selection of Metallurgical Method.

The concentration of ores cousists in separating a heavy, and usnally a more valuable, portion from a lighter and less valnable portiou. This is accomplished by various methods. Among these the most rnde and least complete is sorting nnderground in the mine. A second stage toward improvement is hand sorting after coarse crushing on the surface, the various ores being picked ont by hand from a revolving table or from a moving belt conveyor. A further and closer concentration may be made by means of the varions mechanical concentrating devices. These include jigs, belt-vanning machines, shaking tables, circular tables and buddles, and the dry concentrating machines depending for success in operating on an intermittent blast of air. Each of these various machines, togcther with the canvas tables and hydranlic sizers, in which latter class belong the spitzkasten, etc., have a field of nsefulness, though often they are not properly applied when they may do the best work. Excepting the dry concentrators above mentioned, all of these devices depend to a large extent upon the sorting power of water, aud the snccess is generally proportional to the adaptability of the machine to the ore. A coarse first-prodnct jig would be useless in the treatment of slimes, aud the canvas table would accomplish no valuable result on coarse ore.

Smelting is as much a process of concentration as any of the operations carried ou by means of vanners, jigs, or other mechanical apparatus, and not infreqnently the same ore may be succcssfully treated by either process. By successfully is meant success in a practical or mechanical way, but the economic resnlt may be a loss in one case and profit in the other. A mine situated at a distance from a railroad in a semi-arid region was operated for several months successfully—in a mechanical way—by smelting. The ore was a typical smelting mixture and the matte made ran high and contained a high percentage of the precions metals, but the enterprise was eventnally abandoned, for the reason that costs were so high as to absorb all that should have been profit. The property was closed down, and after a time a lease was given a number of men who overhauled an old mill and prepared to concentrate the ore. This was done at comparatively nominal expense, and success, both mechanical and financial, was the result. The smelter had made a 40% matte at a heavy cost, while the concentrating mill turned ont a 40% copper coucentrate, which also contained the precious metal values as well, at a cost of $3 per ton. This illustrates the need for careful consideration of the installation of a process or of any expensive machinery, for without due consideration haviug first been given such a matter a failure may resnlt where success is possible. There are situations where the difference of cost between smelting and milling complex ores may not be far apart, or may in some cases even be in favor of the smelter. Mistakes of the sort above mentioned are not of infrequent occurrence. It is not only necessary to know that the ore of a certain mine contains a given percentage of copper, or a stated amount of gold or silver. It must be known what process is best adapted to the reduction of this ore at the lowest cost. Amalgamation and chlorination or cyanidation may do it, bnt better economic results may be obtained by concentration and shipment.

There are many men who are first-class miners, who know every detail of mining from the breaking of the groud in a prospect pit to a developed property several thousand feet deep, and yet some of these men have a limited knowledge of metallurgy. The more cautions of these do not hesitate to employ men of experience to determine what is the best treatment for ores with which they are not wholly familiar themselves, and this frequently insures success.

Mine Accidents.

Two distressing mine accidents are chronicled in the daily press the past week—one at the Harwick coal mine in western Pennsylvania, where nearly 200 men lost their lives as the result of the explosion of fire damp—the other was the hoisting of a cage containing sixteen miners into the sheave wheel at the Independence mine at Victor, Colo., by reason of which fifteen were killed and one seriously injured. The cause of this accident has not yet been learned. Each of these disasters teach a lesson which it seems only such unfortunate and distressing occnrrences can emphasize; first the absolute necessity of the most perfect veutilation possible iu coal mines generating large amounts of fire damp, and second, the use of rigidly tested machinery at the mouth of mine shafts and the employment of only those men who are suited to the trying situation of hoisting engineer. There is an iunumerable number of men who understand the operation of hoisting engines and rnu them satisfactorily, when rock or materials only are to be handled, and many of them may also safely be trusted to handle skips and cages carrying men, bnt there are many who lose their confidence when men are on the cage. At the slightest irregularity in operatiou of the engine, or the appearance of an nnexpected sign their self-possession flees and they are as likely to tnrn on a full head of steam as to cut it off and apply the brakes at an uexpected signal. The hoisting engineer occupies a position of grave responsibility. A man who is pre-occupied, thoughtless, or a dreamer, has uo business at a hoist. Such a man might safely have charge of an engine running a mill or some other machinery where the engine continues to run steadily hour after hour, but the hoisting engineer must have nerve, self-control and presence of mind uuder all conditions. The best man at the hoist is an engineer who is also a miner, and who has had abundant practical experience underground. He should also be familiar with every foot of the shaft. He then can intelligibly interpret every signal. He knows every crook and turn in the shaft, shonld there be such, and runs accordingly. At some mines an electric or other bell is provided which rings upou the approach of the skip to within 50 or 100 feet of the collar of the shaft. This contrivance is highly recommended by many, but it is a dangerous device, for in the event of failnre to ring the skip may approach the collar of the shaft under full speed and then overwiuding is almost inevitable. The skip dashes agaiust the sheave timbers, the cable parts and the usnal resnlt follows. Nearly all cages are provided with safety clntches, bnt too often these fail to work properly. The iustance at the Independence mine was no exception, for the cage fell 1500 feet into the sump. Skips are occasionally provided with safety clutches, but more frequently they are not. A law should make such provision compulsory, even in incline shafts, and they should be tested daily to know that they are in perfect working order.

The disaster in Pennsylvania produced the usual uumber of heroes who unhesitatingly ventured into the wrecked mine in the face of almost certain death with the hope of rescuing some who might still be alive, and a number of these brave men sacrificed their lives as a result.

It appearing from a carefnl estimate of the cost of a snitable bnilding to accommodate the several engineering societies in New York City would exceed the $1,000,000 offered by Andrew Carnegie for this purpose, Mr. Carnegie has increased his offer to $1,500,000, provided the Society of Civil Engineers would join with the other societies. These include the American Institute of Mining Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the Engineers' Club.

CONCENTRATES.

THE coefficient of linear expansion of concrete is 0.0000029 per 1 C.

✣✣✣✣

THE unit for measuring electre motive force is the "volt," named from Volta, who suggested it. It measures the intensity of the electric current.

✣✣✣✣

THE rock specimon from Fresno, Cal., is a silicified rock evidently intrusive (dike) containing hard hematite in a small vein through tbe center of the piece. Quartz is also prosent in veinlets.

✣✣✣✣

THE Federal mining laws apply in the Territories and in Alaska the same as in the States, the only difference in either States or Territories being where there are State or local laws, and these cannot conflict with those of the United States.

✣✣✣✣

THE various kinds of fabric used in sluices for catching fine gold are cocoa matting, usually made for the purpose, and resembling that used on floors, though somewhat more coarse, and gunnysacking of varying texture, the kind boing determined by experiment.

✣✣✣✣

THE arrastra is a cheap, convenient and easily constructed gold mill, and does excellent work as an amalgamator, but in these days of good and inexpensive quartz mills of many types the arrastra is becoming yearly more of a curiosity, and a few years later will be seen no more in America.

✣✣✣✣

THERE are numerous occurrences of chromo iron in California, but few of these are producing, tho most easily workable deposits, as far as known, having been worked out. Tbe present price of the ore renders the exploitation of more remote or less favorably situated deposits unprofitable.

✣✣✣✣

HOLES can be put down to a depth of 18 to 20 feet hy the men by means of a churn drill. A good drill for this purpose may be made of a piece of pipe at each end of which is welded a piece of drill steel. The hit at one end should be broader than at the other. This will be found of assistance in reaching a greater depth.

✣✣✣✣

ACETIC ACID will dissolve lead oxide or carbonate, wulfenite, (molyhdate of lead) and some other lead ores. When in solution tbe presence of lead may bo detected by adding a solution of potassium iodide which precipitates a yellow cloud of iodide of lead. This is said to be a good test for the presenco of lead in ore in small amount.

✣✣✣✣

THE exhaust of a steam engino may be employed in a variety of useful ways. One of the most practical and economical uses is to heat the feed water of the hoiler, this being accomplished in a variety of ways. It will reduco the fuel hill from one-third to one-half. It may also he used to heat the chango room of a mine, tho hot water being employed for this purpose.

✣✣✣✣

THE standard of measurement of the volume or quantity of an electric current is the quantity of gas evolved in the decomposition of water hy the current. That amount of current will liberate 10.4 cubic centimeters of mixed gas from water per minute. This unit of measurement has heen called after the name of an eminent French scientist—Ampore; abbreviated amp.

✣✣✣✣

CADMIUM is tin white in color, is malleable, ductile and when fresh has a brilliant silvery luster, but this soon disappears on exposure. It is found associated with zinc ores, and closely resemhles that metal. It can be beaten into a thin foil or drawn into fine wire, hut when heated to ahout 80° C. it becomes very brittle and is easily powdered, in which property it resemhles zinc.

✣✣✣✣

WHEN a pit in a placer mine hecomes so deep that men helow cannot shovel into the sluice hox, a platform may he arranged midway hetween the hedrock and the sluice box, when one man on the platform can usually shovel in as much as two men bolow will throw up to him, as shoveling is easier on a platform than on bedrock, and he is not obliged to lose time in picking up the gravol.

✣✣✣✣

A STANDARD 30-MESH WIRE SCREEN is made of No. 28 wire, having a diameter of 0.0162 inch. The diameter of the moshes is 0.0171 inch, equivalent to 0.43 millimeter. A 40-mesh screen is made of No. 31 wire, the wires having a diameter of 0.0132 inch. The width of aperture is 0.0118, equivalent to 0.30 millimeter. An 80-mesh screen is made of No. 40 wire, which is 0.007 inch diameter, the aperture of the screen being 0.0055 inch.

✣✣✣✣

A MINE LOCATOR may start a tunnel on ground outside of his claim for tho purpose of developing his vein in depth, hut the site of the portal of his tunnel must he on unclaimed ground—the puhlic domain—and there must he no intervening claim hetwoen the mouth of his tunnel and his own claim. Should such claim intervene, a satisfactory arrangement must be made with the owner of tbe intervening claim to run the tunuel through his ground.

✣✣✣✣

THE principal danger from electric cables underground is in sending through them teo great a current, thus causing tbe wires to becomo hoated and setting fires to timbers or other woodwork. Where the wires are bare and are used for overhead trolleys, should the person passing along the track chance to come in contact with the wire and his cap be wet he is likely to sustain a severe shock, though usually the voltage is so low in electric mine traction plants as not to render such shock fatal.

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THE mineral specimens from Lundy, Mono county, Cal., are: No. 1, quartz-mica-diorite; No. 2, diorito in alteration stage to amphibolite schist; No. 3, an impure mica schist, with much calcium carbonate; No. 4, silicified country rock, probably the quartz-mica-diorite or grano-diorite, with pyrite (iron sulphide); may contain gold and silver; No. 5, similar to No. 4, hut contains more silica (quartz). This rock is essontially a quartz ore, containing about 2% to 3% pyrite, and resembles many California gold-silver ores.

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THE United States statutos state plainly that placer locations must conform to the subdivisions of tho land surveys, where such surveys have been made, and for this purpose the tracts may be subdivided into square 10-acre tracts. A 10-acre tract is 660 feet squaro. In regions where Government surveys of the land have never been made placers may be located in any form which may suit the locator providing he does not take more in a single claim than the amount permitted by law—twonty acres. Local laws may require him to take less than this amount.

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THERE is no short, "wet" method of determining the presence of nickel and cobalt in pyrrhotite, known to Concentrates. Nearly all processes involve tho employment of hoth dry and wet methods and are more or less elahorate and complicated. If tho ore he at all oxidized naturally, the pale apple-green color of nickol silicate is commonly seen, and in the case of cohalt the beautiful pink color of erythrite, cobalt bloom (hydrous cobalt arsonato), is usually present. The presence of cobalt may he suspected if an arsenical odor is given off when the pyrrhotite is heated.

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THE more location of a wator right will not securo the locator. He must, within sixty days from the date of location, hegin activo work of dam and ditch or flume construction, and continue the work until the amount of water claimod has beeu divertod from the stream and is flowing in the canal provided for it. The water must be conveyed to the place for which it is intended and actually used. The ditch or flume must he of a size which will accommodato the amount claimed throughout its entire length. No more water can he claimed than is actually taken and used.

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NO EXPERIENCED prospector will condemn a piece of rock on its "looks," for experience has taught that often the most unlikely appoaring rocks are sometimes rich in precious metal. Thus, in Calico district, Cal., a gray or red porphyry was sometimes rich in silver chloride. Jasper and sand rock from the same district were also rich. Many dike rocks carry gold. Quartzites are not infrequently gold hearing, and slates are also sometimes rich in gold. Gold also occurs in calcite at numerous places, and in Amador county, Cal., gold is known to occur in serpentine at a numher of places.

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IN the case of relocation for failure to perform assessmeut at Mogollon, N. M.: The right of a locator to make an amended location and to include additional ground, if such may be had, is recognized provided the size of the claim does not exceed the statutory provision or conflict with local laws. B, who takes A's claim for failure to perform the required assessment work or to make the necessary improvements, is within his rights. Having performed the assessment work on his own claim establishos him in his rights in said claim, and he has the right to amend his location, changing the lines if the act does not bring him into conflict with other previously located claims, and he may even give the new claim another name. If A's claim was actually subject to relocation at midnight, Decemher 31st, B is safe and C has no rights in the case at all.

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THERE is a difference between tuff and scoria. Tuff is an accumulation of volcanic ejectamenta on land which has heen more or less solidified by rain and surface water. There are several varieties of tuff, viz.: Quartz-porphyry tuff, rhyolite tuff, rhyolite-pumice tuff, trachyte tuff, phonolite tuff, andesite tuff, etc., depending upon the material composing the mass. Scoria is a volcanic rock which is filled with air cells; pumice stone is of this character. When scoriaceous lava subsequently has the gas cavities filled by the infiltration of some mineral such as calcite, silica or zeolite, it is called amygdaloid. There are several varieties of scoria. When the gas cells are few and irregularly distributed the rock is said to be vesicular: when they are numerous and occupy an equal space with solid rock it is scoria, and when the cavities predominate it is pumice.

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THERE is a surprising variety in the small details of stamp mill mortars. The original Homestake mortar, placed in the Homestake 80-stamp mill at Lead City in 1878, weighed 5400 pounds. Its dimensions were: Height, 54½ inches; length, 54½ inches; feed opening, beginning 6½ inches below tbe top, 24 inches long, 4½ inches wido and 7 inches deep. At the bottom of tho feed slot, and forming the lip over which the oro passed as it dropped from the feeder, was a projection 4¾ inches wide and 1½ inch thick; the lower edge of the feed lip was 14 inches above tho bottom of the mortar, and 15½ inches from the bottom was the feed opening, which was 48¾ inches wide and 21¾ inches high. The screen frame was set at an anglo of 10 from tho perpendicular. No liners were employed inside the mortars, and no plate on the feed lip, which might he renewed when worn. Since 1878 tho general outlino of the Homestake mortar has been copied, but the liners and other renewable features have since been added.

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A FOUNDATION superior to either brick or stone for engines or compressors may be made of concreto. In the selection of materials and in mixing them properly lies success. Tho foundation bolts may be hold firmly in place by upsetting a square head upon the lower end, or tho lower ond may be turnod into an eye. Tho holts occupying positions directly opposite each ether in the foundation may thon be secured hy passing a heavy iron bar, as a piece of railroad iron, horizontally through tho rings at the ends of tho bolts, and the concrete dumped in upon it and thoroughly rammed. When set tho bolts will he found absolutely rigid, if caro he takon to lift the bolts as high as they will go without raising the railroad iron. Mortar bolts may he securod in the same manner, though in the case of wooden mortar hlocks it is advisable to use a har of round iron which may bo driven through a hole of proper sizo borod with a mill auger, the bar, as in tho caso of concrete foundations, passing through tho rings of the holts, the bolts having previously been placed in proper position when tho block was being huilt up of 2-inch planks.

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IN some regions of massivo oruptivo or intrusive rocks, where the rocks at tho surface are soft and easily picked or shoveled, the surface is seon strewn with rounded, smooth, hard howldors, of a rock othorwise similar to the decayed rock upon which they rest. This is particularly true of some granite, hut is also noticeable in porphyries, greenstone, etc. This is due to what has been called concentric decomposition, which is a process many massive rocks undergo when subjected to atmospheric or other decomposing agencies, by reason of which the outer portions of an angular block or mass undergo decay, the decomposition advancing from the surface inwardly, the process appearing to develop in the rock a series of concentric layers or shells, one within another, enveloping the nucleus, which is little or not at all altered. In all probability the internal structure of the rock was normally concentric, a condition assumed at the time of cooling from the molten magma, hut which would remain unohserved if it were not for this process of decay. This phenomena in rocks is not uncommon in tho vicinity of veins, and is also noticed in some wide mineral zones. The peculiar howlder-like formation observed in some mines has been erroneously attributod in some instances to the attrition of water, but it is undouhtedly due to decomposition, with results similar to those observed on the bowlder strewn surface. When valuahle ore is present in such veins the ore is found in the shells surrounding tho nucleal bowlders, or in tbe matorial representing tho original outer portions of tbe roundod masses, if all concentric evidence of structure shall be found obliterated.

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THE production of alum in the United States in 1902 is reported at about 95,000 short tons. Of this 8500 tons were crystallized alum, tho remainder—a hy product of the manufacture of aluminum in the form of aluminum sulphate. The crystallized alum was valued at $26.25 per ton at place of manufacture, and the sulphate at $22.25. The price in New York City during 1902 was $1.75 per 100 pounds. A large deposit of native alum occurs in the State of Nevada, 12 miles north of Sodaville. The Detroit Chemical Co. of Detroit, Mich., is a manufacturer of alum. Douhtless the alum of New Mexico could he dissolved and recrystallized from the clarified liquor. The output of tin in the United States is confined to shipments of tin stone from South Carolina. Tin is worth at present in New York 28 cents to 29 cents per pound. The tin veins of the Black Hills of South Dakota contain from a fraction of 1% to 20% cassiterite. The mines are not producing, hut in at least two districts are undergoing development. As occurs occasionally in other branches of the mineral industry, the best tin veins were not those first developed in the Black Hills. The ore is not particularly refractory, concentrating readily, although various other minerals of high specific gravity are also separated from the gangue with tho tinstone. Among these are columhite, titanite, wolframite and other rare minerals of similar character. Thore are few, if any, ores too refractory for treatment if the percentage of metal contained be sufficiently large to defray cost of treatment. The tin veins of Cajalco, Riverside county, Cal., contain from a trace of tin up to 90% tin stone. Tho ore occurs irregularly, and the mine development is comparatively small. The works and mines were closed in 1892 hecause the venture did not pay. These mines deserve another trial under more conservative management.

Concrete Hollow Wall Construction.

Written for the' MINING AND SCIENTIFIC PRESS.

The prime consideration in successful concrete work after first-class materials have been secured and competeut mixing aud handling assured, is speedy and uniform drying and drainage. In ordinary wall construction, above ground especially, where the air curreuts, heat aud cold and radiation exert their maximum influence, the exterior or outside surfaces of the work dry readily and quickly, and with the natural tendeucy of good cement work to "float" itself, the surface forms a crust which of course retards the draiuage or drying of the interior portious of the structure. Hence the necessity of covering with sacks or wettiug with hose. In the case of thick bodies like a dam, months are required for even a partial drying, and those who have taken old concrete walls down know that after many years standing in place the interior fracture shows a large percentage of moisture.

In the system of coucrete coustruction discussed herein, as showu iu Fig. 1, the interior of the wall is made hollow by using a uumber of collapsible circular forms placed vertically between outside forms equidistant from the forms and from each other, and after connecting the barbed wire or other forms of continuous binders, which are bedded in the concrete, the outside forms and all around the cylinders are filled with a mixture, in this case six parts coarse gravel and one part best Portland cement, made quite wet as a grout. At suitable intervals old scrap iron is bedded especially near the points where a bond is to be secured. On the end forms, between the large segmental forms, are nailed chamfered cleats vertically and horizontally, which leave the fiuished sectiou 8, 10 or 12 feet, as is determined, dovetailed so that the new sectiou of concrete work is keyed into each succeeding section of wall. In this manner it is possible to withdraw the forms from the green concrete, as shown in Fig. 2, one hour from the time of filling. The draiuage is so effective by reason of the large area of surface exposed to the surface iu each one of these forms, that before the forms are ready to draw there will be from 2 to 6 inches of clear water, and within twenty-four hours the second story may be added. When a boud to old or dry work is to be made, a stronger mixture is used. In this manner have been built 36 or 40 feet of terra cotta lined chimney in a single day and the forms removed the following day. Withiu less than a week the base of the chimney when struck with a top maul will ring like a well seasoned timber or a steel column, showiug that the structure is homogeneous, which is uot always true with a brick flue. In building construction, in addition to its value as a hastener of drying and drainage and the additional fact that it saves one-third in material, is the additional advantage that these hollow spaces, which are continuous, may serve for flues, hot or cold air conduits from furnace or from a cooling chamber, for ventilation, for electric light, telephone or telegraph wires, pneumatic systems, gas and water pipes, etc. Vitrified pipe may be carried into the walls of a structure, the sewage may be thus carried directly instead of into cast iron, and a modern office building may be constructed in this manner at an estimated saving of 40% over present methods.

Fig. 3 illustrates a California tank costing, complete, $900, including four large troughs and floors. Figs. 4, 5 and 6 graphically depict how the same principle is applied in substantial work except that the forms are larger and are placed horizontally instead of vertically. The chief present method of accomplishing this work is to bed steel, cast iron, sewer pipe or wood in a surrouuding wall of concrete or use a wooden form, which can practically be used but once, while these forms may be used an indefiuite number of times. With similar forms J. F. Lyman of Modesto, Cal., to whom we are indebted for the accompanying photos aud data, is building large or small sewer pipe of concrete, either in sections or continuously. The only essentials for this class of work are clean, sharp, coarse, sandy gravel, with or without crushed rock, good cement and one competent concrete man, with ordinary labor. With brick work or stone work, masons and hod carriers demaud $6 and $4 per day for accomplishiug less than may be done with this method in one-half the time and at less cost for labor. Any plasterer can float the walls, or they may be stippled or finished in any way desired in imitation of stone or brick.

The tank shown in Fig. 3 was built for Ora McHenry, on his Bald Eagle ranch, in the center of a 200-acre alfalfa field, which is divided into four fields, the tank, with its troughs and the gates uear, serving as a hub for the field, or four fields, with the dividing fences as spokes. He expects to use this field for a green feed pasture for his large herds of cattle, and his anxiety prompted him to provide this manner of giving his stock plenty of fresh water at all times, and without having them depeud upou ditch water. Plenty of good gravel was available, but it had to be washed, as it held slickeus in quite a large proportion, and the builder considered it unfit for perfect concrete. The engraving shows that the base of the tank is 2 feet under ground and 2 feet above, it is in shape a regular polygon. The walls are 2 feet thick at the base and with an inward batter of 8 inches, leaving the foundatiou walls, upon which the tank proper was built, 16 inches thick on top. In the top of this foundation wall —likewise in two cross walls of even height— was bedded a large amount of scrap iron, projecting above the fiuished top, to serve as an adequate bond between that and the first section of wall above. In the top of each story this process was followed; besides that, sections of barbed wire were wrapped around these projecting irons and carried through the iuside form, converging, like the spokes of a wheel, to the center of the tank, where they were tied together and to other pieces of scrap, all of this uetwork of binders afterwards being bedded thoroughly iu the floor of the finished tauk, the floor itself iu this case being, as indicated, 2 feet above the ground, thus iusuring the use of every gallon of water in the tank. The builder used about five tons of scrap as binders, so that this tank should be earthquake proof. Between the four radiating or intersecting walls aud the outside wall were bedded three barrels of concrete with their tops brought flush with the outer walls. He then filled iu all the space around with well puddled dirt, arching the same between bearings, and upon that tamped the floor, so that with the large amount of binders spoken of in the floor and supported, as shown, at all the points noted, it is immaterial whether the dirt settles or not, for the floor is supported as an arch.

The tauk being 36 feet in diameter, precluded the use of solid forms, so the builder used his flexible outside forms, made by bolting 2x3-inch slats onto a hoop of spring steel, so that by expauding or coutracting these forms a tank iu diameter from 16 feet to a straight wall may be built. The forms being made 8 feet long, enabled him to build with three men two 8-foot segments of the tank, 4 feet 6 inches high, or 16 running feet of 4 feet 6 inches wall, or about 3 yards of concrete material per day. There are about 100 yards in the whole job—troughs, floors and tauk. The work took about thirty days and cost about $9 per cubic yard.

The builder carried the wall around the whole structure, but left an 8-foot section full height out until he had finished the inside walls and floor, when the uncompleted portion was filled and the whole outside cemented with a two-to-one mixture; the tank has a decided echo, much like au iron or wooden one, differing from a brick structure in that it is thoroughly bonded. Mr. McHenry expects to install an electric motor to pump the water into the tauk. In the viaduct or headgate work the excavation is first made 2 feet below the grade of the caual or to good foundatiou, the temporary wooden forms are then placed aud within them the collapsible forms, the concrete is theu tamped around them thoroughly, and after "settling" ten or twelve hours, or over night, the forms are collapsed and withdrawn and is practically finished.

Mr. Lyman says: "I have allowed heavy teams to drive over a bridge three or four days after putting the material iu place, the hollow uature of the structure and the perforated forms insuring instant drainage, large pools of clear water standing at the lower or outlet end."

Fig. 2.—Removing Forms From Hollow Walls.

Fig. 3.—A 65,000-Gallon Tank and Four Water Troughs.

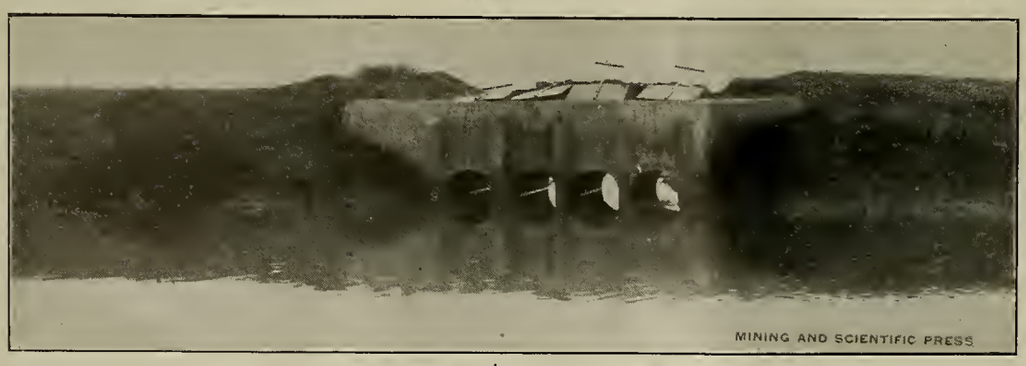


Fig. 5.—Finished Gate; All Concrete.

Grand Encampment District, Wyoming.

TO THE EDITOR:—Through evident inadvertence, the article upon the Encampmeut district in Wyoming in your issue of Jauuary 2, 1904, credits me with a paragraph not to be found in my report upou the region, which is otherwise correctly quoted from Bulletin 213 of the United States Geological Survey. The paragraph referred to is the final one, in which the outcrop and walls of the Ferris-Haggarty veiu are described. The statements which it contains are

inaccurate. My observations upon these points follow:

The outcrop of the vein was originally observed at only one place, where its gossan showed through an otherwise nearly continuous mantle of loose surface debris which has never been cleared away. It is, therefore, not traceable on the surface, and though the two sorts of rock between which the ore body lies do outcrop at points some distance east and west of the mine, neither ore nor any capping which could represent an extension of the vein has been found outside of the actual underground workings of the property. The country rock of the hanging wall is a silvery metamorphic schist, forming a stratum about 80 feet in thickness, while the foot wall rock is a somewhat thicker bed of massive quartzite.

Incidentally, I may be allowed to correct the confusion by your compiler of the Ferris-Haggarty and the Verde mines. The former mine is owned by the North American Copper Co., while the property of the Verde Mining & Milling Co. is still a prospect, though apparently one of some promise.

ARTHUR C. SPENCER,
Geologist U. S. G. S.

Mine Patent Surveys.

TO THE EDITOR:—I have noticed the editorials in the matter of "Mine Patent Surveys" contained in your paper of the 12th of December, 1903, and of the 9th of January, 1904, and thinking the facts upon which the Secretary of the Interior decision was based would interest many and be instructive, I deem it advisable to give a history of the case in the Only Chance and other lode claims.

About July, 1894, the Lucky Strike was surveyed for patent and the boundaries thereof marked on the ground. This claim occupies a portion of the southwest quarter of Section 10 in Township 48 north, Range 1 east, N. M. M. The claim runs northwesterly and southeasterly. The southeast end was tied to a public survey corner of said Section 10. A week or so afterwards the Good Record was surveyed for patent, running in the same general direction, with its northeast corner stake (No. 1) adjoining the southwest corner (No. 3) of said Lucky Strike. The section line between 9 and 10 runs diagonally across the Good Record nearly in the center thereof. The Good Record had a shaft known as the Discovery shaft within 25 feet of its northwest end line, 32 feet deep and well timbered; also a working shaft 4x8 feet in the clear, 71 feet deep, well cribbed, and situated near the middle of the claim. The field notes of this claim show that corner No. 2, the northwest corner, is tied to the said Discovery shaft, and also to the said working shaft. The southwest corner, being corner No. 3, is tied to the Government monument on Ageney Peak and the Government monument on Uneompaghre Peak, two of the most noted mountains in the State, . Likewise corner No. 4, the southeast corner, is tied to those monuments on said peaks. Then corner No. 1 is tied to corner No. 2 of the Lucky Strike survey, and to the Lucky Strike shaft, which shaft was then about 100 feet deep, and is some deeper at preseut, also to the quarter corner of the public survey eommon to and between said Sections 9 and 10, about 1000 feet to the north. Pateuts were issued on the Lucky Strike and Good Record. About two years ago the Only Chance and other lode claims were surveyed for patent, and whieh elaims lie on the north and adjoining the Good Reeord and Lucky Strike. The Only Chance and otber claims were also tied to this quarter corner between Sections 9 and 10, and the Surveyor-Geueral refused to approve of the survey for the reason the public survey tie aforesaid did not agree with the Good Record tie to the same. The surveyor, a very careful and competent man, made a re-survey and still this error oceurred. He also found that this publie survey eorner was off nearly 200 feet to the northeast from the point it should be and the point where the Good Record survey placed it some seven years or more before. He found that all of the Good Record eorner stakes were standing and the other ties meutioned above were correct and there was no conflict actually ou the ground. He reported the facts back to the Surveyor-General and he would not approve of the survey and an appeal was taken to the Commissioner of the Land Departmeut at Washiugton, and the Commissioner sustained the Surveyor-General, then an appeal was taken to the Secretary of the Interior, and he rendered the opinion iu the case of the Only Chance and other lode elaims, April 21, 1903, which you will find in the decision in your land office, I thiuk in Volume 31.

This was au ex-parte affair, and yet the Good Record people were to surreuder the patent, under the decision, upon the written demand by the Only Chauce people, and, upon failure to do so within sixty days, then he would have the Attorney-General institute proceedings in the eourt to cancel the Good Record patent. The Only Chance people served the written notice as advised in the opinion, and the Good Record people told them to commence proceedings at once, for "we would not surrender our patent until ordered by the highest court of the land." That has been some eight months ago, and no suit has been instituted that I am aware of since.

The fact is, that these elaims are situated in a low, barren country, covered here and there with mountain sage, and I was there when the Good Record survey was made, and the surveyor, a chaimnan and myself, found the stone--the quarter section above mentioned—just where we made the Good Record tie. So that, some time within the seven years which elapsed, that stone has been moved some 200 feet to the northeast. The Good Record tie was the first tie that was made to that stone, and the Only Chance and others' survey is the only other tie, the Lucky Strike being tied over to the east.

When the Only Chance people were first in this trouble with the Surveyor-General's office I offered to make three affidavits as to this stone being in place on the line between Seetions 9 and 10, but they would not accept my offer and demanded we make the correction. I met this with the suggestion that we might do that, but how long would it be before we, and even the Only Chance, would be called upon to surrender our patents again in ease this same stone would assume its somnambulistie tendeney by the time another patent survey was made on some other claim? If they would assure us this ubiquitous stone would remain in place forever, we would correct that tie.

As you say, this whole matter will require only a wonderful system of "book-keeping" ou the part of the land department of the United States. It cannot imperil a mau's title to a pateuted claim whieh has its boundaries thoroughly marked aud established upon the ground, still with such an anomalous deeision of the Interior Department many persons will have their patented elaims clouded with another patent from the United States for the same ground, and, by all means, we should have, as you suggest, a "Cabinet Departmeut of Mines" established at Washington.

Another remarkable case in this eounty has come to my knowledge and practiee, aud that was in the ease of the Volunteer lode and the Pierpont lode. The Volunteer lode was patented about 1882. It is situated in heavy timber lands and each eorner of the patent survey was tied to bearing trees, and three of them to large and deep working shafts, one eorner to the quarter corner of section, and two on the south. This claim was worked for many years and beeame renowned for its rich ores, and possibly several hundred thousand dollars worth of ore was taken out. It has been eonveyed as many as a half dozen times. The boundary stakes have been kept in their origiual positiou and the bearing trees are still standing. In this vicinity there have been several excitements sinee this elaim was patented, and, in consequeuee thereof, this quarter corner oceupied several different positions as time went on, until the surveyors in surveys made during the last fifteen years abandoned it as a tie and in their surveys adopted as the loeal tie the uortheast quarter coruer of this section, and when the Pierpont lode was located, and ever since, this south quarter eorner has left the vicinity entirely—at least, it cannot be found.

About two years ago the Pierpont locators came along, when the owner of the Volunteer was absent, and set their location stake within the boundaries of the Volunteer's ground, and there sunk their discovery sbaft to about 12 feet, surveyed and recorded the said Pierpont lode, taking in the Volunteer shafts and about two-thirds of the Volunteer surface ground. Without doing any more work or improvements, the Pierpont made its pateut survey and applied for patent. This patent survey was tied to the aforesaid northeast corner of the section. The owner of the Volunteer came to me while the notiee was being published for patent on the Pierpont, and I told him he might apply for injunction, bring his suit in ejectment, enter a protest, but in no event could they take away his rights to the ground of the Voluuteer, and his claim, being a patented claim, an adverse could not be sustained against him. As the Pierpont discovery shaft was uot on the public domain, and it being clear that they had not done the $500 of work (nor have they done it since) on the Pierpont, they were not only clouding his title, but were practicing fraud upon the Government. So, for the time being, we filed a protest, accompanied with affidavits, setting out the facts in detail about the Pierpout aud the Volunteer, as above indieated, presuming that the department at Washington would inquire into the facts, and the whole matter was certified up to the Commissioner and he sent the case back to the local land office here with a letter of instructious that the Pierpont people should be allowed to enter their claim, and that the Volunteer should have entered its adverse within the sixty days, and the result was, the Pierpont patent has been issued and the Government of the United States has sold and giveu patents, conveying the fee simple title to about six acres of land to two claimants, to wit: the Volunteer owners and the Pierpont owners. Here the department's attention was called not only to its patent issued about twenty years ago for this land, but the fraud that was being practiced upon the Government and the great injustice upon the Volunteer owner in clouding his title, by sworn proofs and plats. I understand the Volunteer has instituted suit against the Pierpont in the District Court of the United States at Denver. J. M. McDOUGAL.

Guuuison, Colo., Jan. 18, 1904.

Mining Problems in Colorado.

Written for the MINING AND SCIENTIFIC PRESS by PERCY A. LEONARD.

Closely associated with the technical problems in mining that are being so skilfully and persisteutly attacked by the brilliant staff of American mining engineers, are those which must be reached on the strictly economic side. In this field layman and alumnus alike contend.

In short, the last analysis to which the most careful investigator along technical lines must submit in obedience to the commereialism of this age is, will it pay?

Praetical mining is not unique by any means in demanding, as a eondition of success, good business management, prime factors in the equation of which are skill and honesty. It is not an uncommon experienee to find expensive equipment, ineluding dressing and reduction works, relegated to the scrap heap, largely because of the lack of economic common sense or honesty on the part of the manager.

Since the time, about forty years ago, when the late Senator N. P. Hill of Denver successfully attaeked and solved the metallurgical problem presented in the reduction of the sulphide ores of Gilpin county, persistent investigation along these lines has developed what we arbitrarily term, "The Proeess Man." While his eoming and labors have resulted in distinct advauces along the technical lines, mining practice has not been always correspoudingly beuefited in a strictly business way. There are a few camps, like Leadville and Cripple Creek, where the mining operators have aggressively evolved, almost co-ordinately, suceessful mining practiee in its most complex form, whieh includes eeonomic milling.

The sequela of this evolution are a constaut and growiug appropriation and utilization of phenomeually low grades of ore, both simple and complex in character, and an increased interest in miniug investments.

While all milling and smelting practice, like every other form of scientifie research, is empirical to a degree, yet euough of economic value has resulted, so that certain proeesses are universally accepted as standard, beeause of their dividend-producing eharacteristics.

It is ouly ueeessary to enumerate a few of these to illustrate this contention. Among these may be named stamp milling aud amalgamation, cyanide in association with eoneentration, ehlorination, magnetic zinc separation, blast, lead smelting, pyritic and mattiug furnace practice.

It is a far cry from the old lead furnace of 1878, that operated exelusively on the surface lead carbouates, found on Carbonate, Fryer and adjacent hills, to the maguificeut smeltiug plant of the American Smelting Co., now operating in Leadville on all elasses of sulphide ores.

This evolution is au epitome of a quarter of a century's careful research, and has almost immeasurably wideued the scope of both smelting and mill practice throughout the miuing world. It has made of mining a high-grade mauufacturing industry by utilizing what, eveu withiu tbe last five years, has been eonsidered waste material, and has made active and dividend-producing miues of undeveloped properties in many ueglected aud abaudoned districts.

The marked advances in cyanide practice, as modified aud adapted to the various ores, has beeome of world-wide uotoriety by such illustrious examples among the dividend earners as the Homestake, Treadwell, Mercur and scores of others, operating on what teu years ago would hardly be eonsidered a good quality of eountry rock.

But at this auspicious time, when the technical diffieulties have been largely subdued, an economic complication presents itself in the appearauce of the destructive and unreasonable miuers' union.

Contemporaneously with the growth of the triumphs of the mine operators in overcoming the physical and other economic obstacles incident to the present development of the miuing industry, the labor boss, or walking delegate, has been evolved.

If he were a man honestly attacking the problem of the relation of capital aud labor in its true eeouomic aspect, he would be hailed with cordiality by every mine owner and smelter man in the United States.

But it is his utter disregard of this phase of the question and the exaggeratiou of the purely personal equation that makes him dangerous and un-Americau. The main issue to-day is not so much between labor and capital as it is betweeu the labor boss and the man who wants to work for whom he pleases at whatever schedule of wages he desires, irrespective of his connection with any organization, and with perfect freedom from molestation from any man. Miniug, as a whole, is less affected than other industries, and yet the disasters threatened and incurred have so sharply defined the issue in the battle now on between operators and employes that the most casual observer can understaud that it is to be a decisive struggle.

The opinion is quite prevalent among the better informed who are on the battleground that the ultimate result will be greater independeuce, possi-

bly lower wages for miners, and greater activity in development and ore production.

It is also believed that the fight will be over sooner in the mining sections than in other portions of the industrial world, and hence, while unfavorable economic conditions may obtain in the East, the Western mining fields will be enjoying an unparalleled era of prosperity.

Automatic Ore Sampling.

Written for the MINING AND SCIENTIFIC PRESS by ALFRED HARVEY, E. M.

The following description is that of an automatic ore sampling plant, illustrated by line drawings. In the drawings the aim has been to give the machinery prominence, hence the building construction and framing has been omitted as far as possible.

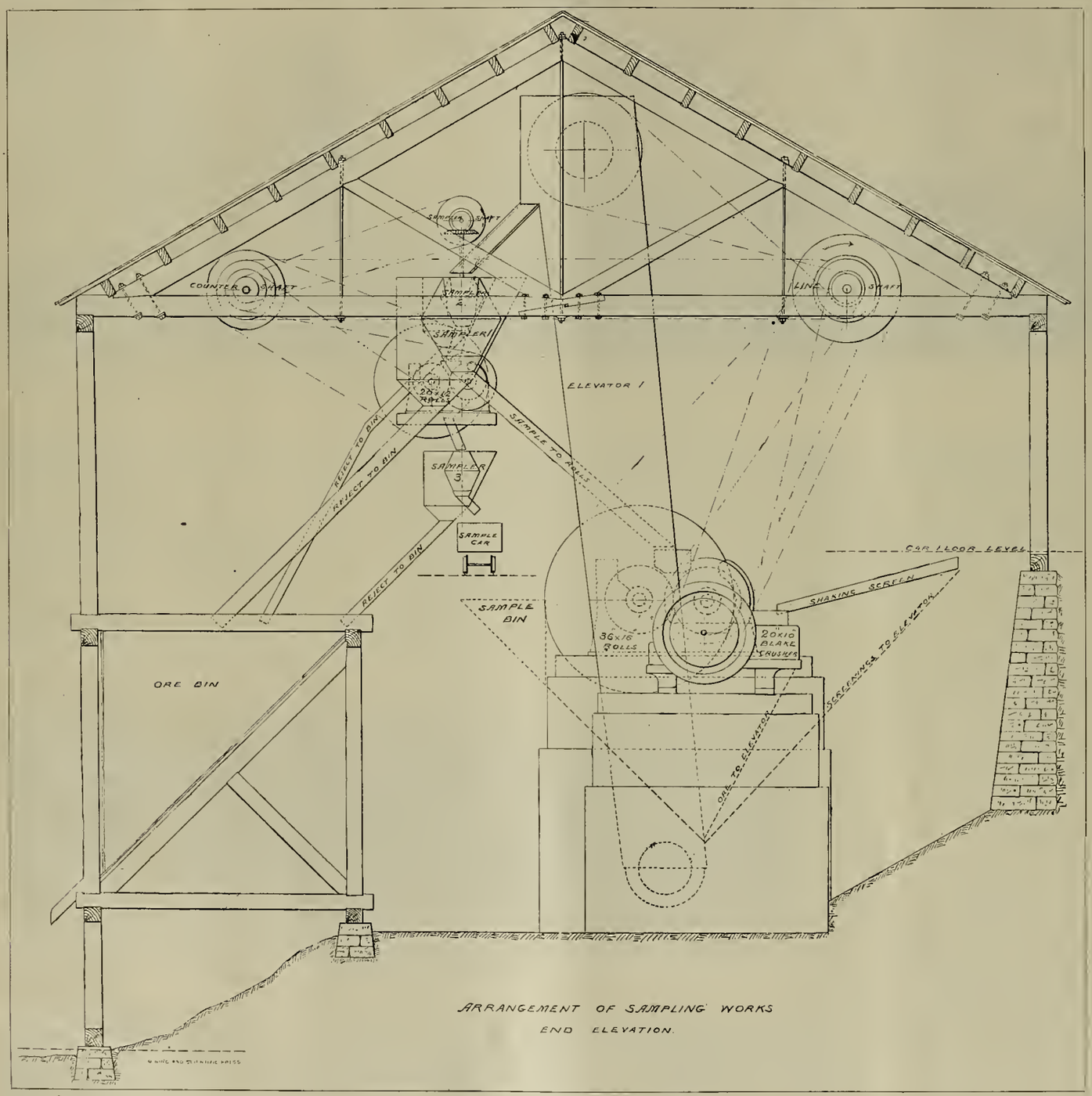
The object of the design is to take a correct sample with the least possible crushing of the ore. Say, for instance, for direct smelting ore.

The plant consists of one 20″ x 10″ Blake crusher, one pair 36″ x 16″ rolls, one pair 20″ x 12″ rolls, two cup elevators, three sampling machines, shaking screen, pulleys and shafting, ore bins, etc.

The capacity of the plant will much depend upon the character of the ore being crushed, and the size of the pieces to which the jaws of the crusher are set to break. We will assume 300 tons to be the daily capacity of the plant.

The samplers shown are intended to cut out one-tenth at each revolution, but they are also made to take one-fifth, one-eighth, one-sixteenth, etc., as circumstances may require.

The manner of operation is as follows: The ore from the car floor level is dumped upon the shaking screen, which feeds the oversize to the 20″ x 10″ crusher, the crushed ore passing to elevator 1, the screenings being conveyed to the same elevator. This elevator discharges all the ore over sampler 1, which cuts out one-tenth as a sample, or thirty tons, which passes through the spout to the 36″ x 16″ rolls to be recrushed. The rejected ore from the sampler, or nine-tenths of the original, is passed on to the storage bins. The one-tenth after recrushing goes into elevator 2, and is discharged over sampler 2, which takes out one-tenth and conveys it to the 20″ x 12″ rolls to be recrushed, the reject passing to the storage bins. The second one-tenth, or one-hundredth of the original ore, having been recrushed as far as possible, is discharged over sampler 3, which cuts out one-tenth. The sample is now one one-thousandth part of the original ore, or 600 pounds, which is discharged into the sample car. The reject, as from the other samples, goes to the storage bins. If the 600-pound sample is considered fine enough it can be dumped over Jones' riffle samplers, arranged in a series of three, with two baffle plates, which would cut it down to 75 pounds. Or it can be raised by a platform hoist and dumped as often as desired to get a suitable quantity for the sample grinders which follow. If, however, it is not thought safe to cut down so far without further comminution, the sample can be dumped into the sample bin, shown in dotted lines, and after the elevator and rolls have been cleaned the sample is allowed to run from this bin into elevator 2. Sampler 2 is thrown out of gear, so that it will not revolve, and the scoop is carefully placed under the elevator spout in such a manner that no waste can take place, and the sample is run through this machine and into the 20″ x 12″ rolls, where it is crushed finer and discharged over sampler 3. If this machine (sampler 3) has another scoop put on for the occasion one-fifth can be cut out, or 120 pounds, which can be subdivided on the riffles before going to the sample grinders; or the one-tenth can be taken, as those in charge may wish, the reject as usual going to the storage bins. After the sample has been reduced to a fine powder by the grinders it goes through the assay office in the usual way.



Arrangement of Sampling Works, End Elevation.

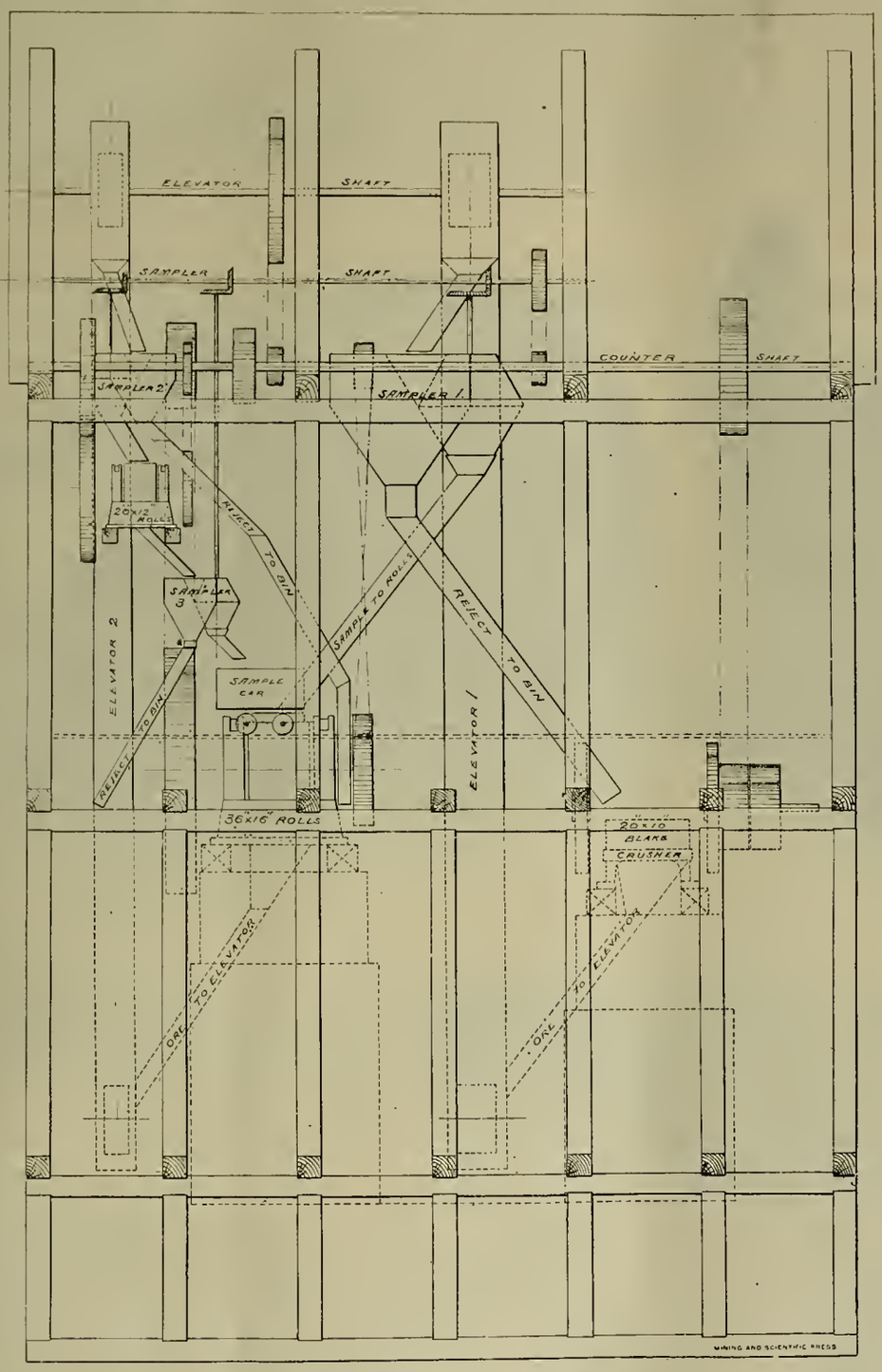
Of the few machines which will sample correctly and which stand out prominently in reduction works in Colorado, the best known to the writer are the new Brunton and the Vezin samplers. In the drawings the latter are shown. Both these cut out the whole of the ore stream at stated intervals of time, as a sample, in distinction to those machines, which take part of the ore stream all the time. Each of the Vezin samplers shown has one scoop, and by the speeds adopted No. 1 sampler would take a scoopful every 4 seconds, No. 2 every 3 seconds and No. 3 every 2.2 seconds. The section of the slice cut out of the stream of ore would be a parallelogram.

The inclined spouts from the elevators tend to equalize and compact the ore streams before discharging them over the samplers.

The plane of the center line of the stream of ore

forms a tangent to the circle described by the center of the receiving part of the scoop. In this way there is no wear on any part of the sampler, except the scoop itself. At the same time the arrangement is such that the ore cannot pound against the cone, neither can it adhere to the inclined end of the scoop, if of a sticky nature.

These samples are suitable for sampling anything from the finest ore up to coarse stuff, say, passing a 4″ ring, or larger. Conditions may be such that it is not considered advisable to pass a certain lot of ore through the Blake crusher, as it may be already fine enough. It may also be desirable to cut out one-fifth instead of one-tenth. In this case a second scoop can be attached to each sampler. The ore would all pass to elevator 1 through a spout for that purpose, avoiding the shaking screen which feeds the crusher.



Automatic Sampling Works—Front View.

Assuming the quantity of ore in this lot to be 300 tons the resulting sample will be 2.4 tons. This sample would be collected in the sample bin until the sampling of the original lot of ore had been completed. After cleaning elevator and rolls it would be fed into elevator 2, discharged over sampler 2, then recrushed in 20″ x 12″ rolls, discharged over sampler 3, giving a sample of 192 pounds, which is probably fine enough to be cut down to the desired size by the riffles before going to the riffles.

The elevator boots being of the drop bottom type can be conveniently cleaned and the riffle samplers can be brushed out without moving them. The rejected portion from the riffles falls into a small bin and can be removed when convenient. A Dodge crusher could be in place of the 36″ x 16″ rolls.

Modifications of this plant can be used to suit conditions at any place, or where the ore is received in smaller lots. The proportion between the amount of the sample and the maximum size of the pieces is a matter that requires consideration. Much depends upon the nature of the ore, whether it is rich or poor, and also whether the value is uniformly distributed. If a sample which has been crushed sufficiently fine to pass through a screen with openings of 1 m.m., can be cut to one ounce avoirdupois, the following weights would be the least that could be taken with safety, if the pieces are of the sizes given:

Diameter of Largest Pieces—M.M.	Diameter of Largest Pieces—Inches (Approximate).	Minimum Weight of Sample.
1	2/5	1 ounce
2	1/2	½ pound
4	1	4 pounds
8	2	32 pounds
16	3	256 pounds
32	1¼	2,048 pounds
64	2½	16,384 pounds
..	3½	44,958 pounds
..	4	69,109 pounds
..	5½	79,300 pounds

Where the ore is required to be finer than that for which this design is intended, for milling purposes, for instance, then one elevator would be needed (dispensing with No. 2), which would discharge into a revolving screen. The screenings which would pass ½″ to ⅝″ ring would pass into the screen hopper, then over a sampler, which cuts out its sample and discharges it into an intermediate revolving mixer. This mixer changes the intermittent into a continuous stream of ore, and then discharges it over a second sampler. The sample is allowed to fall upon a shaking shoe feeding a pair of 20″ x 12″ rolls, recrushed and discharged over sampler 3, the reject being conveyed to the storage bins. The oversize from the revolving screen is passed through a suitable spout to the 36″ x 16″ rolls, recrushed and discharged again into the elevator and again raised to the screen. This process would continue until all the ore had passed through the screen and had been sampled. In such a case the jaws of the 20″ x 10″ crusher would be set closer.

If one-eighth is cut out by each sampler and original weight of ore was 300 tons, the resulting sample would be about 1170 pounds, and would probably be fine enough to cut down further by means of rifles. But if not considered fine enough it could be again fed into the 20″ x 12″ rolls and sampled as before, giving about 186 pounds as a sample.

Remarkably close results are obtained in Colorado by automatic sampling. Ore received at one of the large custom mills, which assayed from $200 to $300 per ton, checked within .02 ounce, or say 40 cents per ton, by this method of sampling. The cost of sampling at these works was 12 cents per ton. One would expect to find more mines, which operate their own mills, automatically sampling the ore coming in and the tailings going out of their mills, thus having a good check on their saving and of the value of the ore from the mine.

Mine Patent Litigation Discussed.

At the request of the Colorado Mine Operators' Association and the Denver Chamber of Commerce the committee appointed by President Roosevelt, consisting of F. H. Newell and G. Pinchot, chiefs of bureaus, spent most of the 22d inst. in conference with some Colorado mining men and lawyers. The purpose of this committee being to report upon the practical operation of the land laws in the West, the subject of the recent rulings of the Land Department as to mineral patents was thoroughly discussed. It was clearly shown by practical illustrations and by the presentation of many specific rulings that the department is committed to the policy of determining the position of patented mining claims by a technical interpretation of the patent description, and that it is refusing to be governed in any manner by the official monuments which identify the claim upon the ground. The committee was furnished with certified diagrams taken from the records of the departments, showing that the lands segregated were in no sense the lands occupied by the claims upon the ground. It was shown that multitudinous complications are being wrought under the present practice; that much land is being segregated which is not patented; that much land which is patented would be thrown open to location and acquisition if the ruling of the Land Department were upheld by the Federal courts; that conflicting claims are piled (on paper) on each other in the Land Office maps, though in some instances they are actually from ½ mile to 2 miles apart. The evidence presented was a revelation to the committee, which expressed itself as not unfamiliar with the question, but as being surprised at the situation as stated. G. L. Hodges opened the subject with a statement of the feeling of insecurity which pervaded the country as to the matter of primordial mining titles, owing to the decisions referred to. G. R. De-Nise presented illustrations based upon certified records of the Land Department, showing the practical effect of the rulings. J. Fillius dwelt upon the fundamental principles of law which were being trampled upon by giving courses and distances preference over monuments. W. V. Hodges gave a synopsis of the Groves test case which is being brought by the Colorado Mine Operators' Association, for the purpose of correcting the practice of the department. M. Boehmer spoke upon the disastrous effect upon the integrity of the engineers and of the records of the Government. A. W. Warwick treated the matter from a wider standpoint than the mere interests of Colorado, stating that Montana, Arizona and many other States were equally interested and would suffer as materially as Colorado. L. F. Twitchell presented the cases which have been recently decided which tend to fix the rule as it now stands, and the necessity for common action in the matter. E. C. Stimson treated the matter in its general bearing upon the mining industry, stating that the mining industry would be seriously retarded unless the matter is speedily corrected. In conclusion, W. E. Pasmore, secretary of the Colorado Mine Operators' Association, spoke on behalf of that organization, and W. F. R. Mills spoke on behalf of the Denver Chamber of Commerce.

STRIKE, DIP AND PITCH OR TREND are common terms in mining. Strike is the horizontal direction of the vein, and dip is a direction downward on the vein at right angles to the strike. "Pitch" or "trend" usually refers to the ore shoot, and has reference to the downward direction of the ore body along the strike of the vein.

The Electric Reduction of Gold From Cyanide Solutions.

Written for the MINING AND SCIENTIFIC PRESS by A. A. BEADLE.

The problems presented iu the metallurgy of gold are somewhat different in their very essence to those belonging to any of the other metals. First of all the metal is found almost exclusively in its native state aud requires no reduction; secondly, the purification of the gold when once extracted entails a cost quite insignificaut in comparison to the value of the metal. Geuerally speaking the ouly problem in the metallurgy of gold is the collecting of the extremely fiuely divided particles which are disseminated through the body of a largely preponderating matrix of quartose or silicate rock. In the treatment of free milling and of alluvial ores amalgamation and chlorination serve to extract the bulk of the gold, the former depending upon the gold particles being absolutely free, and the latter dissolving all metal exposed to the action of the chlorine. Once having obtained the gold in solution in the form of chloride the operation of extractiug it from this solution is a sim ple aud inexpensive matter, and there is uo object iu attempting to recover either the chlorine or the precipitatiug ageut, and there is therefore no reason to believe that electricity will ever be called in to perform this operation.

The case is, however, somewhat diffcrent with the treatment of refractory ores or those which have withheld the last traces of their gold from the amalgamation plates. These ores are amenable to treatment by the cyauide method and have to be lixiviated with a solution of potassium cyanide in order to reuder the metal solnble. In this process electricity, although uot pretending to be essential, has nevertheless stepped in aud promises to overcome some of its weaknesses.

If au ordinary gold ore, containing a reasonable amount of gold and very little cyanicide, be taken as an example, a very weak solution of cyanide, indeed, is theoretically required to dissolve the gold and satisfy the ordiuary equation, say about 0.005% or less, but in practice it is found necessary to nse solutions of about 100 times this streugth. A solution of about ten times this strength will, uuder ordinary circnmstances, dissolve the gold, but it might take somewhat longer. This, however, is not of snfficient strength to enable the metallic zinc, which is subsequently used to reduce the gold from solution, to do its work efficiently, and for this reason alone a much more concentrated solutiou is required, i. e., about 0.5%.

If electrical reduction be adopted in the place of the ordinary zinc methods, the only limitiug factor to the dilution of the cyanide solution is the strength required to dissolve the gold. This, theu, is governed by the length of time which it is most advautageous to allow the dissolviug process to take aud is not dependent on the weaknesses of the zinc extraction afterwards. If the ziuc method of precipitation be used the zinc goes into solution and throws o ut the gold. If the reaction were to take place according to theoretical cousiderations oue ounce of ziuc would throw down abont six ounces of gold, producing a double cyanide of zinc and potassium, but zinc is itself capable of dissolving in potassium cyanide, so that much more zinc potassium cyanidc is produced thau the above principles would snggest, with the resnlt that the bulk of the cyanide is destroyed by the zinc and the dissolving power of the solution much impaired.

Since electrical reduction enables a weaker solution of potassium cyauide to be made nse of, it is obvions that the loss of cyauide is somewhat less, and if the metal can be extracted without decomposition of the cyauide or converting it iuto another double cyanide with some other base metal, the loss might be reduced to a minimum.

The present methods for the electrical reduction of gold cousist in passing the liquid in a slow, bnt continuous stream between a series of electrodes, so that during its passage the whole of the gold is brought into contact with the cathode and there deposited at a very low cnrrent deusity. This idea is best represented by the Siemens–Halske process which is coming iuto nse in South Africa, New Zealand and elsewhere. In this the cyauide solution is allowed to flow slowly between iron anodes and lead cathodes, which are afterwards cupelled for the recovery of the gold. These electrodes are so arranged as to form a series of "baffle partitions," necessitating the circnlation of the liquid through the whole series. The cnrrent density at which the deposition should be conducted varies greatly with different authorities, from 0.05 to 5.00 amperes per square foot of cathode snrface, bnt the former limit is, in all probability, the most advantageous, especially in the treatment of weak solutions, containing about 2 dwts. per tou. There is a certaiu small loss of cyanide due to the decomposition which takes place at the surface of the iron anodes, but this is converted into Prussian blue and can be collected aud afterwards converted into cyanide. The slight loss is made up with new cyanide before returning the solution to the leaching vat.

It is easy to see then that the chief advantage in the electrical reductiou over the ordinary zinc precipitation of gold is embodied in the saving of cyanide, for it is claimed on some authority that the cost of cyanide to be made np in the former is only about one-third of that in the latter, aud the total cost of working the extraction throughout is thereby very materially decreased. The laboratory tests for this method are to a great exteut the same as usual—the cyauide requires to be carefully and accurately estimated in order that the cyanide solution may be carefully adjusted to as low a percentage as possible without the danger of beiug eutirely destroyed during the somewhat lengthy period of leaching the ore.

It is somewhat difficult to obtain authenticated figures which show a fair comparisou between the two methods of extraction, but the following gives an estimate by A. von Geruet of the cost of working the electrical method on the Rand:

	Price Per Ton of Ore Treated.
Cyanide	$0.07
Filling	.20
Fuel, power, lime, lead, iron	.15
Labor, native and white	.14
Charge due to extra cost of plant	.01
Stores and general expense	.07
Total	$0.62

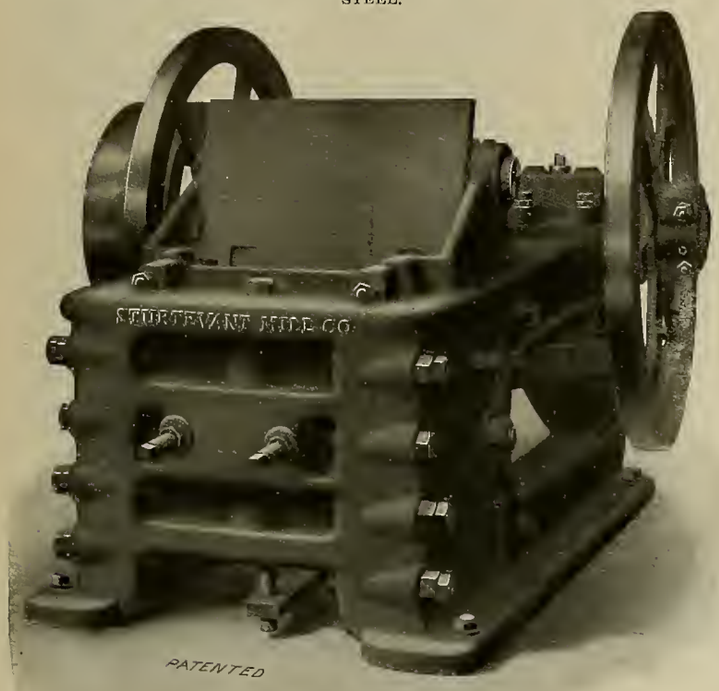
Another authority at Witwatersraud in a similar estimate makes it 70 cents per ton of ore treated.

New Design Roll Jaw Crushers.

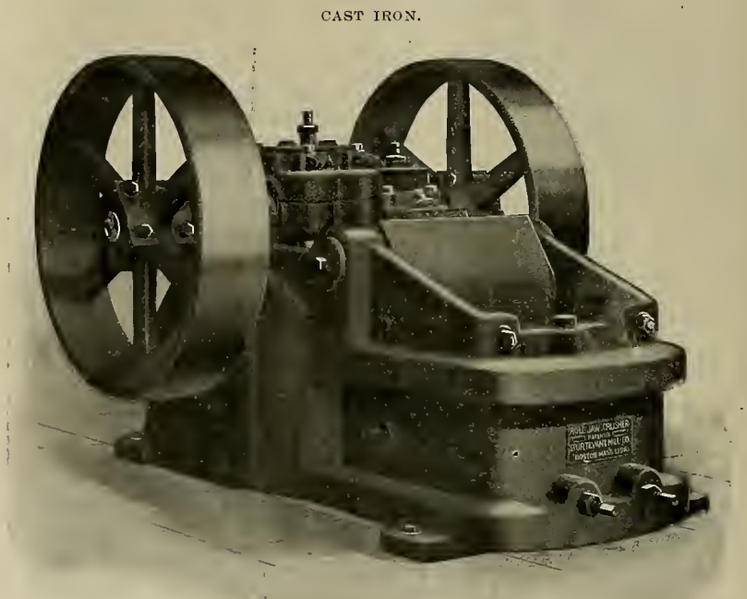
In the accompauying illnstratious are shown two new designs of the roll jaw fine crnshers, one of cast iron and the other of sectional steel construction. Of these, the manufacturers say: "The former is remarkable for its compact, simple and massive design. It is heavy, low and immensely strong, yet all of the reciprocatiug parts are steel, the comparative lightness of which greatly reduces vibrations."

The steel sectional roll jaw crusher is also of unusual strength, although comparatively light, its steel parts being stronger than cast iron, although weighing much less. Both of these machines and several others are shown and described in the new catalogue (No. 8) just issued by the Sturtevant Mill Co. of Boston, Mass. These roll jaw crushers are not complicated. They are jaw and toggle machines of the Blake type, and are designed to be unusually capable of a fine grade of output. The jaws, instead of advaucing and receding, are intended to always remain the same distance apart, and are thus iutended to deliver a fine aud uniform product such as would come from an ordinary crusher and two sets of rolls. They do uot clog and the arrangement of parts admit of a fine class of work. Jaw and toggle crushing is a cheap method of hard rock reduction, and, where roll jaw breakers can crush large rock, their advantage in producing a fine output from large ore is manifest.

STEEL.



CAST IRON.



New Design Roll Jaw Fine Crushers.

Vajen Head Protector.

Frequent reports of mine fires indicate the need of some protection to those involved therein, whether in the mine at the time or engaged in an effort to save life. Such protection is suggested in the use of a helmet or head protector, by the use of which a man can face thick smoke and deadly gas with no danger of suffocation, he being supplied by the helmet covering his head with air sufficient for respiration for two hours. The manufacturers furnish testimonials from miue superiuteudents and others who found them of great value in the rescue of miners overcome by smoke, gas and fumes caused by underground fires. Anything that tends to lessen danger is worthy of notc, and from the statements and testimonials it would seem advisable for any mine superintendent or foreman to have at least one of these helmets on hand for instant use when needed. No one knows when such a protection may be wanted, and the time to get one is before the dreaded accident occnrs. These helmets are made and furuished by thc Vajen-Bader Co., Richmond, Ind., who will send full particulars on request.

ARTIFICIAL ORNAMENTAL STONE may be made by mixing colored cement iu any desired tints and pouring the mixture iuto a bottomless shallow box, set upon a glass plate. After the cement has been poured into the box it is stirred to a greater or less extent, producing those pleasiug combinations of color seen iu artificial stone.

Underground Handling and Transport of Ore.*

Written by CHARLES B. SANER and GEORGE CARTER.

The conveyance of the broken ore from the working face in a mine to the shaft is one of the most important questions of mining and demands careful consideration and attention, whether done by manual, animal or mechanical power, and we believe there is still further scope for improvement in the systems at present in use, both for more expeditious as well as cheaper methods of handling and transporting ore underground.

In dealing with this subject it is desirable to first mention the various methods which have been and are still being used to effect underground transportation by means of such appliances as baskets, leather bags, hand barrows, sleighs, etc., which, although not applicable to mining practice on the Rand, are mentioned to illustrate the methods of handling ore in use at the present day, up to the gradual evolution of the efficient mechanical appliances on a well-equipped mine.

H. H. Webb, in his address to the South African Association of Engineers in June, 1903, stated "that the comparison of working expenses for the year 1902 shows that from 55% to 60% of these costs were in actual mining itself underground, and it is here that the chief economies are to be looked for in the future. At the present cost of milling and cyaniding there is little margin for reduction." And out of this 55% to 60% quoted above, about 15% before the war and 20% since the war is expended on underground shoveling and tramming.

A good deal can be learned from coal mining practice of recent years, where the use of mechanical appliances for mineral transport has made great progress and materially lessened the cost of production, and the application of some of these principles to the varying conditions which exist in metalliferous mining might be attended with economy, especially in the saving of time, as the time factor is one which enters so largely into all the operations conducted on these fields.

We propose to deal with this subject under the following headings:

1. Conveying of the broken ore to levels.
2. Transport of ore to shaft loading stations.

CONVEYING OF THE BROKEN ORE TO LEVELS.—In many of the outcrop mines, especially in the upper levels, the reef dips at such a steep angle that the ore, when broken, easily finds its way to the boxes and ore chutes by gravity, with little or no assistance, hence it is only comparatively recently that, with the general flattening of the reefs in the deep levels and consequent increased "backs," owing to the levels being set off at approximately the same vertical height, this subject has assumed greater importance.

In the first place, a great deal depends on the condition of the foot wall of the stope and the amount of moisture in the broken rock.

The broken ore from the stope faces has first to be handled by shoveling, the poorest and least capable "boys" being utilized.

They laboriously scrape, shove or throw the rock slowly down the stope, and one often finds them huddled together, moving the ore only a few feet at a time, and as often as not by a circuitous route. An improvement is sometimes effected on this crude means of handling the ore by the employment of sheet iron or other suitable material as a temporary floor to the stope.

In place of conveying the ore entirely by this under the rails of the main incline plane and necessitate a break in the track, which is bridged over by movable rails when it is desired to work from a point above.

The only mechanism required to work this device consists of a reel, sheave or drum, around which a rope is passed one or more turns, each end of which is connected, respectively, with a loaded and empty truck, or, when drums are used, two ropes coiling in opposite directions.

The necessary control is obtained by a brake, which is either a segment of wood or a steel band arranged to bear on the periphery of the sheave or drum, or by rubbing discs acting on the boss of the pulley controlled by a tightening bolt.

The rapidity with which the descent can be made largely compensates for any delays that may occur at the top or bottom of the incline, and, owing to the small amount of labor required—that is, one man or "boy" at the brake, the economy over shoveling by hand over long distances is obvious. At the bottom of the incline further handling is carried out either by allowing the contents of the trucks, especially adapted for narrow stopes, to be dumped into an ore chute or box, or, if the stopes are of sufficient width, to allow of the main drive trucks to be used. They may be run direct onto a flat sheet, turntable, or curve, as may be found most expedient.

In the first case the incline can be kept continuously running with intermittent tramming from the box, but the second necessitates a continuous supply of empty trucks.

In the case of the latter method, in use on the Nourse Deep, Ltd. (see Figs. 1 and 2), using 16 cubic foot trucks, the wire used is ¾ inch diameter, the length of the incline being 250 feet, average dip 30°, weight of rails used 16 pounds.

In this case the jig wheel or sheave is composed of two ¾-inch circular discs of steel plate 2 feet 6 inches in diameter, bolted together and flanged round the periphery to a depth of 2½ inches, tapering from nothing to 1½ inch, with rubbing discs placed on either side, the braking being effected by a tightening lever, acting by means of a nut on a square-threaded bolt passed through the center of the discs, the rope being only passed round this sheave once. Its life is thereby considerably increased.

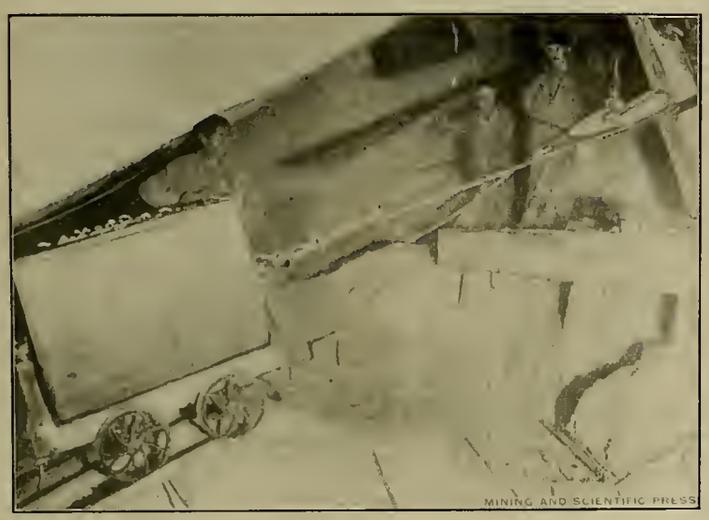


Fig. 1—Incline Plane Top, Nourse Deep.

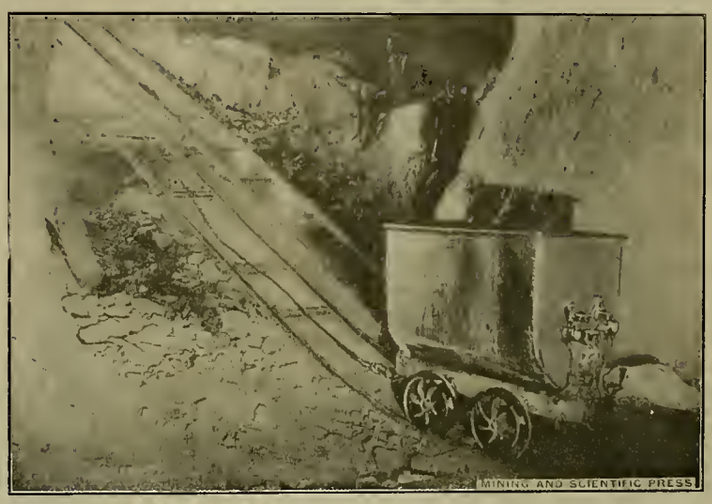


Fig. 2—Incline Plane Bottom, Nourse Deep.

There is another useful appliance recently introduced, known as a shaking chute (see Fig 3), which is most useful in flat stopes, and is being used so far in continuous length up to 90 feet, and even a 300-foot length is in contemplation. The shaking in this latter case will probably be done by mechanical means.

It consists of about ⅛-inch steel or iron plates, which are cut, bent, punched and riveted into lengths of 16 feet, having a width of 24 inches and bent to form a trough some 6 inches deep.

These lengths are easily handled and are bolted together to make up any desired length. It is hung by chains at intervals of about 16 feet to eyebolts fixed into drill holes in the hanging wall of the stope.

The shanks of these eyebolts are tapered from 1 inch to ¾ inch, and have been found to have a sufficient hold by being driven well home without the use of wooden plugs. Thus their subsequent removal can be easily effected.

"Boys" raise the ore by means of shovels into this trough, and one "boy" at the top end moves it backward and forward, and so shakes the ore downward, the ore at its bottom end falling in a nearly continuous stream into a truck, box or platform, as may be most convenient. This main shaker can be fed by subsidiary shakers, conveying the ore from various points in the stope face.

Some of the great advantages of these shaking chutes are their low initial cost, viz., about £14 per 100 feet, inclusive of labor and material; simplicity and portability, a 90-foot length taking forty minutes to take to and hang in position from the level, and fifteen minutes to dismantle and stow away again in the level. Thus they can be fixed into position very quickly and can easily be dismantled when blasting operations are about to be carried out. There seems

Fig. 3—Shaking Chute, Rose Deep.

*Trans. Chem., Met. and Min. Soc., S. A.

every possibility of this appliance being utilized to a much greater extent in the near future thau the majority of other appliances at pres-ent in vogne.

The following comparative test was made at the Nourse Deep, Ltd., to demonstrate the efficiency between "boys" filling trucks from the floor of the level as against filliug by shaking chnte direct into a truck.

The chute was 90 feet long, five "boys" being employed shoveling into the top length. The rate of time filling a truck was two minutes. conveying the ore over this distance of 90 feet. Two good Cape "boys" were pitted against this mode of filling, by shoveling broken ore from the floor of the level iuto a similar truck, which they filled iu four minutes, in this case only having to lift the ore into the truck. After the introduction of such a chnte in one of the stopes of the Nourse Deep, Ltd., the efficiency of the natives' shoveling was increased by 30%.

A somewhat similar contrivance is met with in belt conveyors of various designs. These generally consist of an endless rubber belt workiug round a drum at either end, supported under one side by a series of pairs of V-shaped rollers, the motive power being usually obtained by natives turning either one or both drums by a handle attached thereto.

In a case seen by the authors where such a belt was working in a very flat stope, and under the best conditions, this contrivauce did not seem suitable for the conveyance of large rock, as this easily fell off, and it lacked portability, which is au essential feature.

(TO BE CONTINUED.)

Gaseous Fuels for Power and Heating.

NUMBER III.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by H. SHERWOOD, C. E.

The refuse of petroleum distilling, whenever able to be delivered at-low price, forms a cheap source of water gas at a price a little lower than from crude petroleum. In Europe no difficulty has arisen from its use. It requires the hard carbon of the gas generator to be of coal or of wood.

The heavy oils from bitumiuous shale are the richest in caloric of any known fuel—the gas from such being required not over 10 cubic feet per horse power per hour. They will surely be found in this country not distant from the Pacific ocean, and will form an economical source of power by first distilling them.

Wood is one of the most importaut fuels on the Pacific slope. In localities where no other fuel can be economical, wood may be used with great success in forming water gas. In most parts of Europe it is the most costly of fuels. Here the immense annual waste of wood is appalling—aud it is chiefly willful, merely to save present labor. But the wooded regions are usually many miles from the need for it. The cost of freight by mountain roads makes it a comparatively costly fuel where needed. Where wood has been used for making water gas in Europe special apparatus has been constructed, designed for it and peat. The data given are that from resinous pine wood there is given off 20% of watery vapor, with 12,500 cubic feet of rich gas per ton of air-dried wood, of which the calorific power was higher than rom most coal gas. The char is not over 400 pounds from the ton of wood employed, and this is about consumed by passing the distilled vapors and gases through it wheu incandescent. There is thus obtained 36,500 cubic feet of water gas, containing 44H $5CH_2$ 33CO $10CO_2$ 6N. No data given of the consumption in gas engine cylinder. From its consumption, about 40 feet per indicated horse power per hour may be assumed for engines of 80 H. P. Taking air-dried pine wood at $4.50, weighing 1¾ tons, this consumption of gas would assure power at 6¾ cents per iudicated horse power per twenty-four hours.

Considering that the wooded regions of the Pacific slope are rarely more than 20 to 30 miles distant from ore working requiring heavy motive powers, and that in many of these regions extensive water power is not found, it is quite a matter of sober judgment to utilize the extensive waste aud uatural perishing of pine wood in forested regions by producing there large motive power to be transmitted to places where such power is needed. The installation is not one-tenth of the capital sunk in developing water powers in regions where water powers exist; the production of power would cost no more than the interest on capital in the case of water power; the reproduction of pine is usually most luxuriant and rapid, and the supply need never fail. Much of the most valuable land of the Pacific coast region would thus be recovered for agriculture, of a class with difficulty accomplished elsewhere, while the wooded mountains assure the permanence of the industry. In the half-wooded regions where power is needed, immense quantities of wood are able to be delivered where consumed at two-thirds the cost rate given above, while the better class of wood is employed in mines as timbers and stoping poles. The common pine of this warmer, drier region of California is the Sabin pine (commonly known as the nut pine), which reprodnces and flourishes ou hot gronnds on which uo other pine can grow, and this pine is emiuently useful for producing power by water gas at probably lower cost than any other fuel can ever be furnished where needed.

Lignite is in some parts of the Pacific slope available as fuel for power by water gas, when it is not liked for steam producing. It can, therefore, be obtained at very low relative price. It is found in many places in California, Nevada, Oregon and Washiugton and lies neglected. For iustance, there exists in Washington, near the international boundary, large deposits, 20 feet thick, burning with a loug smoky flame and obtainable in large quautity by systematic mining at not over $2 per ton. Such a fuel is a most valuable source of power aud also of smelting fuel, by converting it into water gas, and at probably a lower price thau any given above. It is also found across the bonndary and not distaut from large consnmptions of fuel for power. The lignites are most extensively employed in Germany, and contain about three-fourths the calorific quality of good bituminous coal. They contain often much moisture which needs drying out, and occasionally too much ash to allow of their employment for ordinary fuel. In instances of water gas generators iu Europe, automatic means have been devised for removing the ash from such fuels, which means are satisfactorily used. At the price at which these lignites can be had in large quantities (and also wood, previously referred to), it may be remarked that they can be used to produce power by water gas and gas engine at from $12 to $15 a year for continuous power, at which price few electric power companies could produce a 6% dividend on capital.

It must be noticed that the whole of costs given above for power are the costs for fuel alone. The attendance needed for water gas and gas engines are about the same as for steam boiler and steam engine, only that in large powers, as but half the weight of fuel has to be handled as iu the case of steam, the stokerage is correspondingly less costly. Also it may be said that the cost of water gas generators is considerably less than the cost of steam boilers, and especially where heavy pieces of machinery (as boilers) have to be carried over inland roads. The cost of gas engines unfortunately cannot be reduced to lower than similar powers of steam engines.

Some notice must be given to the value of water gas as fuel and as an agent in smeltiug ores, roasting ores, heating uses in metallurgy, burning of lime and cement in kilns, glass making, potteries, etc. The value of gaseous fuel in iron smelting has long been recognized and discussed. It cannot be mentioned here. In smelting of copper and lead ores, it may merely be remarked that an agent so rich in heating power, so able to be applied just where and when it is needed, and having such a power in reducing oxides, as a gas coutaining more than 60% of hydrogen undoubtedly has, cannot be wisely neglected—although its use may be new to the operator's ideas, who on the Pacific slope generally take refuge in doing nothing which some one else is not previously doing in his sight. By the use of such water gas, combined with the hot air blast, a higher heat is attainable than by any other fuel, which is equivalent to less of this fuel than of any other. While it can be made oxidizing, it is a more powerful reducing agent than any other can be, and with much less cost than by coke. This is perfectly understood in the natural gas belts. By calculation of the combiuing power of hydrogen and of carbon this is easily seen. For roasting ores the employment of a fuel so regular in heat and so applicable to carry its heat commends it to general use. Glass works aud potteries cannot afford to be without its use. Its freedom from smoke and ash alone insures its use in every up-to-date establishment. In metallurgy its use is rapidly extending. Combined with the regenerative heating stoves, which can give the air or the gas at 1000° C., every metal can be rapidly liquefied. By the use of gas furnaces of the Griffiu type, the highest heat can be attained by the use of pure water gas, which any crucible can be made to bear. Platinum is easily melted by it. On an ordinary firebrick exposed to its greatest heat, a pair of tongs used to grasp it can be nipped together until they meet, and draw out the brick in rough long filaments. With such a heating agent and the most improved methods iu producing it from so many varieties of fuels—at prices which enable its use with so much economy over existing employment of the same fuel—this "progress stricken age" is doomed to allow the glare of knowledge to shine even into these distant regions and compel us to adopt ways now despised, because it cannot yet be said that "everyone does so."

Information to verify the economy of these generators will be given to employers of fuel, power, etc., by applyiug to the writer.

WHERE speaking of the diameter of pipes the outside dimensions are measured in well casiug and the inside diameter of steam and water pipes. Casing is usually made of much thiuner material than steam or water pipe of the same dimensions.

The Manufacture of Gun Cotton and Nitroglycerine.*

NUMBER II.—CONCLUDED.

Written by BRYANT S. DRAKE.

The glycerine is stored in drums which stand in the open air. Wheu glycerine is wanted, these drums are rolled into a small shed and emptied into a tank through a wire netting, which keeps out foreign substances. From this tank the glycerine is blown up by compressed air to a tank far from the storing place of the mixed acids. From here the glycerine and mixed acids are run directly into separate tanks holding one charge each and mounted directly on scales, so that each charge is accurately weighed just previous to the nitration. The scale tanks for the mixed acids are in two little buildings about 50 feet from the mixing house and outside the bulkheads which surround this dangerous place. They connect with the mixers or nitrating machines by means of ordinary draiu tiling firmly joined together and closed at each end by an earthen stopcock. They are made of riveted iron plates and hold over a ton and a half of mixed acids when full. The scale tanks for the glycerine, on the other hand, are mounted on smaller scales beside the mixers and are made of wood. The flow of glycerine to the mixer is regulated by an ordinary stopcock.

The mixer itself, although a complicated looking affair, is in reality very simple, both in theory and construction. It consists of a large riveted iron tank, 7 or 8 feet in diameter and about 4 feet high, containing a large leaden coil through which cold water flows aud a set of three bronze propellers to keep the liquid in coutinual agitation. There is also, near the bottom of the tank, running in towards its center, a set of small pipes through which compressed air may be forced to keep the liquid agitated in case the power agitating the propellers fails. The power is not calculated to fail, however, since the shafting which actuates all the propellers is attached to one end of an electric motor and at the other end a steam engine. A long lever extending alongside the mixers enables the attendant to couple the engine on in a moment, in case the electricity should fail. The leaden coil that carries the cooling water is in three separate sections, each with an independent valve. Each tank is connected to a fine by means of an outlet of which one sectiou is made of glass in order to enable the attendaut to observe the character of the fumes evolved. Each tank has also a three-way outlet cock so that the nitroglycerine may be sent either to the separators or to the drowning tanks directly underneath. These latter tanks are 12 to 15 feet high and 8 to 10 feet in diameter. They are kept constautly full of water and are provided with air valves to agitate the water. They are used only in case a charge of partly nitrated glycerine and acids takes fire. When this happens, the mixture is at once run into the drowning tanks to extinguish the fire and prevent explosion. By no means the least important of the accessories of the mixer is the thermometer. This registers the temperature of the mixture during nitration. The reaction of the HNO_3 on the glyceriue produces water which is taken up by the sulphuric acid with the evolution of heat. If the temperature rises above 30° C., the flow of glycerine is shut off and the temperature of the mixture is rapidly reduced by water flowing in the leaden coils. The cooling water flows through these coils by gravity, and is then returned by an electrically driven centrifugal pump to the tank whence it came. Melting ice is always kept in this tank during the process of nitration.

At Pinole there are four mixers and four complete sets of separating and washing apparatus. The units of each set are placed side by side to secure economy of supervision, aud in the mixing house two men tend the four machines. As the yield of nitroglycerine is about 2.4 times the amount of glycerine used, each 900-pound charge yields over a tou of nitroglycerine. The four charges are run simultaneously. The nitration of 900 pounds of glycerine requires about fifty minutes.

From the mixers to the separators the charge is conveyed in opeu leaden troughs 600 feet long, the object of this distance beiug that if either the separating house or the mixing house is blown up, the other need not necessarily go too. This, however, is a chance only, as either house generally contains at least four tons of nitroglycerine, and at certain periods of the day there are from nine to twelve tons distributed between the two buildings. Then, too, the blowing up of one building would be apt to disarrange the machinery in the other sufficiently to cause a second explosion, even if the concussion itself did not.

The charge as it leaves the mixers is a thick, whitish liquid, which gives off white fumes in considerable quantity, so that, while it is running in the troughs, the fumes rise and cut off vision in about 20 feet.

(TO BE CONTINUED.)

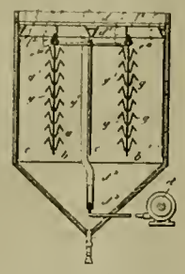
*Abstract California Journal of Technology.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 19, 1904.

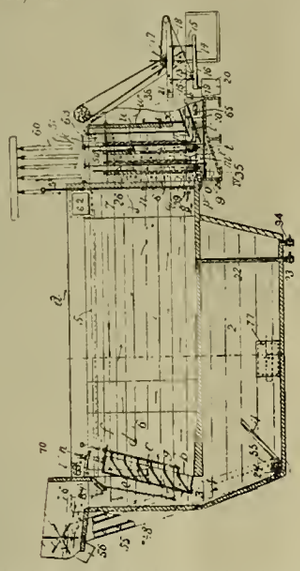
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR EXTRACTING PRECIOUS METALS BY ELECTROLYSIS.—No. 749,844; H. R. Cassel, New York, N. Y.



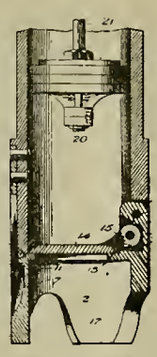
An apparatus for extraction of precious metals by electrolysis provided with tank, vertical electrodes, distributing pulp box, mercury pot in upper part of tank, perforated movable mercury trough, and means for lifting pulp and mercury into distributing box and pot, respectively.

GOLD-SAVING APPARATUS.—No. 750,227; L. Sachse, Los Angeles, Cal.



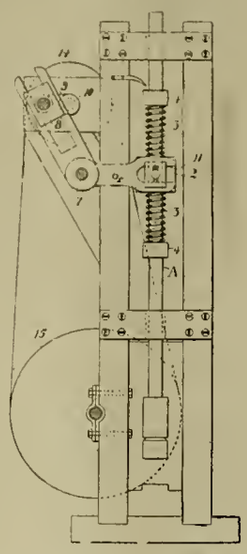
In gold-saving apparatus, combination with tank having upper and lower compartments arranged one above level of other and having floor between them, and communicating with each other through opening in floor, of means for supplying gold-carrying water to tank vertically above opening; means for restricting outflow from upper compartment; and means vertically over opening, adapted and arranged to intercept inflowing liquid and to direct precipitants from such liquid through opening into lower compartment.

SAND PUMP.—No. 750,192; F. G. Irvine, Marietta, Ohio.



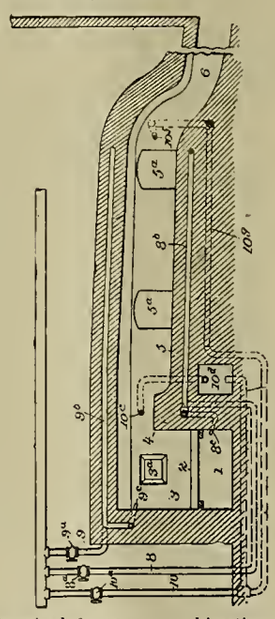
Sand pump or bailer for wells, comprising tubular portion having flat face formed on lower end at right angles to axis, bottom section of same exterior diameter as tubular portion provided with upwardly opening valve and having flat face at upper end to fit against flat face formed on tubular portion, hinge connecting bottom section to tubular portion, longitudinal recess formed in exterior of tubular portion opposite hinge, catch arranged in recess and secured at upper end to tubular portion, longitudinal recess formed in bottom section to receive catch having shoulder formed therein, and cross-recess formed in bottom section below shoulder.

STAMP MILL.—No. 750,006; G. C. Richards, Berkeley, Cal.



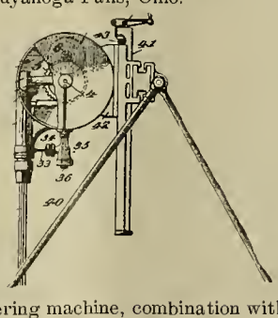
The combination with vertically guided and movable stamp stem, having tappet slidable upon it, lifting stop above and compressible spring below and in contact with tappet, of rigid bell crank lever having its angle fulcrumed at one side of line of travel of stem, connections between one arm of lever and tappet, and slidable connections between other arm and operating crank.

METALLURGICAL FURNACE.—No. 750,022; W. S. Dempsey, New York, N. Y.



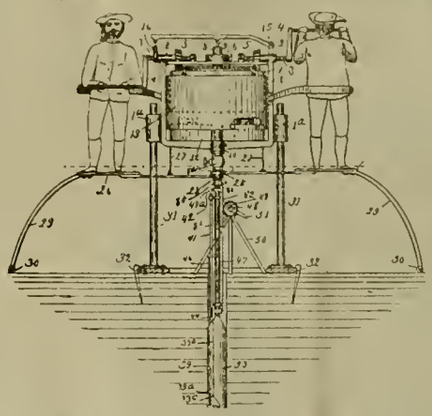
In metallurgical furnace, combination of working chamber and combustion chamber opening into same, oppositely disposed blast pipes below and above grate in combustion chamber, blast above grate being arranged to drive gases generated toward working chamber and blasts below grate being directed angularly in opposite direction to those above grate, and cross blasts within working chamber directed from opposite sides of chamber and backward toward combustion chamber.

POWER HAMMER AND ROCK DRILL.—No. 749,996; J. Kraus, Cuyahoga Falls, Ohio.



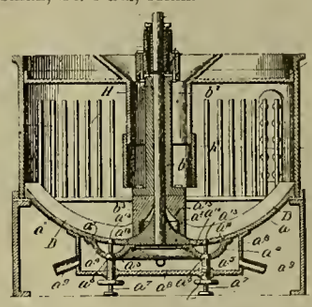
In hammering machine, combination with frame or casing, motor driven pinion mounted in machine, gear with which pinion meshes, one or more hammers provided with arms pivotally connected directly to gear, and anvil or like in line with hammers when in outermost positions.

PROSPECTING INSTRUMENT.—No. 749,718; M. Chase, Haverhill, Mass.



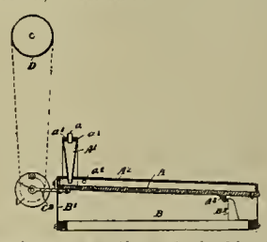
Prospecting instrument comprising boring tool having pair of liquid tight passages connected at lower end of tool, and extending longitudinally thereof, means for operating tool, reservoir and means for circulating heated liquid through reservoir and passages.

AMALGAMATOR AND CONCENTRATOR.—No. 750,224; J. B. Rossman, St. Paul, Minn.



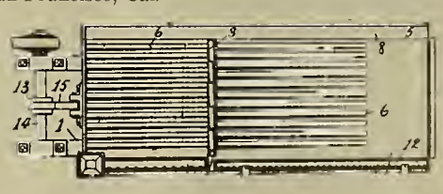
Apparatus of character specified, comprising a bowl having curved bottom slightly rising in center, in combination with rubbers centrally pivoted, extending radially and having close contact with bottom; means for imparting circular, oscillatory motion to rubbers, and rods projecting above rubbers and operating to disintegrate material within bowl and to break up any currents formed therein.

PROCESS OF SEPARATING ZINCBLENDE FROM ORES.—No. 750,034; W. Jamiesou and F. J. Odling, Melbourne, Victoria, Australia.



In process for separation of zincblende from ore with which it is associated, treating ore when in sufficiently wet and pulverized condition with chlorine, in order to attack surface of zincblende, and submitting ore so treated to vanning motion sufficient to bring zincblende particles together and allow them to adhere to each other, forming small masses.

CONCENTRATOR.—No. 750,075; W. G. Anderson, San Francisco, Cal.



Concentrating table sloping to one side and provided with means for imparting thereto longitudinal reciprocating movement and consisting of upper and lower portions located longitudinally or endwise of each other, each portion sloping longitudinally downward from feed end of table, portions having transverse drop therebetween, each portion having longitudinal riffles, riffles of upper portion extending down to drop, trough at drop for conveying pulp to upper side of table, said trough having holes for distributing the pulp upon the lower portion of table, and means for removably and selectively closing holes, and series of spouts inclined downward toward upper side of table, and discharging from upper riffles into trough, in combination with means for discharging pulp upon the upper portion and water upon the lower portion.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

The following table gives the twenty-five principal copper producers of the United States, with their approximate 1903 output in pounds of refined copper, according to H. J. Stevens of Houghton, Mich., with production for 1901 for comparison:

	Estimated. 1903.	Actual. 1901.
Anaconda (Mont.)	95,000,000	101,850,224
Calumet & Hecla (Mich.)	80,000,000	77,761,382
Boston & Montana (Mont.)	25,000,000	50,000,000
Copper Queen (Ariz.)	37,500,000	39,781,233
United C. Co. (Mont.)	32,000,000	29,898,980
Arizona C. Co. (Ariz.)	30,000,000	20,535,800
United Verde (Ariz.)	30,000,000	34,520,693
Mountain C. Co. (Cal.)	25,000,000	29,737,040
Calumet & Arizona (Ariz.)	25,000,000	.....
Detroit C. Co. (Ariz.)	20,000,000	17,535,000
Quincy (Mich.)	18,750,000	20,540,720
Butte Red'tion W'ks (Mont.)	18,000,000	17,969,663
Tamarack (Mich.)	15,750,000	18,000,852
Utah Con. (Utah)	12,500,000	6,000,000
Tennessee C. Co. (Tenn.)	12,000,000	6,000,000
Bingham (Utah)	12,000,000	1,041,801
Parrott (Mont.)	12,000,000	10,167,850
Champion (Mich.)	11,000,000	.....
Shannon C. Co. (Ariz.)	11,000,000	.....
Baltic (Mich.)	10,500,000	2,641,432
Trimountain (Mich.)	10,000,000	.....
Wolverine (Mich.)	9,100,000	4,946,126
Old Dominion (Ariz.)	9,000,000	10 094,787
Butte & Boston (Mont.)	9,000,000	8,028,746
Colorado M. & S. Co. (Mont.)	9,000,000	7,465,260

A feature of the preceding is that Montana, Michigan and Arizona, the three leading copper fields of the United States, have seven mines each in the list, while Utah, a comparatively new producer, has two, and California and Tennessee one each.

ALASKA.

H. H. Williams of Juneau has bonded the Glacier Basin mines for New York parties and will operate them. He is principal owner of the Gold King and the Humboldt mines, both quartz properties. The latter has a 10-stamp mill in operation and will add five stamps. The Gold King is in Berner's Bay district.

ARIZONA.

Cochise County.

A gold strike is reported made in the Santa Rosa district, 14 miles from Douglas, showing a ledge 6 feet wide having 15 inches of pay streak. It carries wire gold.

The underground workings in the Commonwealth mine, at Pearce, have caved in to such an extent that the owners have shut down the mill and ceased extraction of ore for the present. Work has started in sinking a new shaft from which all lower workings can be reached with safety and cleaned out and retimbered.

At the Nugget mine the No. 1 tunnel running on the ledge, 400 feet below the apex of the vein, is reported to have cut last week a shoot at 100 feet that assays $100. Tunnel No. 2, at 150 feet deeper on the ledge, has cut this same shoot at 140 feet. Pritchard & Jones, operators, are preparing to put up a stamp mill.

Maricopa County.

(Special Correspondence).—J. G. Hardin and R. H. Roberts report locating a number of promising claims in Tip Top district, near Phœnix.—The Arizona M. & D. Co., operating the Montezuma lead mine, near Morristown, has put on additional men.——A number of properties are being worked in the White Tank mountains, north of Buckeye.——G. Francis is working men on his mine west of Morristown.—R. E. Humphries expects to put men to work on his claims, east of Morristown, next week.——La Gloria M. Co. is taking out shipping ore, which is being hauled to Beardsley.

Phœnix, Jan. 25.

Suporintendent T. Crandall of the Confederate M. Co. mines, in the Sunflower district, west of Globe (Gila county), says work is progressing. At depth of 80 feet bodies of high-grade ore are showing in several openings. One vein shows 10 inches of copper glance on the Chicopee claim. Also, on the Monitor claim at 30 feet in depth ore is showing.

Mohave County.

The Sheeptrail mill, 40 miles above Needles, Cal., is again dropping its stamps. This mill has been idle for some time on account of legal difficulties.

F. O'Dea reports opening up a body of gold-silver ore on the south end of the Oro Plata mine, near Kingman, showing native and ruby silver. He has a carload of the ore on the dump ready for shipment. From the bottom of the 280-foot level the distance to the south shoot is 100 feet.

J. Carter has a lease on the Billy Bryan mine, at Gold Road, and is getting out gold ore from a streak 18 inches wide.

Pinal County.

(Special Correspondence).—Thirty men are at work at Superior. Ore has been opened up.

Superior, Jan. 25.

C. Udell is arranging to work the deposits of fire clays and other clays near the Atchley ranch, above Mammoth, on the San Pedro river, and on the line of the Phœnix & Eastern Railroad.

G. B. Chittenden reports having struck a 3-foot vein of coal in the shaft being sunk on one of the claims west of Saddle mountain, 8 miles from Dudleyville.

Santa Cruz County.

At the Tres Amigos gold mines at Oro Blanco the mill under Superintendent F. Lanyon is in full operation.

Yavapai County.

G. P. Harrington, of the Tiger G. M. Co., has three 100 H. P. boilers and one 100 H. P. air compressor on the ground at their group in the Bradshaw mountains, southeast of Prescott. One of the boilers will be put into the mill and the other two and the air compressors will be used in development of the mine. Ten more stamps and additional concentrating tables will be put in the mill.

G. W. Sarano, of the Ideal M. Co., at Groom creek, reports a strike made in the south drift at 135 feet, showing a body of ore 3 feet in width that runs $30 per ton in gold.

C. W. Platt says he is grading for the mill at the Illizona M. Co. mine near Kirkland. The shaft, which is down 200 feet, will be sunk to 500 feet before further lateral work is done. A hoisting plant, air compressor and machine drills are being put in. A 10-stamp mill will be built.

The United Verde smelter at Jerome is working two 500-ton and one 250-ton jacket furnaces, the Jerome News says, smelting 1250 tons of ore daily. They are hoisting but 800 tons per day from the mine, the remainder of the supply for the smelter coming from the roast. The company is building another 500-ton furnace, and rebuilding two more 250-ton smelters, all of which, when put in operation, will give the United Verde Co. a smelter capacity of 2250 tons a day. To supply this the number of miners will be increased.

Yuma County.

E. S. Osborne has taken over a number of claims near the Billy Mack group on the Colorado river, near Parker. He has men at work on copper and gold mines on Bill Williams Fork owned by himself and others.

CALIFORNIA.

Amador County.

Newman et al., who have bought the Pine mine on Mokelumne river, near Pioneer, are opening the mine by a tunnel which will strike the ledge 100 feet below the old workings. They are building a road into the mine from the West Point bridge.

Butte County.

J. C. Rowan, of Helena, Mont., and Eastern men have bought a quartz mine on Bloomer Hill, 16 miles from Oroville. A crosscut tunnel, 180 feet long, has been run. The company will put on men next week. They will build a stamp mill.

Around Oroville several drilling outfits are working night and day, prospecting new ground, and six more dredgers are being built in addition to the twenty-four in operation. The American Dredging Co. is constructing one of these dredgers on the Hilgers ranch, on the Gardella tract; Leggett No. 3 is ready for the machinery; the Central Dredging Co. has another boat under way on the De Lancie place; on the Wilcox land W. P. Hammon is building another; W. T. Bagget of San Francisco has material on the ground for building a dredger on his land, and El Oro D. Co. is preparing for another dredger on the Springer land. The latest dredger in operation is the El Oro, which cost $92,000.

Calaveras County.

The Independence gravel mine at Angels is renewing operations. The shaft is 200 feet deep, 90 feet below the gravel, at which point a drift 14 feet has been run.

Work will be resumed next week at the Jones mine, near Angels.——The Allison mines, adjoining the Jones mine, are said to have been bonded and work will start next month.

El Dorado County.

At the Santa Claus quartz mine, near Greenwood, hoisting machinery is being set up.——It is reported that the tailings and sulphurets from the Rattlesnake mine, near Garden Valley, which are being treated by the cyanide process at the Rosencrans plant, assay $20 in gold. It is said the ore when run through the mill did not yield enough to pay for mining it, but it is thought operations will be resumed on the mine and the ore treated by cyanide.

A 30-ton smelter is being built for the Rio Vista gold and copper mine near Nashville. It is expected to be ready to blow in by March 1st, says the Georgetown Gazette.——The steam hoist at the Ida Mitchell mine at Placerville was started up last week. D. H. Jackson is superintendent.

Kern County.

The Standard Oil Co.'s pipe line is expected to resume operations between Kern river and Mendota next month, says the Californian. The reopening of the line is due to the fact that the company has succeeded in relieving the situation at Coalinga, where large quantities had been in storage waiting a chance to be brought to market, and it was not possible to use the pipe line for both oils at once and get any relief. During stoppage of the line from Mendota south work at Kern river has been held up on several properties.

Mono County.

Superintendent Colcord expects to have stamps dropping at the Esmeralda Con. by February 1st, says the Bodie Miner-Index.——The New Bodie M. Co. has twelve men at work. The University shaft has been cleaned out to the 300-foot level and retimbering is under way.——At the Sunshine a crosscut is being run, being in 200 feet. A drift is being run on a 12-inch vein of ore at the Eva.

Nevada County.

Superintendent C. Graham of the Canfield mine near Nevada City says he has started a raise to reach the gravel from the drift. The drift is in 1200 feet. The air compressor has been set up.

Operations will be resumed at the Tule Belle mine, says D. E. Matteson, president. The company owns 131 acres of mineral land on Cincinnati Hill, on which a three-compartment shaft, 200 feet in depth, has been sunk. It shows a ledge, which has yielded ore. The shaft is equipped with a double-drum hoisting engine, pumps, etc. It is near Grass Valley.

At the Culbertson mine in Eureka district, Superintendent English reports uncovering a pay shoot in the 6-foot ledge on the hanging wall side. The Culbertson is 1½ mile from Graniteville and 3 miles from the Gaston Ridge mine. The Syracuse & California M. Co. of New York is developing the Culbertson and the National mines.

The Seven-Thirty mine on Deadman's flat, near Grass Valley, will be reopened, work starting next week, says Manager G. W. Root. It is intended to sink a new shaft and equip the mine with heavier machinery.

At the New York - Grass Valley mine, near Grass Valley, the stamp mill was put in operation last week. With a quadruple discharge and a coarse mesh screen the nine stamps are expected to make output of 125 tons, daily, says Superintendent White. Bodies of ore have been blocked out in several levels. The shaft will be continued down, and at each 100 feet new levels will be driven.

J. McCaffrey, superintendent of the Polar Star mine, near Grass Valley, says the mine will be reopened next month, according to instructions from J. A. Kirby of Salt Lake City, Utah, manager.

The unwatering of the Mountaineer mine, near Nevada City, having been completed, Superintendent Campbell has put on men to drive the 400-foot and 700-foot levels south. In the face of the 400-foot drift there is a 2½-foot vein of ore.

Work has resumed on the new shaft to be sunk on the Green Mountain mine, near Grass Valley, says Manager Labadie. A raise was started from the 800-foot level and work also begun from the surface. The shaft is 16x6 feet in the clear and is down 100 feet from the surface. The raise is up 110 feet. It will be equipped with a hoisting plant, after which they will go below the 800-foot level. Development work will be increased on the Centennial, under the same management, when it has been unwatered.

Placer County.

The owners of the Elite mine at Shady Run near Towle's are running a prospect tunnel of 400 feet, to strike the channel.

Plumas County.

The Cataract mine, near Quincy, has been sold to W. Whitaker, W. J. Schneider and W. Arndale, who will develop the mine. It is northeast of the Penman ranch and south of Grizzly ridge.

At Indian valley, near Genessee, R. E. Carswell and H. Anderson, of Minneapolis, Minn., holding the Peter quartz mine under bond, are arranging for the mine to be opened up and operated by the Regal M. & L. Co. of Minneapolis, of which Carswell is president. They are putting up a mill of ten stamps with concentrators. It is expected to be put in operation in March. A contract has been let to run a tunnel. The mine is above the level of the north arm of Indian valley. The machinery will be run by water power, the pressure obtainable being 160 feet, and will be applied to a 5-foot Pelton wheel. A cyanide plant is also proposed.

Sacramento County.

The Folsom Dev. Co. dredger No. 1, on the Billingsley place, near Folsom, is completed and is expected to be in full operation next week. It will work to a depth of 40 feet below the water level. Dredger No. 2, on the Reed place, will be completed in two weeks. It is smaller than No. 1, working only to depth of 25 feet. S. A. Martindale is superintendent of the two dredgers. The company's machine shop is running with twelve men at work.

Santa Barbara County.

Development of the oil industry around Lompoc is reported improving. While the oil sand is deep, there are three producing wells in this section and more are going down. One well is 3140 feet deep, with 730 feet of oil sand. This is said to be the deepest producing oil well in the State. It is in the Los Alamos valley, in the northern part of the county. The oil sand is thought to go deeper, but it will be impossible to get much greater depth with the casing, as there is heavy pressure of gas at the bottom of the well. The well is kept full of water to keep down this gas, and it is thought that when the well is turned on it will give 1000 barrels per day. When tankage is ready to receive the output, the well will be turned on. As soon as the gas pressure is relieved, the pump will be worked regularly. The well is owned by the Union Oil Co. (being Hill No. 2). Near by is a well, penetrating the oil stratum to depth of 150 feet, which pumps 250 barrels of oil per day. The Union Co. owns this well also, and is putting up a derrick for a well to be drilled 1½ mile west of its Purisima wells. A pipe line to the ocean has been completed.

Shasta County.

The dredger of the California and Detroit Dredging Co., operating near Horsetown, 9 miles southwest of Redding, has started up, replacing the one destroyed by fire last summer. The dredger is operated by electrical power. The company proposes building additional dredgers, as it has more placer ground than one can handle.

Crude oil will replace wood as a fuel at the smelter of the Bully Hill C. M. Co. at DeLamar, though the smelter is in a timbered country, and oil will have to be hauled by teams 18 miles from the railroad terminus at Bella Vista. The main source of power at the smelter is electricity, which is furnished by the Northern California P. Co. which also supplies the smelter at Keswick and the Afterthought mine at Bella Vista. But at DeLamar steam has always been kept up under one set of boilers so that steam power would be quickly available in event of power line being disabled by accident. Wood was used for fuel under the boilers. The only use the company will now have for wood will be to bed down the roast heaps of sulphide ores. This requires 3000 cords a year.

Siskiyou County.

The Fernandez hydraulic mine near Yreka, in Cherry Creek district, has resumed. It can be worked only a few months each season on account of the scarcity of water with which to operate the giants. There is a great deal of snow on the mountains at present, and prospects look favorable for this season says the Bee. The boiler at the coal mine, 6 miles from Yreka, burst last week and operations are temporarily suspended.

Tuolumne County.

J. Michel of Sonora has bought the Sievert quartz claim and the northeast extension of the Sievert mine, 2 miles northeast of Sonora.——O. M. Rising of East Oakland has taken over a half interest in the Rising Sun, New Discovery and Sonorita quartz claims, near Arastraville.

The Yankee Hill M. Co., operating the Vine Spring mine, near Columbia, will increase the mill from two to seven stamps and add a cyanide plant to handle the output of the mill.—R. Grun of Carters has bought the Manzanita quartz mine, on the Buchanan ridge (formerly the Blue Bird mine), near Carters.—E. G. Kennedy has bought the Big Fern mine, 3 miles north of Jacksonville.

S. W. Wilhelm is putting up a 4-stamp mill on the Vivian and Concord claims, a mile above Parrotts Ferry bridge, on the Stanislaus river, near Columbia. He made final payment on the Concord last week. Three more buildings have been completed.

COLORADO.

Archuleta County.

The Wilkesbarre-Colorado Oil Co., which has a lease on the school section near Pagosa Springs, has two outfits of tools on the ground and will begin drilling for oil this week.

Chaffee County.

The Waverly-Badger G. M. Co. at Turret is putting in plant of machinery on the Badger mine, consisting of a 50 H. P. boiler, 6x8 steam hoist, duplex pump, cages, trams, et al. The Waverly-Badger group consists of seven claims 1 mile north of Turret mountain and 2 miles northwest of Manoa on Cameron mountain. The country rock is said to be trachyte,

but they are developing a 2-foot vein of hematite, which, at depth of 75 feet, carries values in gold. The Badger group is owned by Iowa men, with C. T. Brown of Waverly, Ia., president. S. Stoner of Turret is local manager.

Clear Creek County.

At the Mendota mine, near Silver Plume, the management is preparing to put in larger boilers and hoisting machinery to increase development work.

At the Stevens mine, near Silver Plume, the 50-ton concentrating mill was put in operation last week.

The Terrible mill at Silver Plume resumed operations last week, after idleness of several weeks. The mill was closed down on account of the water pipes having frozen for distance of 5000 feet. An attempt was made to thaw the line by blowing steam from the power house, but this was found to be impossible as the distance was too great. An engine and boiler were then placed at the other end, with better success. It is stated that fifty men worked for several days keeping fires going along the course of the pipe line.

At the Hood & Maxwell Grillith mine, near Georgetown, last week 12 inches of smelting ore were opened up, giving 300 ounces in silver and 0.6 ounce in gold. In addition to the gold and silver the ore carries copper and lead. The strike was made in a winze sunk from the 300-foot station of the tunnel level at depth 30 feet and in a drift from bottom of winze. That portion of the Grillith vein operated by Hood & Maxwell is producing ore from ground operated by lessees and regular shipments are being made.

Custer County.

The shaft of the P. & O. mine, near the Bassick mine, near Silver Cliff, is down 600 feet, and crosscutting and drifting on the streaks of high-grade gold ore are under way. Ore is a telluride. A plant of machinery is on the ground.——It is reported work will be resumed on the Hector group, near Custer City. There is a shaft sunk to a depth of 200 feet.

Fremont County.

Mica mining is under way northwest of Florence at Micanite by the United States Mica Co., composed of Chicago, Ill., men. Plans are being drawn for a mill which will be built this spring, says Manager R. W. Menk. Several carloads of mica have been shipped.

The Portland Cement Works, near Florence, which have been closed down since the Colorado coal strike, will reopen next week.

The United Oil Co., while drilling well No. 312 at Spindle Top Heights, 3 miles south of Florence, struck oil last week at a depth of 2775 feet. Manager Wallace says the oil in the new well rose to near the surface and 500 barrels per day can be pumped.

The Metallic cyanide mill, 2 miles north of Florence, the property of the United States R. & R. Co., was burned last week, causing a loss estimated at $100,000. The origin of the fire is not known. This mill which has not been operated since becoming the property of the U. S. R. & R. Co., was being dismantled and the machinery being shipped to Utah. A large quantity of the machinery was stored near the mill in sheds and some of it was damaged, rendering it worthless. The mill was closed three years ago on account of the men asking for shorter hours and an increase of wages, which was refused. At that time 300 men were kept at work.

Gunnison County.

G. S. Givens, manager of the Monarch M., M. & D. Co., is developing the Kimberly, recently leased, near Sherrod, near Pitkin.

Las Animas County.

A new coal mine near Suffield is being opened up, 1½ mile northwest of Bowen station. It is on the same vein as the Union Coal Co.'s mine, says the Times. A tramway is being built and shipments of coal will be started. The Colorado & Southern Railway has put in a sidetrack for loading and all the material is at the tipple site. Fifty miners will be employed.

Ouray County.

The Ouray Con. M. Co., in which St. Louis, Me., men are interested, has taken over eighteen claims in the Blowout district, near Ouray. They propose to tunnel from Blowout gulch and into the Cascade range.

San Juan County.

The Iron Hat C. G. M. Co., with properties in Prospect basin, near Silverton, including their Crown Prince mine, will start development work this week. A contract will be let on the Crown Prince tunnel. Native copper has been found on the claim, says Manager Horrington.

San Miguel County.

The ore chutes in the Smuggler-Union mine, near Telluride, are being filled and next week Manager Wells expects to put more stamps in operation. There are 200 men employed by the company (but one-half the full working force). The tramway is running steadily, and it is expected the ore hins at the mill will be filled by Feb. 1.

Teller County.

W. W. Rasor, operating on the Valley View claim of the Spar G. M. Co., on Guyot hill, reports having struck payable ore. He has driven the tunnel 110 feet, which is 90 feet from the surface. The lead is 3 feet wide and is thought to be the El Paso shoot. He will follow it and increase development.

The Fremont M. & D. Co. of Florence, A. F. Myers, president and manager, is preparing to build a power plant and a reservoir on High park, near Victor.

The Bayard M. & L. Co., operating the Trilby claim, adjoining the Gold Sovereign mine on Bull hill, Cripple Creek, will put in a heavier plant of machinery which will have a capacity of 1000 feet. The shaft is down to 500 feet. Ore is being taken from two drifts, one at depth of 300 and the other 500 feet. This ore is giving smelter grade returns and the shoots in both drifts are 3 feet in width. The company is shipping out three cars of ore per week. The largest shoot was struck in sinking the shaft. This shoot has now been followed for some distance. Sylvanite and free gold are found in the ore.

The Peggy G. M. Co., owning the Le Clair claim, near Anaconda, is shipping out at rate of two cars per week. The ore is giving returns of six ounces gold per ton. Most of the ore is coming from a stope 15 feet south of the shaft at depth of 320 feet. In the north drift there is ore, but so far Manager Gilpin is not pushing development in that portion of the property. The screenings from the ore return six ounces gold per ton, while the coarse rock runs two ounces.

On the 26th inst., fifteen men were killed and one man severely injured as the result of an accident to the hoisting engine at the Independence mine at Victor. In the main shaft of the mine sixteen men were being hoisted in the cage from the sixth, seventh and eighth levels. When the cage reached the surface the brakes failed to stop the engine, and the cage with its load was drawn up in the gallows-frame, the strain on the cable causing it to part and releasing the cage, which dropped 1500 feet down the shaft into 20 feet of water in the sump. Similar accidents, in which no lives were lost, are said to have occurred twice before at the Independence from the same cause.

IDAHO.

Blaine County.

The Newton Revis placers, comprising 120 acres on Little Smoky river, near Hailey, have been sold to Hollister et al. of Hartford, Conn.

Boise County.

A. and E. Small and F. Long are working placer ground at Warm Springs, near Idaho City. The gravel is 8 feet deep.

Canyon County.

The coal fields on Indian creek will be developed by the Diamond Coal Co., which has been incorporated by O. H. Calander, F. A. DeClark, A. Thommen of Emmett and M. Hawley and W. W. Paxton of Boise. They have coal rights for several sections of land on Indian creek and have opened a 2-foot and 3-foot vein of lignite coal. Five men and a drill have been working for two weeks. The coal fields are 22 miles north of Emmett.

Elmore County.

(Special Correspondence). — The old camp at Atlanta is taking on new life and there is much activity in mining here. The Monarch and Benton groups of mines are being developed with good results, and in the Minerva it is reported that on the 200-foot level a vein 4 to 5 feet wide carries values of about $200 per ton, with a richer streak of 6 to 7 inches of high-grade ore. This is a gold camp and is attracting attention from outside. It is expected the comiug season will see large development in this camp.

Atlanta, Jan. 25.

Idaho County.

The Lewiston Tribune reports 150 miners on the payroll of properties operating in the Buffalo Hump district.

Eastern men proposo to build an electric plant at Buffalo Hump, to supply power for the mines and mills, says H. M. Lancaster of Rathdrum, consulting engineer for the company. Lancaster says, owing to the high prices of fuel at the Hump, there is opportunity for favorable investment of capital in a power plant. Surveys have been made. They had hoped that water power up to 1000 H. P. could be secured, but only 400 H. P. was found available that could be counted upon all the year through. The Crackerjack mine has developed 300 H. P. for its plant.

Lemhi County.

A ledge carrying tin values is reported found 3 miles west of Salmon City. O. E. Kirkpatrick of Leesburg says the ore assays 10% tin, 20% lead and $4 in gold. Stream tin has been obtained in this section for several years, especially in Panther creek, near Forney. There is a shaft down 30 feet on the ledge.——Kirkpatrick, who is superintendent of the Gold Flint mine, in which Salt Lake City, Utah, parties are interested, says 1900 feet of work has been done on this group of ten claims, opening up a 20-foot ledge of ore which averages $5 in gold per ton. ——The Gold Dust group, next to the Gold Fliut, is owned by Salt Lake City parties. A 10-stamp mill is in course of construction, and it is expected the plant will be in operation in the spring.

Shoshone County.

The shaft on the Hypotheek mine, near Wardner, is down 50 feet below the tunnel level and at 60 feet they will start to crosscut. The bottom of the shaft shows concentrating ore, which was found all the way down, says the Wardner News. The vein is 60 feet in width. The shaft is a 6x9 compartment. O. Guay is principal owner and manager.

P. Burke is reported to have an option on the Champion group, on Stephens peak, near Mullan. The property has been under development for four years and 400 feet of tunnel have been run. Burke is chief owner of the Park group. The Park and Champion are said to be on the same lead, on opposite sides of the hill. The tunnel in the Park has been run in 2000 feet. They are said to show values in copper. The mines are about 4½ miles from Mullan.

KANSAS.

Cherokee County.

At Baxter Springs the mill for the Sunny Side mine is being set up.——A. W. Abrams has made a strike of jack on his farm.——The north shaft of the Tom Clark mine has gone through 16 feet of lead.

At Galena, Wilkes & Co., on the Henry C. mine, have finished sinking to the 160-foot level.——J. E. Thrasher says a 500-foot drill hole will be sunk in the spring on ground south of Galena, where indications of oil have been found.

J. C. Moore, with Kansas City parties, is sinking a shaft on the Murphy ground, near Empire. Last week in sinking they struck a 10-inch "vein" of coal at depth of 22 feet. A drift will be made to open up the coal. The shaft is being sunk for ore, which the drill holes show at 75 feet.

MICHIGAN.

Houghton County.

The second shaft of the Calumet & Hecla mine on the Kearsarge lode, near Calumet, has been "bottomed" on the ledge, says the News. No. 1, which struck the ledge Dec. 1, is in the rock 40 feet. It is thought the lode lies to the east, in which case vertical shafts will be cut. Diamond drill work has been progressing since October.

The Franklin mine at Hancock is expected to show increased production during January. The mine is said to be improving in the lower levels of the Franklin Jr.

Houghton reports say negotiations are under way for the sale of the Arcadian mill to the Centennial C. M. Co., near Calumet.

The Elm River copper mine at Winona has entered the lode again at the 500-foot level and is crosscutting.——The two diamond drills of the St. Mary's Mineral Land Co. are working near the Winona, one within 1000 feet of No. 3 shaft of the Winona, where the showing is said to be encouraging to both the Winona and St. Mary's.

The trammers at the Quincy mine, at Hancock, went out on a strike last week, resulting in closing down the mine and also the mill, due to lack of stamp rock, rendering 1800 men idle. Blacksmith, machine and carpenter shops were also closed, under threats of strikers. The trammers formulated demands on the company for $60 per month, trammers to quit at 11 A. M. Saturdays, same as miners, and the day shift to consist of four gangs, instead of three; men loading electric haulage cars to change with those working old-style tramming alternate weeks; pay of trammers' laborers and rock house men to be $2 per day, instead of $1.80 or $1.90, as now; any man discharged for connection in this strike, all to quit. Later the company offered to compromise and pay $60 for January and $57 hereafter. The men refused, but it is thought the compromise may be accepted.

The reverberatory building of the new smelter at Houghton is roofed in. The building will contain five furnaces.

Keweenaw County.

The new shaft at the Allouez mine, near Allouez, underway, known as No. 1, has reached depth of 365 feet. The additional depth made during December was 75 feet. The Kearsarge lode is expected to be cut at depth not to exceed 1000 feet. A crosscut can be extended from the 30th level east to the lode, a distance of 150 feet, thus affording 200 feet of stoping ground before going to the Ahmeek boundary. One extra head will be available at this plant after the Centennial requirements are provided for.

The 1903 production of the Mohawk mine, near Allouez, was 6,500,000 pounds of refined copper, and with the aid of the third stamp the production of the mine is expected to be increased by 50%. The third Mohawk head is completed, but will not be put in operation until No. 4 rock house is ready (about Feb. 10).

The building of the rock house at the St. Clair shaft of the Phœnix mine at Phœnix is under way. The shaft is down 1710 feet. Shipments are being made from the stock pile at this shaft in addition to mill shipments from west vein shaft.

MISSOURI.

Jackson County.

The Apple Tree M. Co. has developed a lead mine in the Kansas City bottoms, says the News-Herald. Ore is being hoisted from a depth of 60 feet. A small pump handles the water. A turn in of 15,000 pounds per week is made. J. Myers is part owner of the Apple Tree.

Jasper County.

In sinking a shaft on the Cunningham land at Chitwood the Maybelle M. Co. has opened up a tiff cave at depth of 132 feet. Sinking below the cave the company has struck a body of ore of disseminated tiff and flint. They have a sub-lease of eight lots. J. M. Martin, E. Jenkins and J. M. H. Young are interested.

The Chicago Zinc & Lead Co., R. E. Sanford superintendent, has put up a building and steam hoist, preparing to putting machines to work in the ground. The mines are on the Portland ground north of Webb City. —— C. E. Mathews and W. W. Wampler have bought the Cumberland mill on the Bankers' ground, and will move it to their 20-acre lease on the Kelley ground north of Joplin, where they have a shaft down into ore.

Qualls, Mooneyhan & J. Gray of Carthage have a 56-acre lease 2 miles north of Carthage, on which they report striking a 25-foot face of ore in the first drill hole at 120 feet.

J. W. Kerr has struck a jack prospect on the Acme land south of Webb City and is having a shaft sunk. —— M. C. Terry reports there are two new mills going up on the Aylor ground at Alha.

E. H. Mower, W. P. Leon and O. H. McKinnon have organized the Hohoken M. Co. at Joplin. —— On the Williams land, 2 miles west of Carthage, J. W. Aylor and R. A. Bowen, lessees, have opened up a drill hole strike showing lead and zinc from depth of 30 feet to 78 feet. It is intended to continue the drilling to depth of 160 feet.

J. B. Daniel, manager of the Sphink and Ruby Neck mines at Neck City, says all the interests of his companies are sold to G. L. Cole of Neck City for Eastern men.

MONTANA.

Fergus. County.

The Judith M. Co., operating the Surprise group in Gilt Edge district, near Lewistown, is increasing development work. A tunnel was started at the base of the mountain in November and is in 200 feet. In this tunnel a body of cyanide ore of low grade, but of sufficient value to make working profitable, has been cut. In another tunnel, farther up the hill, another body of higher grade ore is shown, says Superintendent W. E. Wilson. A mill will be built during the coming summer.

Granite County.

Machinery for the mill being built by the Willow Creek M. Co., near Phillipsburg, is on the ground. The mill will be ready for operation by March 1st.

Jefferson County.

M. L. Hewitt, manager of the Cataract C. M. Co., in Cataract district, near Basin, says the smelter is completed and is expected to be in operation this week. Delay was caused by waiting for coke and coal supplies.

The Pennsylvania-Montana M. Co., operating the Hattio Ferguson mine, in Cataract district, near Basin, has placed its machinery and operations are under way. The number of men at work will be increased. The water has been pumped out of the shaft.

Lewis and Clarke County.

It is expected operations will be resumed at the Whitlach-Union mine, under bond to Canol & Martin of Helena. The Whitlach-Union is 4½ miles from Helena. They will sink 500 feet, going down on the dike. The ores are free milling. Canol & Martin have two shifts of men developing the M. & N. group in Ontario district, which group includes the Sure Thing mine.

They are nearing the 300-foot level, where station will be put in and crosscuts run from it. The shaft was sunk on the lead and the vein is 35 feet wide.

On the Big Indian mine, near Helena, development work is progressing. The company will develop it to depth of 1000 feet. Besides the 1000-foot shaft to be sunk on the largest vein two tunnels are being run, one to be driven 1200 feet to tap the main veiu at depth of several hundred feet below the present workings. It was expected to run this tunnel at least 700 feet before striking any ore body, but a vein was cut at distance of 150 feet which was previously unknown.

Madison County.

The Alder M. Co., operating on the Kearsarge and Rough Rider mines at Summit, near Virginia City, is pushing work on its mill and cyanide plant, and it is expected the machinery will be in operation by March 15. The company has sixty men on the payroll, besides forty miners who are further developing the Kearsarge. Two tunnels will be run. One will be driven 1500 feet to crosscut several veins known to exist. The other tunnel will follow the vein of the Rough Rider and will run in 1000 feet, developing the mine to depth of 750 feet.

The Dakotah M. Co., which is operating a group of mines in Hungry Hollow, has bought the General Shafter mine, near the Kearsarge mine, near Virginia City. Men have been put to work and will develop it. There is a 5-stamp mill and cyanide plant on the mine, the capacity of which will be increased.

The Grant M. Co. is working the U. S. Grant and Fairweather mines, 1 mile from Virginia City. The company has forty men on these properties. Three carloads of concentrates were shipped last week to the East Heleua smelter, and further shipments will follow. There is a 15-stamp mill, concentrator and cyanide plant, the power for which is derived from two 60 H. P. engines.

NEVADA.

Eureka County.

R. A. & W. Laird are working men in the Williamsburg mine on Adams hill, near Eureka. They have sunk 65 feet and drifted 95 feet, and have 30 feet more to drive before tapping the body of ore, says the Sentinel.

Lincoln County.

F. R. McNamee of Salt Lake City, Utah, has a lease on the manganese mines, 14 miles east of Los Vegas, near De Lamar, and will increase development work. He has men on the Iron King claim. Averages from the surface give 42% manganese and 27% iron, says the De Lamar Lode. It is intended to sack and haul it to Manvel, Cal., a distance of 70 miles, from where it will be shipped to Chicago for practical test. It will be hauled to Los Vegas as soon as the railroad reaches that point.

The Quartette mine, at Searchlight, has reached its 700-foot level and drifting will be begun.

Nye County.

(Special Correspondence).--Active work has begun on the 63 miles of railway on the Tonopah-Rhodes route. There is considerable material on hand at Sodaville, and with fair luck the road ought to be in operation into Tonopah by June next. A. Tripp is superintendent.

Tonopah, Jan. 24.

The Mohawk-Alpine M. Co. has been organized, with headquarters in Utica, N. Y., by C. Y. Fuller, F. A. Cassidy, J. C. Breen, W. M. Van Auken and B. E. Shear, the last-named being manager. The holdings of the company comprise six claims near the Nevada-Alpine mine, near Tonopah. Work is under way and shows silver-lead ore. Below the outcrop a shaft has been sunk 25 feet and a crosscut run into the hill 27 feet.

The Toyabbe M. Co., which has been organized by Skelton & McCarthy, has bought a group of claims in the Toyabbe range, 80 miles north of Tonopah, 40 miles south of Austin, and west of the road between Austin and Belmont. These mines are said to be in the same mineral belt as the Ophir Canyon mine, 2½ miles distant. The main ledge is 6 feet in width, with a 12-inch streak on the foot wall that averages $55 a ton. This ore runs about 30% lead. The other 5 feet of the ledge averages 10% lead, twenty ounces silver and $5 gold per ton. The company proposes putting in a concentrating plant and a compressor plant in the spring. C. S. McCarthy is manager.

Storey County.

(Special Correspondence). — "Keeping everlastingly at it brings"—an occasional dividend. On Jan. 21 the Ophir M. Co., on the Comstock, declared a dividend of 25 cents per share, the first since Jan. 12, 1880—twenty-four years ago, during which time work has been steadily prosecuted. The company expects to continue the regular payment of dividends. In the old days on Pine Street, San Francisco, Ophir was the favorite with those who followed Fortune's fluctuations, for no matter what ups and downs of the other stocks, Ophir was always counted on as a good buy on which to make quick returns.

Virginia, Jan. 22.

W. G. Douglass, superintendent of the Alta mine, says it is expected the Alta shaft may be used in connection with contemplated deep work in the Gold Hill part of the Comstock.

The Ophir M. Co. at Virginia City last week received $20,184.61 as net proceeds of the sale of five railroad cars of ore shipped to the smelter, says the Virginia City Chronicle.

Washoe County.

E. & H. I. Olinghouse have their stamp mill at Olinghouse in full operation.

Manager Williams says the Williams mill is dropping its stamps on high-grade ore from his mine and from the Cabin and Gold Ledge mines at Olinghouse.

NEW MEXICO.

Grant County.

A body of copper ore is being worked by Ernest & Islas on their lease on the Aztec mine, near the Romero, at Santa Rita. Five shafts have been sunk on this body and the lessees are preparing to sink another one to depth of 150 feet. They are putting in a steam hoist and other improvements.

Guadaloupe County.

Gold-bearing placers are reported found on Revuelto creek, 18 miles east of Tucumcari, on the Rock Island Railroad. Three hundred men are on the ground. The formation is said to be of black sand.

Rio Arriba County.

W. W. Ingersoll of Santa Fe, operating in Bromide district, near Hopewell, will drive a 1000-foot tunnel on the Bromide mine.——The Strawberry mine, in Bromide district, has closed down temporarily.

At Bromide it is reported the Tusas Peak M. Co., owning and operating the Tampa mine, will build a mill in the spring. The Tampa shaft is down 270 feet and is being sunk deeper. Stringers from the vein are being cut in the shaft and crosscuts will be run from the 300-foot level to the vein.

Sierra County.

A ten years' lease has been given to the Bigelow G. & C. M. Co. on land surrounding the Warm Springs, 2 miles north of Hillsboro.——The new mill built by the South Percha G. M. & M. Co., near Hillsboro, is in full operation.

Socorro County.

The Tularosa Democrat at Estey City says F. Boner is preparing plans for a 50-ton smelter to test all classes of smelting ore. As soon as the test is made the company will build a smelter that will give them, with their other processes, a capacity of 400 tons a day.

The Mogollon G. & C. Co., which is working the Cooney mine at Mogollon, is running 120 tons a day through the concentrator, having doubled its capacity. Rolls are being used instead of stamps. Several concentrating tables have also been added. Machine drills have been put into the mine. Six tons of concentrates are being produced by the mill per day. In the mine a depth of 500 feet has been obtained and arrangements are being made to sink deeper.

Taos County.

E. Westoby is developing the Jack Pot mine on Goose creek, near Red River.——G. B. Crow is working on his group on Black mountain.——Men have been put to work by M. Carmichael on the Franklin placer, near Red River.——C. Purdy and W. D. Cannon are developing the Norway mine, in Road canyon, at Red River. They have cut a new lead.

OREGON.

Grant County.

It is reported Burbridge & Burch are preparing to work their placer property on Crane Flat, near Granite. They have incorporated the Oregon G. Dredging Co., of Spokane, Wash., with F. Burbridge, A. Burch, J. F. Herrick, D. T. Ham and M. A. Folsom as directors. The Crane Flat placers consist of 240 acres of dredging ground. The company will put in dredgers in the spring. The gravel is estimated to average 30 cents a yard. The dredger will have a steam plant capable of generating 150 H. P.

Ore shipments are being made from the Fourth of July claim, on Granite creek, 4 miles from Granite. The Fourth of July adjoins the Gold Hill group. W. Wade, S. Camp and J. C. Wooley are principal owners.

Lane County.

The 15-stamp quartz mill at the Lucky Boy mine, at Blue River, has been closed down pending removal to the new millsite. Twenty-five additional stamps will also be put up. The millsite is 100 yards farther down the mountain side than the old mill, where there is plenty of water for running the enlarged plant. Power for operating the mill will be furnished by the electric power plant which the company has built on the McKenzie river, 6 miles from the mill.

Union County.

At a depth of 280 feet a vein of coal is reported struck in an artesian well on the J. W. Townley ranch, near Union.

Wallowa County.

It is reported the Tenderfoot M. Co., near Joseph, will build a 20-stamp mill, with cyanide plant. A sawmill will first be put up to prepare lumber for the buildings.

SOUTH DAKOTA.

Custer County.

The shaft of the Black Hills C. Co., near Custer, has been unwatered and work resumed in the crosscutting toward the west at the 700-foot level. The work shows a body of copper and iron pyrites carrying values in copper and gold. J. B. Taylor is superintendent.

The Saginaw M. Co. will resume operations at its mine, 8 miles northwest of Custer, this week, says Manager Woodbury. The company owns claims in the same belt with North Star and Roosevelt mines. A shaft has been put down several hundred feet following a vein of milling ore. A steam hoisting plant has been put in.

Lawrence County.

Operations were resumed last week in the mines of the Horsesboe M. Co., near Deadwood, and ore is being received at its cyanide plant in Terry. The mill will be started this week. Shipments will be continued to the National smelter at Rapid City, which is again in operation after a temporary shut down.

A deal is pending in Yellow Creek district, south of Lead, for consolidation of Wasp No. 2 and the Alder Creek companies and other boldings, jointly connected, embracing 500 acres of ground. There are deposits of cemented and quartzite ore which are said to be amenable to the cyanide process. Beneath the quartzite there have been found several veins of free milling ore in the slates. W. R. Dickinson of Lead is manager.

A strike of ore is reported in the mine of the Queen of the Hills M. Co., in Whistler gulch, south of Central City. The ore is found in a vertical vein, and is free milling.

The air compressor has been set up at the tin mill of the Tinton M. Co. at Tinton. The mill will have a capacity of 125 tons of ore daily and is expected to be put in operation next week. The main workings are 2700 feet from the mill and the ore will be trammed to the mill by gravity. Another tunnel will be started lower down the hill, which will give a depth of 300 feet on the main ore vein. M. Lyon is superintendent.

Pennington County.

The mill of the Sunbeam M. Co., operating on Friday gulch, 7 miles northwest of Hill City, will be put in operation next week. The shaft has been sunk to a depth of 450 feet and crosscutting is being done east and west at the 300-foot level.

The Empire State M. Co. proposes to build a stamp mill this season. Its mines are near Palmer gulch, 5 miles east of Hill City. J. B. Stafford of Hill City is manager. Increased development work is being done, opening up more ore. A drift is being run east.

Work has been resumed at the J. R. mine, 4 miles east of Hill City. There is a shaft 260 feet deep following a vein of free milling ore. The lower workings are being unwatered preparatory to further development. An air compressor has been set up and other improvements made. F. C. Crocker is principal owner.

A stamp mill with cyanide annex will be built by the Lakota G. M. & R. Co. at the Grizzly Bear mine, 5 miles southeast of Hill City. Considerable ore has been blocked out. A hoisting plant will be put in.——The Clara-Bell M. Co. will increase the size of its mill this spring, says F. Herbert of Oreville, manager. The main ore shoot has been struck again in the shaft and a hoisting plant has been set up.

A test run has been made by the Mainstay M. Co. at Keystone in the Bismark mill. The shaft is 400 feet deep, with crosscuts at the 200 and 300-foot levels, which have opened up three veins of low grade free-milling ore.

TEXAS.

Shipments of crude and refined oils from the Beaumont (Jefferson county) and Sour Lake (Hardin county) fields during the year 1903 amounted to 15,000,000 barrels, says the Record. Of this, 7,572,849 barrels went from Port Arthur by steamer and barge to New Orleans, Atlantic coast points, Cuba, England and Egypt; 1,416,178 barrels by steamer and barge from Sabine Pass to foreign and domestic points, and 5,711,615 barrels shipped by tank cars to points in Texas and Louisiana, only a small percentage of the rail shipments going to States other than these two. From Jennings (Louisiana) 298,800 barrels were shipped during the year 1903 by rail. Combining the rail shipments with the water shipments, the total from Texas and Louisiana fields amounted to 14,999,442 barrels. The record of shipments by the Kansas City Southern Railroad for the year was not obtainable, nor a complete record of barge shipments from the Jennings field. Of the rail shipments, the Southern Pacific handled from Gladys (Spindle Top) 10,667 cars; from Beaumont 1663 cars; from Sour Lake 11,359 cars; from Jennings 1328 cars. Shipments from Sour Lake were not started until July, 1903. The Santa Fe moved 3833 cars from Beaumont. In computing the Southern Pacific shipments from Gladys and Beaumont, an average car capacity of 200 barrels is used. Most of the system cars shipped from Gladys and Beaumont are of 300 barrels capacity, while the private line cars vary from 160 to 200 barrels. At Sour Lake the 300-barrel system cars predominate. The same applies to Jennings. The Santa Fe system cars are of 225 barrels capacity. It is difficult to figure the completo production of the various Texas fields for the year 1903, owing to the great number of operators and diversity of interests, but estimates are stated as follows: Spindle Top, 6,500,000 barrels; Sour Lake, 7,000,000 barrels; Jennings, 500,000 barrels; Saratoga, 100,000 barrels; total estimated production, 14,100,000 barrels. Estimates of oil in storage range between 7,000,000 and 8,000,000 barrels, not including the 1,500,000 barrels in Southern Pacific tanks or Texas oil in storage at Eastern stations.——The Higgins Oil & Fuel Co. will increase operations at Batson. The company has bought nine acres near the new wells and two rigs are at work. Six-inch pipe has been ordered for a line from Batson to Sour Lake. This line will be used by the Higgins Co., the Paraffine Co., the Heywood Co. and other producers who have oil to pipe to Sour Lake. From Sour Lake to Beaumont the Higgins Co. will use the United Oil & Refining Co.'s 6-inch line, and from Beaumont to Port Arthur the line of the National Oil & Pipe Line Co.——The Heywood Oil Co. is sinking the first well on its Batson lease, within 200 yards of the flowing wells. The drill is nearing a depth of 1000 feet.

UTAH.

Beaver County.

The Estella M. Co., near Milford, is increasing development, says Manager Tarbet. The new working shaft, which has been started at a point near the ore body, is down 70 feet. The steam hoist is in place and the company will build a stamp mill, with an auxiliary cyanide plant.

A strike of copper ore is reported made on the Letitia group of mines, near Milford, assaying 7% copper, with values in gold and silver.

Cache County.

A strike of native silver ore, which also carries gold, is reported made in the ground of the Vipont M. Co. in La Plata district, 25 miles from Logan. W. A. Wilson of Salt Lake City is manager.

Carboo County.

Sunnyside camp is making greater output of coal from the two mines of the Utah Fuel Co. there than at any previous period. A full number of men is at work, with the experienced digger making $4 a day on an average, while the new men are averaging $3 for eight hours' work. Men are being turned away from Sunnyside, as the company has all the men it can work. Those for whom there is not room at Sunnyside when applying for work are sent to the other camps of the company at Castle Gate, Clear Creek and Winter Quarters. At Castle Gate, with the new men arriving from the several settlements where diggers are being recruited, there are 200 miners employed. Twenty-five additional men will bring the number up to normal.

Grand County.

Negotiations are under way for consolidation of the International C. M. Co. and the Dirigo-La Sal M. Co., operating at Basin, in the La Sal mountains.

Juab County.

A new shaft at the Eagle & Blue Bell mine, near Eureka, was started last week. Men are working from four levels, two shifts, raising and sinking, and as soon as connections can be made from the incline shaft the number will be increased. The management hopes to have the shaft down 700 feet by July 1. The shaft will go down 1300 feet from the mouth of the tunnel, 500 feet below the surface. As soon as the shaft reaches the bottom of the old workings stoping will start.

Salt Lake County.

The Highland Boy mine, at Bingham, is

said to be producing an average of 700 tons of ore per day, 550 tons of which go to the company's smelter in the valley. Work on the addition to the smelter is progressing.

The United States M. Co. will add a battery of lead furnaces to its copper smelting plant at Bingham, and plans are being prepared by G. K. Fischer, the company's mechanical engineer.

An Eastern company represented by A. V. Patten of Ogden has an option on the Castro group of mines at Bingham for $60,000, says the Reporter.

Summit County.

It is reported negotiations are pending for the sale to the Federal M. & S. Co. of the Silver King and the Daly West mines at Park City, both producers of silver-lead ore.

Tooele County.

Superintendent Raddatz of the Honerine mine at Stockton says he expects the milling plant to be put in operation by Feb. 15.

Uinta County.

C. O. Baxter of Salt Lake City, manager of the St. Louis Gilsonite Co. interests, on the edge of the Uinta reservation, says work is progressing on the line of railway to give outlet for product of their mines. The grading for the line, which extends from Camp Gulch to Crevasso on the Colorado-Utah strip—a distance of 50 miles—is expected to be completed by February 10th, when the company will have established direct connection with the Rio Grande railway. The Dragen ledge owned by the company is said to be 8 feet between walls.

WASHINGTON.

Ferry County.

(Special Correspondence).— The Hendryx cyanide process will be in operation February 1 at the Mountain Lion mine.—— The Quilp mine is working as usual and hoisting an unusually high grade of ore. ——The Knob Hill mine is making a raise from the 150-foot level to the surface. There are 4 feet of shipping ore in the face of the drift.——The Belcher, a copper-gold property, is being opened up. It is smelting ore, carrying a high percentage of iron and 30% sulphur.——Work is resumed on the Wauconda group.

Republic, Jan. 23.

Sinking on the Abe Lincoln mine, near Orient, has been started under contract for the Hibernian G. M. Co., incorporated to operate the Abe Lincoln and Bryan claims. Three shafts have been sunk on the Abe Lincoln ledge, which shows on the surface 100 feet wide, carrying gold and silver values. The Hibernian Co. is composed of Spokane, Wash., men, the officers being H. H. Martin, F. M. Morris, L. Hughes, J. Parry and A. E. Gallagher.

Manager C. T. Porter says the Golden Lion-Little Four mines will sink 200 feet on the 40-foot shaft before drifting or crosscutting.

Stevens County.

The Last Chance mine, near Northport, is hauling ore for shipment to the smelter, says L. P. Larson, owner.——Five furnaces are in full blast at the Northport smelter of the Le Roi (Rossland, B. C.) Co., and a sixth one is being remodeled for operation next month.

WYOMING.

Bighorn County.

A second oil strike in the Bonanza fields, near Bonanza, this month, is reported made by the Collins company, which struck a flow of oil at depth of 765 feet. The flow was ten barrels a day, but the well has been cased and drilling will be resumed to reach the second oil stratum.

Carbon County.

The No. 4 entry of the coal mine at Hanna is again afire and all men were taken from the mine until the fire can be subdued or walled in. The mine is not yet fully repaired from the explosion of last June. The fire is confined to a small area.

The Boncecovia M. Co. of Detroit, Mich., and Cleveland, Ohio, men, is preparing to prospect mining claims which it owns 4 miles north of Rawlins. A contract for 100 feet of work has been let. Assays on ore from this claim show copper and gold values.

Sweetwater County.

The Belgo-American Oil Drilling Co. has men at work drilling several wells for oil in the Salt Creek fields near Rock Springs, and operations will be continued through the winter. One of the wells is being put down by an English crew and the other is in charge of American drillers. The methods employed by the two crews are different and the results secured by each are being watched with interest.

Uinta County.

Evanston reports say oil and coal prospectors have been warned by the Union Pacific R. R. Co. that they must confine their prospecting in southern Wyoming to government land and make no locations on sections of the railroad grant. Locators insist that if they discover oil or coal they are entitled to a patent.

FOREIGN.

The British gold output for 1903, in ounces, compared with 1902, is reported as follows:

	1903.	1902.
British Columbia	....	*230,491
India	600,060	514,291
Transvaal	†2,677,088	1,707,661
Rhodesia	†15,711	17,918
Western Australia	†2,106,974	2,092,555
Queensland	909,900	860,153
Victoria	†711,710	777,738
New South Wales	†286,063	300,289
New Zealand	....	508,015
Tasmania	‡35,186	69,491

* Lode only. Placer gold: 1902, $1,073,110.
† Eleven months only.
‡ Six months only.

AUSTRALIA.

Queensland.

The Queensland returns for gold for December are reported as follows:

	Tons crushed.	Yield in ounces.
Charters Towers	24,300	35,300
Croydon	8,900	9,800
Gympie	10,400	10,800
Mount Morgan	20,300	9,500
Ravenswood	2,000	3,500
Other fields	6,700	6,800
Alluvial	....	1,900
Total	....	86,600

The total yield for the twelve months of 1903 was 909,900 ounces.

Western Australia.

The value of the government water system for Coolgardie and Kalgoorlie sections is shown by one mine's saving on the field, says the W. A. Journal. Fresh water pumped from Helena river is supplied to the mines at 5s per 1000 gallons through agency of company acting as lessee, which is the payee to the government under the agreement to buy 500,000 gallons per diem from the C.W.S. The purchased water in month of October averaged 520,000 gallons a day, or 20,000 above the contracted quantity. The mines on their part have to let run to waste the whole of the salt water pumped from the workings. The Ivanhoe mine last summer had a water bill of £76 per day; now it is £22 per day. The Bouldor and others of the larger mines are similarly assisted. One summer the mine had an outlay of £5000 a month for water. When the hot weather arrives the consumption, on account of evaporation, will, of course, be greater.

BRITISH COLUMBIA.

Boundary District.

Work was resumed at the Rathmullen mine last week, near Summit camp. G. E. Foster is principal owner.——The Hall M. & S. Co. has contracted for output of the Oro Denoro mine, in Summit camp, but the ore will be treated at the British Columbia C. Co's. smelter at Greenwood for the present.——Work on the Senator group, in Summit camp, is progressing and ore shipments are regularly made to the Granby smelter, which company has a bond on the mine. The ore has high percentage of iron, making it desirable for smelting.

P. McDonald and J. Sutherland, owners of the Elkhorn mine in Providence, last week made a strike of ore carrying gold and silver values.

East Kootenay District.

The John Bull group of claims, 3 miles above St. Mary's Lake at the Meadows, has been sold to L. A. Jarnagin of Spokane, Wash. Development work consists of a tunnel, in 60 feet, with 6 feet of copper ore showing in the face. Assays give 12% copper and $5 in gold. Jarnagin has has also secured the Dominion adjoining, a silver-lead prospect, showing 6 feet of galena on the surface and continuing 60 feet in depth. A second lead carries copper and gold values, and has a shaft down 62 feet in ore. Development work will be increased in the spring, under superintendence of Mr. Jarnagin.

At Wilmer it is reported the Ptarmigan mine has closed down.

The records of the Government office at Fort Steele show for the year 1903: One hundred and sixty-nine claims held under Crown grants or certificates of improvements; 335 certificates of work issued; 193 mineral locations recorded; total number of existing claims in Southeast Kootenai, 696. Eighty-seven transfers of mineral claims were made during the year. Number of free miners' certificates issued was 400.

Rossland District.

At the Rossland Power Co.'s 200-ton plant, near Rossland, to handle War Eagle - Centre Star ores construction is progressing. The main buildings are completed and the machinery is being set up. The management expects to have the works in operation by May 1.

At Le Roi mine, at Rossland, the output is being brought up to a basis of 24,000 tons per month. Much of this ore is being taken from the stope on the 800-foot level, where the face is said to be 80 feet in width. In the 1350-foot level development of the ore shoot is progressing.

Slocan District.

An impulse water wheel has been set up at the Alamo concentrator and crushing started.——Water pipes are being laid at the Rambler mine at McGuigan and hauling of coal will cease.——Men are at work at the Whitewater Deep mine.——The jigs in the Ivanhoe mill at Sandon are being changed from double to four-compartment, to handle the zinc values to greater advantage. The Slocan Star mine will do the same.

Three feet of galena has been struck at the Hope claim at Sandon. ——The lessees at the Republic group are making shipments of ore. The ore is being taken from the Bell claim.

Work is progressing on the L. H. mine on Red mountain, near Silverton. It is owned by Fingland, Tingling & Brand. Two tunnels have been driven and at the face of the drift there is a shoot of 18 inches of quartz which carries $40 in gold per ton. The ledge is 10 feet wide. There are two tunnels on the mine, the longest of which is in 500 feet. The first 150 feet of this is crosscutting, the balance drifting on the lead. The second tunnel is in 100 feet and will tap the lead. The mine is 3 miles from Silverton and 1½ mile from a wagon road.

West Kootenay District.

The Elwood Tinworkers' G. M. Co., Ltd., with main offices at Elwood, Ind., has bought a fourth claim in Lardeau district, being the Silver Dollar, near Trout Lake, which has a free milling vein opened for distance of 3000 feet. The Elwood Co. will build a mill on the Silver Dollar claim to handle ore from all its holdings.

The total amount of ore shipped from the Silver Cup mine, near Trout Lake, during the year 1903, was 976.12 tons, having value of $82,212.87. —— The total amount of ore shipped from the Nettie L. mine for the year 1903 was 1042.73 tons, having value of $57,678.54.

The shipments during 1903 from Ferguson camp fell behind those of 1902, owing to building of reduction works jointly by the companies owning the Nottie L. and Silver Cup mines, it being deemed wiser to await the completion of the plant than continue shipping under a high freight and treatment rate. The Silver Cup mine shipped 976 tons in 1903, with a value of $82,212. The Nettie L. sent out 1042 tons, with a value of $57,678.

At both the Lucky Jack and the Swede groups of the Great Northern Mines, Ltd., at Poplar, in the Lardeau, showings of high-grade quartz are being opened up. Mill tests made at the company's mill at Camborne have been completed on ore from both groups. One and one-half tons from the Lucky Jack — the ore being taken from both surface and underground workings—gave $150 per ton on the plates, says the Spokesman. Returns for nine tons from the Swede group gave $37 per ton on the plates. E. M. Morgan is superintendent. The initial month's run of the Great Northern Mines, Ltd., 10-stamp mill at Camborne produced $5000 on the plates from 500 tons. The ore was taken from the dump at the upper workings of the Rossland claim. A contract has been let for the completion of the Terminal tunnel to be the main outlet for both the Rossland and the Criterion veins. It is a crosscut and must be driven 400 feet before striking the main lode, giving depth of 250 feet. —— The Golden West and Crown King mines have been bonded to W. F. Teetzel et al. of Nelson, B. C., for $25,000. Development will be started in the spring.

Yale District.

Fourteen square miles of coal lands in the Nicola district will be developed, says W. Holland of Toronto, manager of a company of Eastern men who control the ground. It is said the coal mines were first proved several years ago by Government borings, which prospected 10 square miles of territory. This is said to have shown large bodies of bituminous coking coal generally in the valley to a depth of between 600 and 700 feet. Some of the veins are said to be 16 feet wide. The company has a charter from the Dominion Parliament and a bonus of $6400 per mile to build a railroad. The road will connect with the Canadian Pacific railroad at Spence's bridge. Surveys are said to have shown that a 1% grade can be secured for the entire 50 miles between Spence's bridge and Nicola lake. The line will follow the course of Nicola river and gives access to mines at junction of that stream with Coldwater river. In addition to the coal there is said to be a number of copper claims which will be reached by the road, and a hematite deposit. It is planned to build coke ovens at the coal mines.

CANADA.

Ontario.

The Canadian Manufacturer says for some time past the government of Ontario has had under consideration the question of withdrawing from sale or lease all the known unsold nickel lands in the Province and offering them to the Imperial Government to provide war material for the manufacture of armor plate and British guns. The order in council of November 11, 1903, withdrawing a belt of land 10 miles wide on each side of the Temiskaming and Northern Ontario Railway, to reserve the minerals, especially the nickel ores, is the first step toward making possible British ownership of the nickel of Ontario.

INDIA.

The output of the gold mines of India by months for 1903, compared with 1902, is given in ounces as follows:

	1903.	1902.
January	48,080	41,612
February	46,268	40,053
March	48,327	41,575
April	48,271	38,329
May	48,628	28,063
June	48,980	37,166
July	50,571	42,847
August	50,286	49,628
September	51,452	49,420
October	52,724	47,858
November	52,016	48,332
December	54,157	48,078
Totals	600,060	514,291

The principal producers for month of Decombor were:

Champion Reef—	
Mill, tons	15,300
Mill, ounces	15,364
Tailings (cyanide), tons	20,176
Tailings, ounces	2,412
Total ounces	†18,815
Mysore—	
Mill, tons	16,150
Mill, ounces	15,250
Tailings (cyanide), tons	11,882
Tailings, ounces	1,562
Total ounces	*18,388
Oorégum—	
Mill, tons	11,636
Mill, ounces	5,565
Tailings (cyanide), tons	9,472
Tailings, ounces	1,038
Total ounces	6,603
Nundydroog—	
Mill, tons	6,100
Mill, ounces	5,804
Tailings (cyanide), tons	5,211
Tailings, ounces	566
Total ounces	6,370
Balaghat—	
Mill, tons	3,030
Mill, ounces	2,183
Tailings, tons	2,160
Tailings, ounces	224
Total ounces	2,707
Mysore West and Mysore-Wynaad—	
Mill, tons	2,172
Total ounces	1,101
Hutti (Nizam's)—	
Tons	640
Ounces	473

* Including 1234 ounces sealings from plates and 342 ounces base bar.
† Including 1039 ounces from plates.

MEXICO.

Chihuahua.

The Batopilas M. Co., owning a mineral concession of 69 miles square near Batopilas, in district of San Andres del Rio, has five properties in operation—the Porfirio Diaz tunnel, and the San Mignol, Todos Santos, Camudin and Descubridora mines. The Porfirio Diaz tunnel is in 7000 feet. Five shafts are also being sunk, four being incline and aggregating depth of 3750 feet, and the other is vertical with depth of 700 feet. The underground workings are said to total 44 miles. The vein is 3½ feet in width, the ore carrying native silver and sulphide. Equipment consists of a 75-stamp mill (800-pound stamps), a 25-stamp mill (900-pound stamps), nine table concentrators, six single hoists, two of which are steam and the other four gasoline, four boilers, two 14 H. P. electric generators for lighting the mines, mills, camp, etc., one roasting furnace and lixiviation plant with capacity of ten tons per twenty-four hours, one amalgamation plant consisting of eight pans 3½ feet in diameter, and four settlers. Another twenty-five stamps are being added to the 25-stamp mill, which are expected to be in operation by Feb. 1. Both mills are operated by water power, water being brought in an aqueduct 2½ miles long, and generating total of 350 H. P. The 75-stamp mill is equipped with foundry and machine shop. The mines are 250 miles from the nearest railroad, and all supplies are brought in by mule train.

Guerrero.

Thirty-two kilometers west from Chilpancingo, and in Bravos district, the Delfina M. Co. is operating La Delfina group of mines. Development consists of one inclined shaft, down 100 meters, and of one tunnel, in 390 meters, says the Mexican Investor. The high-grade ore, sulphide of silver and antimony (pyrargyrite), is said to run $400 silver per ton. This ore is shipped for treatment. The low-grade ore is treated by the 5-stamp mill and concentrators on the ground. The company is putting in a 25-ton-per-day

smelting plant which will handle the high-grade ore.

Los Tres Aztecas y Anexas M. Co. has taken over and is operating the Calandria, Montezuma, Cierro Altos and Mercurio claims, in Alarcon district, 16 kilometers northeast from Naranjo station, on the Mexican Central Railroad. These mines are tunnel propositions. Three tunnels are being driven — two from opposite sides of one of the mountains on the group, and one is being driven into another ridge. The first two are being driven to meet at a common point and are expected to tap the ore bodies at depth of 400 feet below the old workings. The other tunnel will tap the ore bodies at depth of 700 feet below the previous workings. The ore is said to carry lead, silver, iron and some gold.

Jalisco.

(Special Correspondence).—The owners of the Bolanos mines are working ore running fifteen ounces in silver per ton. The ore also carries high percentage of lead, with some copper. Several companies have tried to work the rich ores below the water level, but their pumping plants have proven inadequate.

Mexican gambucinos (prospectors) are working the tin veins north of Huejuquillo. They do their own smelting and sell their product in Zacatecas, where it commands about 58 cents per pound in Mexican currency.

Zacatecas, Jan. 15.

Michoacan.

At the Dos Estrellas mine, at Tlalpujahua, two tunnels are being driven and two vertical shafts sunk. The main or Dos Estrellas tunnel is in 835 meters, and the Cedro tunnel, the face of which is 1609 meters north of that of the main tunnel, is in 535 meters. The two-compartment north shaft is expected to tap the Cedro tunnel at depth of 250 meters and at a point 750 meters in. Should developments continue satisfactory, it is stated that the management will enlarge each of the shafts to four compartments and add another hoisting plant at each. They also propose enlarging the present single-compartment main tunnel to double-track width.

G. A. Evans of Telluride, Colo., says his company is preparing to build a smelting plant near Tejupilco.

The Jupiter M. Co. will put in pumping and hoisting machinery at its mines near Tlalpujahua, says A. E. St. Morris, superintendent.

Nuevo Leon.

Additional machinery will be put in by the Alamo M. Co. at its mines in the Montanas mountains, near Monterey. F. T. Howe is manager.

Oaxaca.

F. L. Freeman of Cincinnati, O., interested in the Frederico mine, near Oaxaca, says they are preparing to put in additional machinery.

Sonora.

(Special Correspondence). — Extraction methods will be improved in operating the Cinco de Mayo mine at Pilares de Tierras, in Moctezuma district. A railroad will be built from the mine to La Para, ou the Copper Queen Co.'s branch to Placeritas de Nacozari. The mine is owned by Gen. Garcia and is a chloriding proposition.

Nacozari, Jan. 16.

The Winona M. Co., which is developing a copper property—the Maravilla—in San Antonio Pass, 20 miles southeast from Nogales and 3 miles south of Washington Camp, has the shaft down 100 feet and is drifting for the ledge, which the shaft cut in going down, passing through 53 feet of copper ore.

G. Wyman, president of the Wyman M. Co., which is operating the Animas mine at San Javier, states that the concentratiou plant in course of construction will be ready for operation in April.

On the Dormido mine, owned by W. F. & H. K. Chenoweth, a strike has been made of high-grade gold ore. The Dormido is near the Providencia mine, owned by the same parties. They are 7 miles east from Cerro Prieto, in Magdalena district.

C. W. Phillips of the Rey de Oro M. Co., near Magdalena, says it is the intention of the company to build a 10-stamp mill on its mines.

The dredger of the Chicago & Sonora G. Placer M. Co., near Suaqui Grande, is reported to have resumed operations, says the Oasis. During the rainy season in July the boat was washed away, landing high and dry on one side of the scene of work.

At Arizpe, it is reported, a strike has been made of gold-bearing ore in the Las Chispas mine, owned and operated by J. Pedrazzini.

J. Henderson of Nogales, Ariz., manager of the Mina del Oro mines of Provenir de Sonora M. & M. Co., says he is preparing to build a pumping plant at Saucedo, 1½ miles from the mine, and also lay a pipe line. The mine is near Poza station on the Sonora Railway.

The American-Mexican M. & Dev. Co., G. Charters, manager, operating at San Ricardo, will lay pipe line and build pumping plant for the mill and mine.

Superintendent D. J. Duncan of the Hays Con. M. & M. Co., operating near Quipano, says the masonry work for the dam and the pump foundations is under way. A pumping plant and pipe line will be put in.

Tamaulipas.

R. Benevedo of Matamoras, who has leases on 500,000 acres of oil lands in Tamaulipas, reports he is, with California men, preparing to develop the holdings for oil.

NEW ZEALAND.

The gold returns for New Zealand for month of December is reported at 49,794 ounces, of value of £193,261, as compared with 64,071 ounces, value £248,293, in December, 1902.

RUSSIA.

The Russian Department of Mines reports the output of platinum in 1903 to have been 389 poods 3 funts, which is equivalent to 14,007 pounds, as compared with an output in 1900 of 310 poods 26 funts, or 11,183 pounds.

Personal.

R. J. CORY, manager, Denver office, Allis-Chalmers Co., is in Chicago, Ill.

H. B. HICKEY of Albion, Cal., is in San Francisco, Cal., on mining business.

E. K. SMART of Grass Valley, Cal., is in San Francisco, Cal., on mining business.

W. G. DOUGLASS is superintendent of the Alta mine on the Comstock, near Gold Hill, Nev.

W. BRAY of Placerville, Cal., interested in El Dorado county mines, is in San Francisco, Cal.

A. S. MORRISON has resigned as superintendent of the Noonday copper mine, near El Dorado, Cal.

H. W. TURNER has returned to San Francisco, Cal., from an examination of mines at Bohemia, Or.

M. M. GREEN, M. E., is professor of mechanical engineering at the University of Colorado, Boulder, Colo.

G. D. DOVETON of Denver, Colo., is at Torres, Sonora, Mexico, constructing slimes plant for Crestone Co.

A. C. KYLE is superintendent of the Bullion M. Co., operating on the Comstock, near Virginia City, Nev.

T. DENNIS has resigned as superintendent of the Adventure copper mine at Greenland, Ontonagon county, Mich.

M. J. LIDSTONE of San Francisco, Cal., has gone to San Bernardino county, Cal., to build a milling plant near Dale.

O. E. KIRKPATRICK of Leesburg, Idaho, superintendent of the Gold Flint mine, is in Chicago, Ill., on company business.

D. ELLIS is assistant mine foreman of Horseshoe M. Co., near Deadwood, S. D., and will have charge of the Hardscrabble mine.

S. BAMBERGER of Salt Lake City, Utah, is president and manager of the Lower Mammoth mine in Juab county, Utah.

W. W. ELLIOTT AND F. M. DRESCHER have opened an office in Prescott, Arizona, for examination of and reports on mines.

J. W. PENDER is manager of the San Diego, the Capitanena and the San Nicolas mines near Santa Barbara, Chihuahua, Mexico.

J. W. ASTLEY, superintendent of the Snowshoe mine at Greenwood, B. C., has gone to London, England, on company business.

SUPERINTENDENT S. TARBET of the Estella M. Co., operating near Milford, Utah, has been appointed manager of the company.

S. A. MARTINDALE is superintendent of the gold dredgers of the Folsom Dev. Co., operating near Folsom, Sacramento county, Cal.

B. C. BURNHAM, of Denver, Colo., will represent the Broderick & Bascom Rope Co. of St. Louis through the intermountain territory.

W. W. TINER has returned to San Jose, Cal., after a two-years' engagement with a Russian mining company operating in Mongolia, China.

W. R. MILLHAM, manager of the Interstate G. M. Co., is at Custer, S. D., to take charge of development work on the company's mines.

SUPERINTENDENT M. W. MATHER, of the Plumbago mine, near Alleghany, Sierra county, Cal., has gone East on company business.

J. DUDLEY is superintendent of the Eureka M. Co. at Santa Eulalia, Chihuahua, Mexico, succeeding H. Anderson, who is in New York.

W. LINDGREN of the United States Geological Survey has left San Francisco, Cal., for Cripple Creek, Colo., to complete the resurvey of the district.

T. H. OXNAM, manager of the Palmarejo & Mexican Gold Fields, Ltd., is at their mines at Palmarejo, Chihuahua, Mexico, from Los Angeles, Cal.

W. L. CLARK, till recently assistant manager of the Clark properties in Butte, Mont., has gone to Jerome, Ariz., as business manager of the United Verde C. Co.

J. MCCAFFREY, superintendent of the Polar Star mine, in Nevada county, Cal., returned to Grass Valley, Cal., last week from an extended stay in San Francisco, Cal.

D. P. GILLIS, recently foreman at the Snowshoe mine near Libby, Mont., has gone to Matagalpa, Nicaragua, to accept a position as mine foreman for the Leonesa M. Co.

J. R. DE LAMAR of New York, principal owner of the Bully Hill copper mines in Shasta county, Cal., and interested in mining properties in Nevada, is in San Francisco, Cal.

F. FIELDING, who has been assayer at the Con. Cal. & Va. mine, Virginia City, Nev., for thirty years, has resigned and will go to Los Angeles, Cal., to open up an assaying office.

E. F. STAPLES, of the assaying firm of Baverstock & Staples of Los Angeles, Cal., is investigating mining property in the Magdalena mining district of Sonora in company with H. Cohen of London.

EMERSON GEE returned to Los Angeles, Cal., from Culiocan, Sinaloa, Mexico, on the 20th inst., and went on the 25th on professional business to Culiocan and interior points of Sinaloa and Durango.

T. H. TRACY has resigned as general superintendent of the North American C. Co., Encampment, Wyoming, and accepted a position with the Allis-Chalmers Co. of Chicago, Ill., in their New York office.

C. W. CLARK of Butte, Mont., is general manager of the Clark holdings in Arizona, including the United Verde copper mines and smelter at Jerome, Ariz., the United Verde & Pacific railway and the Iron King mine and smelter, with offices at Jerome.

G. H. BARNHART, who was superintendent of the Ymir Gold Mines, British Columbia, during the first four years the property was in operation, until February, 1903, has been appointed resident manager to succeed R. M. Atwater, Jr., who resigned at the first of the year.

E. A. ASHCROFT, a metallurgist of London, England, who, with Prof. J. Swinburne, head of the Mining Institute of England, has been working on a new process for reduction of ores, is in San Francisco, Cal. Mr. Ashcroft has been examining mining properties in British Columbia.

H. P. EELS, president of the Bucyrus Co. of South Milwaukee, Wis., and S. L. G. Knox, general manager of the company, are in San Francisco, Cal. They have returned from an inspection of the work done by the gold dredging machinery furnished by them at Oroville, through the Western Engineering & Construction Co. of San Francisco, their Pacific coast representatives.

Obituary.

JOSEPH ARROWSMITH, a mining engineer of Oakland, Cal., aged 73 years, died on the 27th inst. He leaves a widow.

A. S. MERRY died near Swansea, Wales, on the 29th ult. He was a partner of Lord Swansea (H. H. Vivian) and was a celebrated metallurgist there.

J. FLOYD, a mine owner of Nevada county, Cal., died at Grass Valley, Cal., on the 16th inst., from a hemorrhage of the lungs. He leaves a wife, and was aged 52 years, a native of England.

W. H. GARDNER, a California pioneer, died at San Jose, Cal., on the 26th inst. Deceased was a native of Virginia, 74 years of age. He went to California in 1852, crossing the plains by ox team, and followed mining until 1883. Four grown children survive him.

G. W. WILSON, a pioneer miner and assayer of Cripple Creek district, Colo., died at Cripple Creek on the 18th inst. Deceased was 61 years of age, a veteran of the civil war. In 1890 and 1891 he served as Mayor of Breckenridge, Colo., and for several terms represented a ward of that city as alderman. He also served as State Senator. He is survived by two sisters.

SELWYNN M. TAYLOR, a mining engineer of Pittsburg, Pa., died in the Harwick mine of the Alleghany Coal Co., near Cheswick, Pa., on the 25th inst., being overcome with gas while leading a rescue party following an explosion of fire-damp. Deceased had planned and plotted the mine, and was called by the Alleghany Coal Co. as the man best fitted to lead the rescuers.

J. LEE, aged 74, a pioneer miner of Gilpin and Clear Creek counties, Colo., died at Central City, Colo., on the 9th inst., after an illness of two months. Deceased was one of the first to prospect Leavenworth mountain, and is said to have located the O. K., Argentine, Jenny Lynd and other lodes. He was a veteran of the Mexican war and leaves a widow and two daughters.

SHERMAN G. SACKETT died at Denver, Colo., on the 18th inst., aged 53 years, of Bright's disease. Deceased was chief clerk of the United States Mint in Denver under two administrations and was an expert assayer and metallurgist. He went to Colorado in the early 70's from his native State, New York, and settled at Georgetown. After leaving the Mint he took up mining again. He leaves a wife.

JOHN MALTMAN, interested in Nome, Alaska, mines, and a brother of President Maltman of the Maltman mine of Angels, Cal., was killed on the 21st inst. while stretching a guy wire to a smokestack on the engine house of the Maltman mine at Angels. While attempting to tighten the steel wire it touched the electric cable of the Union Light & Power Co., which carries 18,000 volts. Maltman was standing in a pool of water and the current was short circuited.

J. M. DOUGLASS, a pioneer mining man of the Comstock at Virginia City, Nev., died in San Francisco, Cal., on the 17th inst. Deceased was born at Georgetown, Scott county, Kentucky, Dec., 1819, the following year removing to Pike county, Missouri. He worked in the Wisconsin lead mines. He went to Nevada county, Cal., in 1850, and to the Comstock in 1866. He is survived by two brothers and a nephew, W. G. Douglass, who is superintendent of the Alta mine at Virginia City, Nev.

JOHN MORRIS, a coal mining expert, formerly of Youngstown, Ohio, died at Denver, Colo., on the 12th inst., due to liver trouble. When the coal mine explosion took place in the Vulcan Fuel Co.'s mines at New Castle, Colo., in 1896, he was sent by the Santa Fe Railroad, which company owned the Vulcan, to the mine to make a thorough examination as to the causes of the explosion. Deceased was at one time a candidate for the position of State Mine Inspector of Colorado. He is survived by a son.

Commercial Paragraphs.

THE Mine & Smelter Supply Co. of Denver, Colo., report sale of a De Remer water wheel for a 400 H. P. plant for Mexico and another to Idaho.

THE Jeffrey Manufacturing Co. of Columbus, Ohio, through its connection with the Ohio Malleable Iron Co. of the same place, are now in the field soliciting orders for high-grade malleable castings.

THE Economist Gas Engine Co., 519 Howard Street, San Francisco, Cal., has installed a 40 H. P. pumping plant for J. Golman & Co., Tulare, Cal., for irrigation purposes. They are also putting in several irrigation plants at Winters, Yolo county, Cal.

AT Sheffield, a suburb of Kansas City, Mo., on the 21st inst., at the foundry of the Weber Engine Works, was cast the base for an unusually large gas engine eight tons of molten iron being required to fill the mold. The engine will be exhibited at the St. Louis Exposition. It will be a vertical two-cylinder engine, 150 H. P., with fly wheel 72-inch diameter. With charcoal fuel, and a gas producer

attachmont, it will produce power as an electric generator. Tho completed engine will weigh sixteon tons.

THE American Process Co., 62 and 64 William streot, New York City, has installed a direct heat sand dryer for the Granite Brick Co. of Glens Falls, N. Y. They are manufacturers of brick under tho Huennekes system. They have also put in a clay dryer for the Chattahoochee Chemical & Mining Co., Girard, Ala., and a direct heat dryer for M. P. Hubbard & Co., Baltimoro, Md., to dry sulphate of lime refuse.

THE C. O. Bartlett & Snow Co., Cleveland, O., have orders for olevating and conveying machinery from the Iroquois Portland Cement Co., Ca[illegible], N. Y.: the Elk Rapids Portland Cement Co., Elk Rapids, Mich.; the Grasselli Chemical Co., Clovcland, O.; tho Struthers Furnace Co., Struthers, O.: the Sandusky Portland Cement Co., Sandusky, O.: the Sherwin-Williams Co., Clevcland, O.: the Cleveland Gas, Light & Coke Co., Cleveland, O.: the Farmers' Chemical Co., Clovoland, O.: the S. Lorain Coal Co., and also from the Rossland Power Co., Rossland, B. C., for mining machinery.

THE Fred M. Prescott Steam Pump Co., Milwaukee, Wis., report the following among their recent shipments: A vertical beam condenser with a capacity of 70,000 pounds of steam per hour, to the Denvor Tramway Powor Co., Denver, Colo., making three machines of this size shipped to them during 1903; a triple expansion mine pumping engine to the Republic Iron & Steel Co., with a capacity of 2500 gallons per minute against 500 feet head; a triple expansion mine pumping engine to the Clairton Steel Co., with a capacity of 2500 gallons per minute against 500 feet head; two large triple expansion pumping enginos to the El Oro Railway & Mining Co., Ltd., El Oro, Mexico, completing a large order; a compound and condensing mine pumping engine to the Clover Leaf Gold Mining Co., Roubaix, S. D., with a capacity of 1000 gallons per minute against 500 feet head; two large compound hoiler feed pumps to the Tennesseo Coal, Iron & Railway Co., Birmingham, Ala. Among recent orders they have booked the following: From the Penn Iron Mining Co., Vulcan, Mich., three triple expansion mine pumping engines, each with a capacity of 1200 gallons per minute against 500 feet head; one triple expansion mine pumping engine with a capacity of 1200 gallons per minute against 1000 feet head; two sinking pumps of large capacities: from the Cleveland-Cliffs Iron Co., two triple expansion miue pumping engines, each with a capacity of 1200 gallons per minute against 500 feet head; one triple expansion mine pumping engine with a capacity of 1000 gallons per minute against 500 feet head; from the Calumet & Pittsburg Development Co., Bisbee, Ariz., one triple expansion deep mine pumping engine with a capacity of 1500 gallons per minute against 1000 feet head; one triple expansion deep mine pumping engine with a capacity of 1000 gallons per minute against 1000 feet head.

Trade Treatises.

Marsh boiler pumps are the subject of section 1, Catalogue No. 11, issued by the American Steam Pump Co., Battle Creek, Mich.; full-page illustrations, sectional views, detailed descriptions, with price lists.

Catalogue No. 9, from the C. O. Bartlett & Suow Co., Cleveland, Ohio, illustrates and describes their make of interlocking shoulder-bearing chain belts, with detailed data, price lists of sprocket wheels, etc.

Circular No. 77 from the Jeffrey Mfg. Co., Columbus, Ohio, is devoted exclusively to illustrations and descriptions of the Jeffrey grab buckets, which will work in ore, mine-run coal, broken limestone, gravel and sand.

H. W. Johus-Manville Co., 100 William street, New York City, send a description of their asbestos-metallic theater curtains, and a sample of the asbestos cloth used in the manufacture thereof, a subject of present general interest.

Oro cars are the chief subject of the black and carmine catalogue of the Atlas Car & Mfg. Co. of Cleveland, Ohio, and in 101 pages of the finely produced publication no less than fifty-four styles of cars, such as used by mines, are shown, most of the illustrations and descriptions having a full page devoted to each. Other cars and devices for miners' use are also portrayed in excellent manner.

The Trenton Iron Co. of Trenton, N. J., have issued the following publications: "Wire Rope and its Application to the Transmission of Power, Etc.," information of a general character concerning wire rope, and its special applications to the transmission of power, suspension bridges, etc.: also matter relating to wire rope fittings, sheaves and tackle blocks; illustrated, and containing valuable tables giving the weight, strength, working load, bending stresses, etc., of the different kinds of wiro rope. "Wire Ropo Tramways," profusely illustrated and treating principally of the Bleichert system of wire rope tramways of which The Trenton Iron Co. aro the manufacturers and sole licensees on the American continent. This is a revised issue of their former publication on this subject, with new text and illustrations. "Cablo Hoist-Conveyors," wherein special attention is directed to the Laurent-Cherry patent system, which requires no fall rope carriers, and the Hall patent system with self-filling bucket, specially adapted to excavating. "The Application of Wire Rope to Surface and Underground Haulage," a reissue of the chapters on the same subject in their previous publication entitled, "Wire Rope Transportation in All Its Branches" (now out of print). Any or all of these will be mailed free of charge, to anyono interested.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING JANUARY 19, 1904.

750,043.—WASH BASINS—D. B. Allen, S. F.
750,044.—HARVESTER—W. V. Allen, Chico, Cal.
750,075.—CONCENTRATOR—W. G. Anderson, S. F.
750,149.—GRAIN CAR DOOR—J. Barry, Seattle, Wash.
750,153.—SHAFT HANGER—Bechtol & Manley, Tacoma, Wash.
749,835.—ELECTRIC SWITCH—W. J. Bell, Los Angeles, Cal.
749,896.—CABLE GRIP—E. J. Brown, Coalinga, Cal.
749,920.—PILE PROTECTOR—A. S. Cooper, Oakland, Cal.
749,957.—PILE STRENGTHENER—A. S. Cooper, Oakland, Cal.
749,723—TYPE WRITER—D. S. Dufur, The Dalles, Or.
749,853—MAKING BUTTER—J. Estep, Tacoma, Wash.
750,178.—UMBRELLA—H. Fesenfeld, Hoquiam, Wash.
749,782.—TRUNK STRAP—R. Forbes, Downieville, Cal.
749,898.—HOIST—C. V. Fowler, Los Angeles, Cal.
750,190.—COOKER—J. Henault, Los Angeles, Cal.
750,032.—HOOK PIN—E. C. Herring, Reno, Nev.
750,193.—WARDROBE—W. C. James, Cucamonga, Cal.
749,968.—MAST HOOP—A. Klatt, Collinsville, Cal.
749,901.—MATTRESS—F. J. Lewzey, S. F.
749,942.—PUMPS—R. J. Mullin, Seattle, Wash.
749,969.—PACKING—J. K. Munson, Houghton, Wash.
750,037.—GRINDER—J. B. Phillips, San Bernardino, Cal.
750,006.—STAMP MILL—G. C. Richards, Berkeley, Cal.
750,227.—GOLD SAVING DEVICE—L. Sachse, Los Angeles, Cal.
750,038.—ATTEMPERATING DEVICE—M. H. Shoenberg, S. F.
749,808.—HAMMER—Speer & Bowman, Los Angeles, Cal.
749,908.—WRENCH—F. Stuart, Ritzville, Wash.
749,954.—FURNACE—M. L. Trapp, Los Angeles, Cal.
750,133.—CURING FOODS—C. B. Trescott, Portland, Or.
750,144.—SAW SHARPENER—W. J. Winter, Christopher, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

STAMP MILL.—No. 750,006. Jan. 19, 1904. G. C. Richards, Berkeley, Cal. One-half assigned to H. Murphy, San Francisco, Cal. This invention comprises a supplemental shaft with levers adapted to engage tappets which are loosely carried upon the stamp stems and which are retained in place by sufficiently stiff springs so that vertically reciprocating movements of the stems and stamps would be effected by the action of the levers upon these tappets, while the springs would yield sufficiently to prevent sudden strain caused by the inertia of the heavy stamps and stems, the lower spring also acting to prevent breakages in case any hard substance that cannot he broken falls between the stamps and the dies.

ATTEMPERATING DEVICE.—No. 750,038. Jan. 19, 1904. M. H. Shoenherg, San Francisco, Cal. This invention relates to improvements in means for heating air forced under pressure through a tuhe or nozzle, and pertains particularly to an improved air hlast hand piece for dentists and others. Its ohject is to provide a simple electrical heating apparatus wherehy air at any pressure or temperature may he instantly obtained hy the manipulation of a single combined cock and switch.

HARVESTER, THRASHER AND SEPARATOR.—No. 750,044. Jan. 19, 1904. W. V. Allen, Chico. Cal. This invention consists in the employment of a supplemental straw carrier extending heyond the usual main straw carrier, so placed as to receive the discharge from said main carrier and having a series of turnable and adjustable direction hoards and a supplemental fan hy which the hlast of air is delivered hetween the main and supplemental straw carriers and also through the spaces hetween the direction hoards. A closed hottom receives any grain which is thus separated from the passing straw and returns it to a supplemental auger located heyond the augers of the regular cleaning shoe, and hy means of the adjustahle hoards the strength and direction of the hlast through and hetween them is regulated.

Books Received.

"Metallurgical Analysis and Assaying," by W. A. MacLeod, director Government School of Mines at Charters Towers, Queensland, and Chas. Walker, lecturer at the Government School, has been received from the publishers. This treatise represents the work in a three years' course for students of mining schools. Part I treats of qualitative analysis, the preparation and properties of gases. Part II is devoted to qualitative and quantitative analysis. Part III, section 1, deals with laboratory experiments and assaying, the second section heing devoted to technical analysis. The work is very complete and will be found a useful treatise on the various subjects in which it deals. It contains many tabulated schemes for mineral determinatiou and for use in chemical work. 318 pages, illustratod. Price $4. J. B. Lippincott Co., publishers, East Washington Square, Philadelphia, Pa.

Latest Market Reports.

SAN FRANCISCO, January 29, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅛d (standard ounce, 925 fine); New York, bar silver, 55⅞c, refined (1000 fine): San Francisco, 55⅛c; Mexican dollars, 42@42½c San Francisco, 44c New York.

COPPER. — New York: Standard, $12.75; Lake, 1 to 3 casks, $12.62½; Electrolytic, 1 to 3 casks, $12.50; Casting, 1 to 3 casks, $12.37½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 10s spot per ton.

The copper situation shows a slight recession instead of the expected advance, possibly due to the failure thus far of Japan and Russia to engage in war. The price in Eastern markets ranges between 12½c. and 13c. The market is steady, however, and there is no evidence at present of a material change.

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £11 11s 3d ℔ long ton.

SPELTER.—New York, $5.05; St. Louis, $5.00; London, £21 17s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.25 @ 28.50; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32½c; har tin, ℔ lb., 35@37½c. London, £130 5s; £127 15s spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.40 ℔ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ℔ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.00 @14.25; gray forge, $13.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.50; open hearth billets, $23.00 @23.75; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@15 00
Northern 2	14 00@14 50
Northern 3	13 50@14 00
Southern 1	14 35@14 60
Southern 2	13 85@14 10
Southern 3	13 35@13 60
Forge	12 60@12 85
Charcoal	16 50@17 00
Billets, Bessemor	24 00@24 50
Bars, iron	1 30@ 1 50
Bars, steel	1 46@ 1 60
Rails, standard	28 00@30 00
Rails, light	26 00@30 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
Dealers forge	9 00@ 9 50
No. 1 railroad wrought	10 75@11 25
No. 1 cast, net ton	10 50@11 00
Iron rails	13 00@14 00
Car wheels	13 50@14 00
Cast horings	3 25@ 3 50
Turnings	7 00@ 8 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8¼c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerino, por lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; loss than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than ouo ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; douhle tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 foet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

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OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 43c; cs., 48c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaino, 27½c; Wator White, in bulk, 15c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@55c; Natural White, 70c; Bleached, do., 75c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

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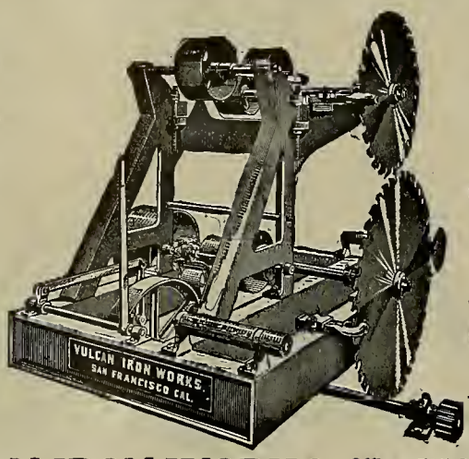

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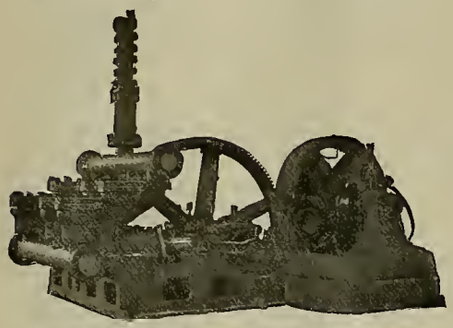

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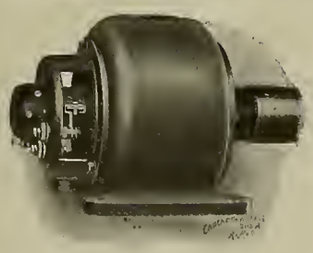

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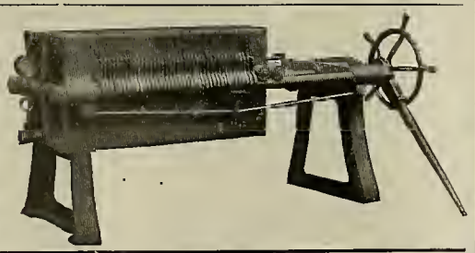

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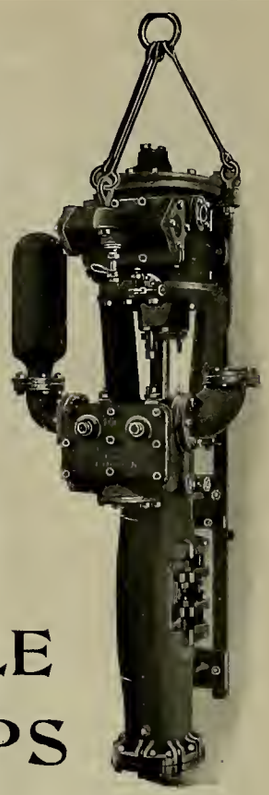

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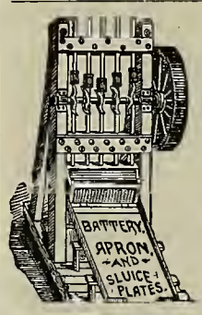

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Whole No. 2272.—VOLUME LXXXVIII. Number 6. SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 6, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Mica Schist as an Ore Carrier.

Although veins in mica schist are for some reason looked upon with less favorable eye by the miner than some other classes of rock formation, yet quartz veins in mica schist have produced a large amount of gold, and in some districts the ore in mica schist is rich in gold. Ordinarily the veins occur as a succession of lenses or kidneys of quartz, and usually these have a tendency to follow each other in succession of lenses with a strike across the formation at a greater or less angle, determined by the direction from which the stresses producing the incipient folding were exerted. In some instances these lenses are short and narrow. In others in the same district they are wide and proportionally longer. In both cases, and particularly in the former, they often occur in a series of nearly parallel lenses forming a zone of mineralization. Where the compressive stress which caused the greater or less torsion of the rocks has been sufficiently great, folds have given place to abrupt fracture and a fissure vein results. In instances of this character a fissure, if followed persistently, will usually be found to merge into a succession of lenses which gradually become smaller and less distinct until all signs of crumpling or disturbance of the schistose structure disappears. This may occur within a few hundred feet or may extend for several miles along the strike of the formation. The prejudice against the downward extension of zones and lenses of gold-bearing quartz in mica schist is even stronger than that against its longitudinal occurrence. Numerous mines in this formation have been developed and proven profitable, but when the ore bodies in sight have been exhausted unless exploration has been carried on simultaneously which has developed new ore deposits, it is not uncommon to see such a mine closed with no further effort at development.

The fact that more than one lens has been discovered should prove sufficient incentive to seek for additional deposits, but as above stated the prejudice against this class of veins is fixed more or less firmly, and new discoveries are usually either accidental or made by men new in the business of mining. When mining in this formation the fact that the lenses break across the formation should not be lost sight of. A level driven straight ahead when a lens has been worked out may miss by a few feet, or even a few inches, another valuable deposit lying at one side or the other of the course of the drift. In these cases crosscutting is advisable, as it is in any mine, and neglect to give this important matter the attention it deserves may result in closing a mine of really great possibilities. The quartz found in lenses in mica schist is usually granular and glassy, and is generally classed as unfavorable to the occurrence of gold unless gold be seen in the rock, which is not infrequently the case. Very often the schist lying within the zone of mineralization is also gold bearing as well as the quartz lenses, though when this occurs a careful examination will disclose the fact that the schist has been silicified to a greater extent than is observable in the normal rock. There is one fact in favor of gold quartz occurring in mica schist in the form of lenses. It is usually free milling to a remarkable degree, but on the other hand, when the vein develops the fissure type of structure it is not uncommon to find complex ores—arsenical iron sulphide, galena, zinc blende and copper sulphide as well as pyrite. Rich ore also often results, but the rebellious nature of the ore to some extent offsets this richness.

Summarizing, it may be said mica schist produces erratic lenses and veins of quartz; that the quartz is above the average in value of gold quartz ores occurring under different conditions, but that the values are irregularly distributed, and that, although there have been many profitable mines in this formation, the large proportion of failures in mines opened in it may be charged rather to a lack of knowledge of the occurrence of ores in the schist than to the mines as representing a distinct or unreliable class.

Method of Securing Dump on Flat Placer Ground.

Securing Dump Room on Flat Ground.

The problem of securing sufficient dump and grade to admit of working placers on flat ground where there is abundance of water available is readily solved by the employment of hydraulic elevators, but where the quantity of water is limited to a small sluice head, the question must be solved by other means. The accompanying engraving shows how the difficulties were overcome at a placer mine in San Bernardino county, Cal. The gravel bed was opened by means of an inclined shaft, the incline being continued upward on a timber structure as shown. A car holding 16 cubic feet of gravel was used, and this was hauled from the face of the drift up the incline and onto the flat portion of the frame, in which bins were constructed to receive the gravel dumped from the car. A small portable engine and boiler furnished the power. The bins were provided with chutes which discharged into the sluice box constructed at the side bins. These were opened as required, and the water pumped from wells in the vicinity washed the gravel. When it was desired to clean up or to make any change in the line of boxes, the stream of water was temporarily diverted through a side gate, whence it flowed through a half-round flume made of disused pipe, to the wells. The movements of the car were controlled by a man stationed in the covered portion of the structure. The pile of rocks near the sluice was formed by pieces thrown out occasionally by the car man on the frame. The plant worked satisfactorily and might be duplicated to advantage under similar conditions elsewhere. The construction is simple, inexpensive and ingenious, showing that difficulties of this character may be overcome.

Two-Post Head Frame Built on Substructure in Soft Ground.—(See Page 94.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:
NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, FEBRUARY 6, 1904.

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THE De Beers diamond syndicate, it is reported, has again advanced the price of diamonds. As the De Beers Company practically controls the diamond output of the world, there is little likelihood of a lower price obtaining in the near future. It is claimed that the constantly increasing expense in mining diamonds, together with the statement that the yield of the diamond-bearing ground is less than formerly, make an increase in price advisable.

INSTANCES are recorded where mining and milling have been or are being carried on at a cost so low as to surprise those who are well informed as to mining costs under varied conditions. In some of these instances it will be found that a large amount of dead work has previously been accomplished by the present or a former manager, which is now overlooked by every one except the manager himself, and as no charge is made for this work against the ore now being mined the mining cost seems strangely low, whereas, if the cost of the dead work were charged against the ore made available by this work, the cost would be raised considerably. Mining costs, to be valuable as a means of comparison, should take into consideration every proper charge.

INTELLIGENT use of the diamond drill in the gold mines of Western Australia has resulted, it is reported, in largely increasing known extent of ore bodies, the work of development having proved the discoveries made by use of the diamond drill to be correct and reliable. In that field the experiments with the drill have been made systematically, and the records kept have not been disproved by subsequent development. It was found, however, that in boring long holes the "drift" of the drill was considerable in some instances, and that until a series of holes had been bored the location of the ore cut by the drill was somewhat uncertain, but a series of holes systematically arranged makes it possible to determine the position of a body of ore with approximate certainty.

An Important Verdict.

The Coroner's jury, after investigating the occurrence at the Independence mine at Victor, Cripple Creek district, Colo., on January 26th, when fifteen miners were killed by overwinding of the cage, found the following verdict:

We, the jury, find that the deceased came to their end in the Stratton's Independence mine on Thursday morning, Jan. 26, through F. T. Gillese losing control of the engine there in use and pulling the cage into the sheave wheel, thereby parting the cable and precipitating the cage loaded with men down the shaft. And we further find that if the mine management had not neglected the usual precautions, the sad casualties might have been reduced, if not avoided. The usual precautions that were not taken are as follows:

First—No man was required to preside at the collar of the shaft while hoisting men.

Second—No safety device was in use on the cable to prevent the overwinding of the same.

Third—Men were loaded and unloaded without placing the cage on chairs.

Fourth—The disc brakes of the hoisting engine were detached from their usual position and therefore useless.

We, the jury, recommend that all safety appliances and precautions herein named and recommended be adopted and used not only by the Stratton's Independence mine, but by all mines in this district not now using the same, thereby reducing to a minimum the dangers to life and limb that men working in mines are subjected to.

We further recommend that a competent extra man should stand near the engineer while he is hoisting and lowering men, whose duty should be to render any assistance needed.

The above evidently indicates the state of mind in the community where the accident occurred. In the business of practical mining accidents are of frequent occurrence, and usually they occur in some new and unexpected way. This is always evident, for an accident which can be anticipated is usually avoided by the necessary precautions taken to avert it. In this case, however, from reports sent out by the local press it seems that the hoisting engine had previously given trouble, and in one instance an occurrence similar to that of January 26th happened, but before disaster resulted the engineer was enabled to operate the brakes and brought the engine to a stop. The several recommendations of the jury, if carried out, might, or might not, prevent a similar catastrophe under like conditions The requirement that a man be stationed at the collar of the shaft is a good one under ordinary conditions, but in an event such as occurred there recently, when the engineer was calling wildly for assistance and the engine winding at high speed with constantly accelerating velocity, it is difficult to imagine the top man standing at his post, or to see of what particular usefulness he could be under such circumstances. The second count, that "no safety device was attached to the cable to prevent overwinding," is a suggestion of doubtful utility. A hoisting engine usually possesses power far in excess of that necessary to lift the load it hoists from the mine. A clip, or other device on the cable, would scarcely have the effect of stopping the engine, while the strain on the cable would probably cause it to part the moment the safety device on the cable came in contact with some firm obstruction. The provision of bumpers on the guides to prevent overwinding would seemingly be a better device, when if the cage were provided with the usual safety clutches these would immediately operate, should the cable break, if the clutches were in good working condition, with a chance of holding the cage, as it had acquired no momentum. The third count, "Men were loaded and unloaded without placing the cage on chairs," has no apparent connection with the disaster, though chairs are always an advisable equipment and should be in constant use, as it is economy to employ them. The fourth count was "The disc brakes of the hoisting engine were detached from their usual position and were therefore useless." This charge presents a most unusual condition. Why the brakes were removed is not stated, but the fact of their absence appears to explain why the engineer was unable to apply these very necessary brakes and in this manner avert the catastrophe.

When cages or skips are run in balance, as in this instance, it is presumed that the cages have approximately the same weight. The shaft was about 1500 feet deep. The cages weighed, it is stated, about 4000 pounds. An inch and a quarter rope weighs 2.45 pounds per foot. When passing at the depth of 750 feet from the surface the weights are about equally balanced, the difference being in the weight of the men—in this case about 2000 pounds. As the upgoing cage approached the surface there was a difference of about 3600 pounds of cable in favor of the downgoing cage—1600 pounds more than that carrying the men. It is customary to shut off steam when nearing the surface, the additional weight of the down side, together with the momentum of the moving cages and rope, sufficing to bring the loaded cage to the surface, when it can be easily controlled by the brakes, if they are in working order, which, it appears from evidence in this case, they were not. It is presumable that a considerable interval had elapsed since the last hoisting trip had been made, and the engineer had no reason to suppose the brakes were not in working condition at the time of starting the skip from the lower levels of the mine.

Gold Dredging.

Dredging for gold within the past few years has become a distinct and important branch of the mining industry. This class of mining is carried on in gravel deposits where the situation admits of no other of the many mining methods being employed with a hope of financial success. The economical adaptation of the steam shovel to the handling of earth, gravel and finally to broken ore, demonstrated the economy of this means of handling large amounts of material at low cost. The experiment of dredging was tried by the employment of various devices. In some instances powerful pumps were used, which lifted gravel, water, and some of the gold as well, but they were soon superseded by bucket dredgers of various types. The first dredgers were considered expensive, costing $20,000 to $30,000 each, beside the cost of preparatory work in installation. Later a careful study of the requirements of the dredger suggested possible improvements. As a result dredgers were built costing $40,000 to $50,000, and it was found that these larger and more complete machines were more economical than the smaller and less expensive machines. Now dredgers are made costing $65,000 and over, and these machines, costing two and three times as much as the earlier dredgers, have been proven to be much more economical in operation than those of less cost and capacity. Elsewhere herein is an abstract of the annual report of a company operating near Oroville, Cal., in which many details of dredging operations are given. A comparison of the relation of values obtained in prospecting bore holes to results of actual dredging is interesting and instructive. The costs per cubic yard of material treated is also of interest, as these costs are segregated into the various branches and details of the operation. In New Zealand dredging is one of the most important features of the mining industry there. During November, 1903, nearly 100 dredgers were at work there, producing during three weeks working time 7216 ounces of gold. The cost per cubic yard of gravel handled for purpose of comparison unfortunately is not available.

The Battle for Copper.

The Supreme Court of Montana has reversed a decision of the lower court in the suit brought by J. MacGinnis vs. the Boston & Montana Copper Co. to restrain them from operating in Montana, for the reason that the Boston & Montana Co. was a corporation existing under the laws of another State, and as such was controlled by the Amalgamated Copper Co., and that the Amalgamated Co. had no right to hold the stock of another corporation under Montana laws. The Supreme Court has decided that no citizen has the right to maintain such action against such corporation, and that this right is vested in the State only; that the Amalgamated Copper Co. is neither a trust nor a monopoly, and that corporations may hold stock in other corporations, the same as individuals, and that the same is not contrary to the best interests of the State. A law was recently passed in Montana over the Governor's veto giving corporations the right to acquire and hold stock in other corporations and to vote the same. Unless the Supreme Court grants a new hearing on appeal, the accumulated dividends of the Amalgamated Co. will be disbursed. This is only another page in the history of the war for control of copper being waged between F. A. Heinze and the Amalgamated Copper Co.

CONCENTRATES.

BURLAPS wrapped about exposed water pipes will usually prevent the freezing of the water in the pipes. This is not proof against extreme cold, but is a good preventive against moderately low temperatures.

✤✤✤✤

IT is unnecessary to use bridging in shaft sinking except where the ground passed through is so soft that it requires the driving of lagging. It is occasionally put in in hard rock shafts, but it is an unnecessary expense.

✤✤✤✤

RAILROAD RAILS, with the bottom side turned upward, make a good grizzly. If the rails are separated by thimbles placed on the cross rods, those at the lower end being slightly wider than those at the top, it will have a tendency to reduce jamming of the rock between the rails, and the grizzly will more readily clear itself.

✤✤✤✤

ALL corporations operating in a State foreign to that under the laws of which the corporation was formed are required to have a resident agent at the capital of such State, who must have a power-of-attorney from the directors of the company. This agent usually is an attorney who acts in a similar capacity for several companies.

✤✤✤✤

THE posting of a notice by the owner of a mining claim under bond to an individual or a company, in which the owner disclaims all responsibility for debts contracted by the operators, is not required by law, but is a method usually adopted by the property owner to prevent attachment of his property in case debts are incurred by the bond holders.

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WHEN nitrogen is passed over a highly heated mixture of potassium carbonate and carbon the nitrogen is absorbed and potassium cyanide is formed, but the more simple method of making it is by heating potassium-ferro-cyanide, which breaks up into potassium cyanide and ferrous cyanide. The latter is decomposed by the heat into carbide of iron, the nitrogen being set free.

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WHERE it is desired to make curves in the line of track passing through a stope in which the square-set method of timbering is in progress, the posts may be set at a greater distance apart where necessary than the regular distance, the timbers being cut particularly for each place. If the ground is heavy, a line of poles may be laid back of the posts along the track and the space back of it filled at once.

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THE main gangway of a drift mine should be cut into bedrock to a depth of 2 or 3 feet. This serves a double purpose. It makes loading of cars from platforms along the drift more easy and consequently economical, and it makes it possible to ignore inequalities in bedrock surface, while maintaining a uniform grade for the track. This applies more particularly to drift mines of comparatively small width of channel.

✤✤✤✤

ONE of the most difficult problems facing the drift miner is the proper location of a tunnel site to reach the channel of an ancient river by driving through the rim rock. In most cases the tunnel driven for this purpose, where sufficient data has been unobtainable, has been found too low, and when the gravel was finally reached it was impossible to sink in the gravel owing to large amount of water encountered.

✤✤✤✤

IN the treatment of sulphide gold ores direct by cyanidation the success of the operation depends so far as observed upon the fineness of crushing of the material to be treated, and upon successful agitation of the sulphides during treatment. The cheapest method of reducing concentrates to a sufficiently fine state of division is a matter for experiment. It is believed, however, that this can be accomplished more satisfactorily and cheaply dry than wet.

✤✤✤✤

A TEST for the presence of silver in ores may be made by treating a quantity of the ore in boiling nitric acid, add water and when the solution is clear add a few drops of hydrochloric acid or a solution of common salt, and any silver present will be precipitated as a white cloud or as flakes of white chloride of silver. If the ore be chloride of silver, its presence may be detected by treating the ore with a solution of hyposulphite of soda, which dissolves the silver chloride. It is precipitated by calcium sulphide. Chloride of silver is soluble in ammonia.

✤✤✤✤

THE "cut" need not be drilled in the center of the shaft while sinking. It can as well be drilled nearer one end or the other. In a three-compartment shaft three machines, each on a separate bar, may be used, one at each end and the third near the center. The center machine and one of those at an end can be used to drill the center of the cut and the end holes, and the other machine to drill the down holes at that end of the shaft. In some instances four machines have been used mounted on two bars and a full round drilled with a single setting of the bars.

✤✤✤✤

WHEREVER gravel lies upon a "false bedrock" in the bed of a stream, it is reasonable to suspect the existence of older gravel below the false bedrock. This false bedrock may be a bed of conglomerate, a bed of calcareous travertine, a bed of hard clay mixed with pebbles and other rock fragments, a sheet or flow of volcanic rock such as basalt or andesite, or a bed of indurated sand of either volcanic or fragmental crystalline rock. It does not follow, however, that the old channel should be found directly beneath the newer one, and the failure to discover it there does not positively indicate that no older channel exists either to one side or the other.

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COPPER DEPOSITS are not confined to any particular geological age, but occur in rocks of almost any age and in many different kinds of rock. The United Verde mine of Arizona is in slaty and schistose rock, with limestone, all of pre-Cambrian age. Those of Butte, Mont., are in granite; those of Missouri are in Carboniferous limestone; those of Bingham district, Utah, are in porphyry and limestone; those of Cananea in similar formations. Many copper deposits are in diabase and diorite, or in schists altered from those rocks. The copper deposits of Paradox mountains, Colorado, are in sandstone. Copper also occurs in serpentine and in quartz porphyry.

✤✤✤✤

THE cost of obtaining a mining concession in Mexico is estimated at from $120 to $300 Mexican silver, divided as follows: Fees to mining agent, with acknowledgments, $20; publication of advertisements, $2 to $5; surveyor's fees, $25 to $200; expenses of trip to the mine not exceeding 10 kilometers (about 6 miles) and labor on survey, $15 to $25; stamp tax on five pertenencias, $50; deed tax, $2. To procure any number of pertenencias less than five will cost about as much, and a larger number may be reckoned as costing from $15 to $25 each in addition to the figures above given. The average cost, where a large number of claims are taken, is about $15 Mexican silver.

✤✤✤✤

THERE is a difference of opinion among mill men as to the advisability of dividing the plates in front of the battery. Some claim this arrangement to be an advantage in dressing plates and permitting a saving of time. Others hold that the comparatively small amount of time saved is more than offset by the loss occurring when all the pulp from the battery is run over one-half of the plate surface and that divided plates have no advantages. The same difference exists as to drops in the plates. Some contend that drops of one-half inch are a distinct benefit, having a tendency to render the quicksilver active. Undoubtedly amalgam accumulates where these drops occur if the drop be not too high. Whether there is a loss caused by this arrangement is a matter of differing opinion among mill men.

✤✤✤✤

THE Federal Statute provides: "Upon a failure to comply with these conditions (provisions defining method of making location, marking corners on the ground by means of posts or monuments, annual assessment, etc.) the claim or mine upon which such failure occurs shall be open to relocation in the same manner as if no location of the same had ever been made; provided that the original locator, his heirs or assigns, or legal representatives, have not resumed work upon the claim after failure and before such location." A, having resumed work through his agents before B made his location, debars B from claiming the ground and it is unnecessary for A to make a new location. The claim is as much in force as though he had done the assessment as required by the statutes during all the years following his date of location. The assessment work, however, to the amount of $100 must be completed.

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STREAMS and springs in the mining regions are often charged with ferrous and aluminum sulphates, resulting from the decomposition of bodies of sulphide ores. Where much iron is present a deposit of iron oxide is found on the rocks of the gulch, and this iron sometimes forms a firm bed of cement which may extend a long distance down stream from the source of the deposit. The water from such springs is usually remarkably clear and crystal-like, but is unfit for drinking or other use, being strongly astringent. The exploration of the vein or deposit from which the water issues will usually discover a deposit of iron sulphide, and in some instances copper as well. At Copper basin, Yavapai county, Arizona, the rocks of the streams tributary to the copper-bearing veins are coated with green copper carbonate, and nearer the source of the copper water copper carbonates have been deposited in the loose gravel, forming workable deposits of copper ore, upon which much development work has been done.

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THE saw is too large for the power. Try a 26-inch. A flywheel furnishes no power, but it tends to maintain a more steady running of machinery operating under a variable load, as in the case in point. When a shaft is sufficiently large for the strains put upon it, there is no good reason for increasing its size. The amount of power transmitted by a belt depends upon the relative diameter of the pulleys, and speed at which the belt travels, as well as upon the width of belt. The character of the pulleys is also a factor. Leather covered pulleys will transmit more power than those having turned cast-iron faces. A 4-inch belt is large enough for the equipment and could be used with more power than the present engine generates. It is believed that the product of oil refineries known as distillate is superior to gasoline, as it requires less in bulk, gives a stronger action in the engines, is less dangerous and costs about one-third the price of the former.

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THE fundamental principles of stadia measurement are based on the fact that parallel lines subtending the same angle from a given point are proportional in length to their distances from that point. This principle is applied by placing two horizontal hairs in the barrel of the telescope of a surveying instrument, equi-distant from the central cross hair. These are usually set at a distance from each other which will just cover a given length of a rod held in front of the instrument at a given distance. For convenience this is usually 1 foot of the rod at a distance of 100 feet from a point in front of the object glass of the instrument, which is equal to the focal length of the glass—that is, the distance from the cross hairs to the object glass. This distance, plus the distance from the center of the instrument to the object glass, must be added to all distances measured by stadia, whether long or short. Where distances are measured by this method over hilly ground, tables are supplied by instrument manufacturers for making the necessary correction for angles. By using care and not attempting too long measurements, the results of stadia work are as accurate as chaining over rough ground.

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SEVERAL of the mining States and Territories have passed mining laws which in most cases require the performance of certain acts in addition to those imposed by the Federal statutes. It has been contended by some that the States and mining districts have no authority to pass and enforce such laws. Secretary Teller expressed doubt whether a State Legislature had any right to attach additional conditions to the requirements of the United States laws, but Commissioner Williamson held that such requirement is not in conflict with congressional law. The State courts have uniformly enforced this class of provisions, and, there being no authoritative ruling denying the right of the State to make such legislation, it is assumed these conditions are valid. Several States have laws which require the sinking of a discovery shaft or its equivalent prior to the completion of location. These States are Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Washington and Wyoming. The Circuit Court of Appeals for the ninth circuit (case of Northmore vs. Simmons, 97 Fed., 386) decided that it was competent for the laws of a State or the local regulations of a district to increase the amount of actual work required to hold a mining claim by the Federal law, and upheld the validity of the regulation.

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IN rock exposures the jointing planes are sometimes mistaken for planes of bedding. In some instances the distinction may be important. Where exposures of large extent may be studied, there is seldom any difficulty, as the floors produced by the joints are rarely, if ever, parallel, though often nearly so. Frequently the jointing planes are distinctly marked while the bedding planes are almost wholly obliterated, and in such cases the floors may be mistaken for planes of sedimentation. There are instances where the bedding planes stand nearly vertical, due to uplift of the formation, and in this ore deposition has taken place, but the floors formed by the jointing planes seem to have influenced the deposition of the ore, which is confined within irregular but distinct limits between floors lying a considerable distance apart, with several intervening floors which have no apparent effect on the ore deposition. In such instances the ore appears confined to a zone more or less irregularly defined by what may be considered the walls of the vein. These occurrences are erratic and cannot be anticipated, either as to the finding of ore or its discontinuance when found. In a mine where these geological peculiarities occur the necessary requirement is the discovery of an ore body large enough or rich enough to pay, though this may be said of any mine, but the occurrences above described are rather the exception than the rule.

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THE California Legislature passed mining laws in 1891 providing for proof of annual assessment, forfeiture of co-owners and resumption of work to prevent forfeiture. In 1897 another act, more comprehensive in scope and embracing some of the subjects embodied in the previous law, was passed. This act, by implication, repealed the act of 1891 to the extent that it embraced subjects covered by the prior law. This last named act was itself repealed by the act of March 20, 1899. The language being uncertain, it was contended that this last act did not repeal the act of 1897. The State Supreme Court held that the act of March 20, 1899, took precedence over all previous acts which were thereby repealed. On February 8, 1900, the State Legislature passed another act in which the language was free from objection, and which was practically the same as the previous act. The State law is still uncertain as to recording of annual assessment work. It requires the performance of assessment work, but imposes no work in addition to that required by the Federal Statute. Section 1159 of the civil code contains the following: "Affidavits showing work or posting of notices upon mining claims may be recorded in the Recorder's office of the county where such mining claims are situated." The word "may" indicates that the recording of such notice of assessment work performed is optional and not compulsory. It is unlikely that the courts would sustain an attempt to forfeit a claim for failure to record such notice.

Cost of Gold Dredging Operations in California.

Following is an abstract of the annual report of the Oroville Gold Dredging & Exploration Co. of San Francisco, Cal., for the calendar year 1903:

BULLION TABLE.

MONTH.	Cubic Yards (Bank Measurement) Dredged.	Operating Expenses.	Cost per Cubic Yard, Cents.
January	*31,000	$ 1,712 77	5.52
February	*30,130	1,804 48	5.98
March	*30,570	2,895 99	9.47
April	49,130	2,684 32	5.46
May	35,900	2,273 46	6.33
June	34,040	2,667 87	7 83
July	40,100	3,017 13	7.52
August	46,000	3,884 83	8.44
September	46,790	2,529 99	5.34
October	50,960	2,574 56	5.05
November	39,420	2,530 64	6.42
December	40,570	2,208 91	5.45
Totals and averages	474,610	$30,784 95	6.48

*In January, February and March 44,680 cubic yards of soil dredged on moving dredge to block 196.

DETAILS OF OPERATING COSTS.

	January	February	March	April	May	June	July	August	September	October	November	December	Totals	Per Cent of Total	Cost per Yard, Cents.
Labor: Operative	$545 96	$430 75	$569 53	$610 82	$519 83	$497 50	$451 20	$623 87	$514 72	$583 66	$612 70	$555 07	$6,515 51	21.2	1.37
Repair	156 60	371 00	305 30	171 30	332 30	331 60	265 00	199 18	162 50	174 35	183 00	245 85	2,897 98	9.3	.61
Supt.	150 00	150 00	150 00	150 00	150 00	150 00	150 00	150 00	150 00	150 00	150 00	150 00	1,800 00	5.9	.38
Power: Dredge	412 20	181 46	478 23	493 68	383 05	378 47	385 14	503 03	476 84	519 53	455 00	468 47	5,135 12	16.6	1.08
Pumps	11 12	21 22	41 00	23 20	39 00	16 20	21 00	51 00	33 00	24 10	43 00	14 00	337 84	1.1	.07
Hardware Supplies, Tools, etc.	52 37	182 94	43 28	208 20	146 50	195 03	134 32	167 65	72 57	101 57	84 15	127 48	1,516 06	5.0	.32
Repair Parts, etc.	292 16	391 98	1,255 25	937 11	619 63	970 76	1,486 38	2,003 21	871 83	925 77	895 72	359 67	11,009 55	35.7	2.32
Freight and Express			25 93	24 54		50 53	45 59	33 02	4 15	10 38	17 67	14 62	226 43	.8	.04
Hauling	13 90	11 00	15 00	15 00	21 50	36 75	38 50	42 25	29 00	43 25	27 50	23 00	316 65	1.0	.07
Steel Cable		64 13						67 87	119 40			62 84	314 14	1.0	.07
Lumber	26 81		12.47	29 22	25 75	19 71			11 98			9 31	135 25	.4	.03
Electrical Supplies					23 65	4 32						27 97		.1	.005
Cl'g Ground	51 75						40 00	43.75	84 00	6 00	57 00	178 60	461 10	1.6	.095
Sundry Exp				21 25	12 25	17 00				36 00	4 85		91 35	.3	.02
Totals and Averages.	$1,712 87	$1,804 48	$2,895 99	$2,681 32	$2,273 46	$2,667 87	$3,017 13	$3,884 83	$2,529 99	$2,574 61	$2,530 64	$2,208 91	$30,784 95	100 0	6.48

EXTRACTION TABLE.

MONTH.	Depth in Feet.	Acres Dredged.	Cubic Yards, Bank Measurement.	Number of Prospect Holes in and Near Area Dredged.	Prospect Value Recovered, %.	Operating Costs in Cents per Cubic Yard.	Character of Ground Dredged.
January	26.7 G.	.49 G.	20,850 G.	6	58	5.52	Soil and tight gravel containing clay.
	14.7 S.	.43 S.	10,150 S.				
February	14.5 S.	1 29 S.	30,130 S.			5.98	Soil.
March	14.0 S.	.18 S.	4,400 S.	4	71	9.47	Soil and loose gravel,
	27.2 G.	.59 G.	26,170 G.				Soil and loose gravel.
April	28 6	1.06	49,130	3	70	5.46	Soil and loose gravel.
May	28.5	.78	35,900	3	70	6.33	Soil and loose gravel.
June	30.5	.69	34,040	3	94	7.83	Soil and loose gravel.
July	36.8	.68	40,100	2	77	7.52	Soil and loose gravel.
August	34 4	.78	46,000	3	65	8.44	Soil and loose gravel.
September	30.0	.96	46,790	2	43	5.34	Soil and loose gravel, worked by Chinese.
October	30.7	1.03	50,960	2	173	5.05	Sand and fine gravel.
November	28.1	.87	39,420	2	105	6.42	Sand and fine gravel.
December	26.7	.94	40,570	1	124	5.45	Some Chinese tailings.
Totals and averages	30.4	10.77	474,610	31	74	6.48	

ALL OPERATING AND ALL OTHER COSTS.

COSTS.	January	February	March	April	May	June	July	August	September	October	November	December	Totals	Total Expense in Cents per Cu. Yd.
Biggs No. 1, Operating Expense.	$1,712 77	$1,804 48	$2,895 99	$2,684 32	$2,273 46	$2,667 87	$3,017 13	$3,884 83	$2,529 99	$2,574 56	$2,530 64	$2,208 91	$30,784 95	6.48
General Plant	14 00	383 84				127 05	552 09	50 85	31 10			25	1,159 18	.24
Prospecting, Oroville	552 76	15 20											567 96	.12
General Expense, Oroville.	45 18	42 04	37 38	70 00	686 98	38 48	56 61	481 91	140 34	31 95	116 72	55 71	1,803 30	.38
Gener'l Expense, San Francisco.	47 20	56 80	97 73	48 84	174 20	75 80	67 79	51 01	44 45	47 38	45 65	44 15	801 00	.17
Taxes, Oroville			328 09								988 87		1,316 96	.28
Bullion Expense.	6 47		8 69	15 83	13 68	17 38	21 59	23 64	13 38	17 26	4 12	8 47	150 51	.04
Totals and Averages	$2,378 38	$2,302 36	$3,367 88	$2,818 99	$3,148 32	$2,926 58	$3,715 21	$4,492 24	$2,759 26	$2,671 15	$3,686 00	$2,317 49	$36,583 86	7.71

REPAIR TABLE SHOWING COST OF LABOR AND MATERIAL ON DIFFERENT PARTS OF THE DREDGE.

		Jan.	Feb.	March.	April.	May.	June.	July.	August	Sept.	Oct.	Nov.	Dec.	Totals.	
Ladder and bucket line	Labor	$13 50	$26 64	$65 80	$119 20	$298 98	$288 69	$75 00	$49 68	$40 50	$46 57	$44 58	$61 49	$10,678 45	
	Material	64 66	241 14	1,177 66	968 65	568 75	1,000 26	1,466 97	1,881 51	854 39	584 40	629 43	120 00		
Stacker	Labor	29 65		5 72	15 92	3 91	18 19	16 00	22 13	39 11	19 00	41 59	57 27	1,241 28	
	Material	168 30		95 25	8 00			43 00	35 00	11 02	168 00	244 88	198 62		
Winches	Labor	11 03	17 08	5 72	1 43		3 90	19 87	57 22	27 00	18 79	22 98	5 12	468 30	
	Material	38 30	45 00	3 82			14 89		45 80		197 85		32 50		
Screen	Labor	1 90	7 52	62 95	4 08	1 95	24 22	19 87	21 19	2 18	4 16	9 65	5 43	278 49	
	Material	10 55	33 64			3 60			38 25			7 35	30 00		
Pumps	Labor	5 89	31 09	83 33		5 90		3 20	5 41	1 98	28 61	5 28	23 41	257 52	
	Material		38 00						21 20		4 22				
Lines	Labor	41 06	45 09	17 52	25 92	11 72	10 15	9 62	30 14	21 78	18 79	29 41	39 38	701 73	
	Material	10 50	116 83				14 40		69 78	121 47	33		67 84		
Cleanups	Labor	15 97		6 08	5 51	26 58	27 74	20 85	27 55	28 98	34 04	26 42	15 67	316 29	
	Material				21 25		18 19				36 00	5 46			
Contingent repairs, etc	Labor	61 40	191 98	59 03	15 73	25 75	17 79	49 32	11 58	21 62	24 32	46 42	87 04	2,800 62	
	Material	88 43	185 44	75 95	237 42	287 14	246 36	194 82	222 46	122 05	225 82	142 82	159 96		

TABLE OF LOST TIME.

MONTH.	Ladder and Bucket Line—per cent.	Stacker—per cent.	Winches—per cent.	Screen—per cent.	Pumps—per cent.	Power—per cent.	Lines—per cent.	Clean-Ups—per cent.	Other Causes—per cent.	Total Lost Time—per cent.	Total Dredging Time—per cent.	Average No. Cubic Yards Dredged per Day of Running Time.	Average No. Cubic Yards Dredged per Day of 24 Hours.
January	7.1	15.6	5.8	1.0	3.1	5.1	21 6	8.4	32.3	22.3	77.7	1,257	1,000
February	7.8	0.0	5.0	2.2	1.1	6.5	13.2	0.0	56.2	46.4	53.6	2,007	1,076
March	18.4	1.6	1.6	17.6	23.3	14.4	4.9	1.7	16.4	34.9	65.1	1,514	986
April	58.4	7.8	.7	2 0	0.0	8.0	12.7	2.7	7.7	21.9	78.1	2,100	1,637
May	76.5	1.0	0.0	.5	1.5	4.1	3.0	6.8	6.6	39.0	61 0	1,900	1,160
June	73.9	4.4	1.0	6.2	0.0	.7	2.6	7.1	4.2	39.9	60.1	1,890	1,135
July	23.4	5.0	6.2	6.2	1.0	33.0	3 0	6.5	15.7	37.0	63 0	2,114	1,332
August	21.1	9.4	24.3	9.0	2.3	4 4	12.8	11.7	5.0	24.2	75 8	1,998	1,484
September	20.4	19.7	13.6	1.1	1.0	7.7	11 0	14.6	10 9	24.0	76.0	2,053	1,560
October	22.3	9.1	9.0	2.0	13.7	7.0	9 0	16.3	11.6	23.0	77 0	2,135	1,644
November	19.4	18.1	10.0	4.2	2.3	1.5	12 8	11.5	20.2	24.3	75.7	1,752	1,314
December	20 4	19.0	1.7	1.8	7.8	2.2	12.4	5.2	29.6	30.7	69.9	2,017	1,412
Totals and Averages	30.7	9.4	6.6	4.5	5.4	7.9	9.9	7.7	17.9	30.6	69.4	1,875	1,300

SUMMARY OF COST IN CENTS PER CUBIC YARD.

	1903.
Dredge Crew, Power and Operating Supplies	2.52
Repair Labor	.95
Repair Supplies	2 65
Total Operating Costs	6.10
Superintendence	.38
Oroville General Expense	.28
San Francisco General Expense	.17
Taxes and Insurance	.38
Bullion Expense	.04
Grand Total all Costs	7 35

For three dredges these items would he as follows:

	1903.
Dredge Crew, Power and Operating Supplies	2.52
Repair Labor	.48
Repair Supplies	2.58
Total Operating Costs	5.58
Superintendence	.16
Oroville General Expense	.09
San Francisco General Expense	.06
Taxes and Insurance	.24
Bullion Expense	.04
Grand Total all Costs	6.17

The above work was done with one $45,000 dredge uuder direction of Superintendeut C. H. Munro. The original inteutiou of the organizers of the company was to equip the property with three $45,000 dredges. This has not been done, as the $67,500 style of dredge since developed can haudle 60,000 cubic yards per month at a cost of about 6 cents per cubic yard. It is the iuteution of the company to now add one $67,500 dredge. With this and the $45,000 dredge it is expected to handle 100,000 cubic yards per month at a total average cost of 5.7 cents per cubic yard.

Weights of Steel and Iron, Etc.

TO THE EDITOR:—In looking over the table of weights of round, octagon and square steel given in your last number, out of curiosity I applied the old rules for memorizing for the purpose of getting at the approximate weights of bar wrought irou. I found that they agreed very well, after making allowauce for the extra weight of steel over iron. In doing that, however, I discovered a new rule that will give—uot approximate, but absolutely correct—weights of octagon steel to the third or fourth decimal place. As it may iuterest your readers, I give it below. It must be understood that the rule is given in the following form in order that it may be easily remembered:

Rule for fiuding the weight in pounds of octagon steel bars. The weight found is for oue lineal foot of bar. It is to be uuderstood that the diameter of the octagon is to be measured from face to face, and uot from angle to angle. That is to say, it is with reference to a circle, a circumscribed octagon, and not an inscribed one. Take the number of quarter inches in the diameter and square them. Add to this square the square of the same diameter taken in inches. Divide the sum by 6. The quotient is the weight in pounds of oue lineal foot of the octagon steel bar. Example:

Octagon bar 1 inch in diameter.

$1 \times 4 = 4$ quarter inches.

$((4 \times 4) + (1 \times 1)) \div 6 = 16 + 1 = 17 \div 6 = 2.833$ pounds per liueal foot.

2 inches in diameter:

$((8 \times 8) + (2 \times 2)) \div 6 - (64 + 4) \div 6 = 68 \div 6 = 11.333$ pounds per lineal foot.

5 inches in diameter:

$((20 \times 20) + (5 \times 5)) \div 6 = (400 + 25) \div 6 = 425 \div 6 = 70.833$ pounds per lineal foot.

Comparing these results with your table, they will be found to agree exactly. Taking the number of quarter inches is, of course, the same thing as multiplying by 4, but given in that way it is easier to remember.

There are several approximate rules for finding the weight of wrought iron bars, and as some of your readers may not know them, and as they are easily remembered, and therefore useful, I will apend them. They give approximate results only, but they are sufficiently accurate to answer ordinary purposes.

Approximate rules for finding the weight of bar iron: For iron of rectangular or irregular section, take the area of the section in square inches and multiply by 10. The product is weight in pounds of 1 linear yard.

Example—Bar, 2×4 inches: $2 \times 4 = 8$; $8 \times 10 = 80$ pounds per linear yard; $80 \div 3 = 26.666$ pounds per foot.

For round iron bars, take the number of quarter inches in the diameter aud square them; divide the square thus found by 6. The quotieut is weight of 1 linear foot.

Example—Round bar 2 inches in diameter: $2 \times 4 = 8$; $8 \times 8 = 64$; $64 \div 6 = 10.666$ pounds per foot.

It was from this last rule that I deduced the rule for calculating the weight of octagon steel bars, and it is rather curious that while the latter gives only the approximate weight of round iron bars, it gives the exact weight of octogon steel bars, even to several decimal places.

There is another rule, easily remembered, that ap-

plies to railroad "T" rails, and which also gives exactly correct results. As is well known, railroad iron or steel is graded or classified by the weight per yard of a single rail. Thus what is known as "56-pound iron" (or steel) is that weighing fifty-six pounds to the linear yard. If it is desired to find the number of gross or long tons in a mile of track (single track, of two rails) it is easily found by the following:

Rule for finding the weight of railroad "T" iron in 1 mile of single track (two rails) in long tons: Divide the weight per yard by 7, multiply the quotient by 11, and the product is the weight of 1 mile of track in long tons of 2240 pounds.

Example—56-pound rails $(56 \div 7) \times 11 = 88$ long tons.

Example—85-pound rails $(85 \div 7) \times 11 = 133.57+$ long tons.

In the case of round iron or octagon steel, having a diameter of less than one inch, if expressed in quarter inches, it is only necessary to square the numerator of the fraction, as, for instance, for a diameter of three-fourths inch, square the 3, etc. If the diameter be expressed in eighths of an even number, it can of course be reduced to quarters, except in case of one eighth, where it is half a quarter—that is, .5—which is to be squared. If the number of eighths is uneven, it will be expressed by quarters and fractions, as in case of ⅞. Here there would be 3½ quarters, and the formula would be $((3.5 \times 3.5) + (.875 \times .875)) \div 6 = W$. A diameter of 1⅞ inches would reduce to 7½ quarter inches, and so on.

SANFORD ROBINSON.

Steeple Rock, New Mexico, Jan. 25.

The Precious Stones Industry.

In the annual report on the precious stones industry by G. F. Kunz is an interesting preliminary review of the industry for 1903 in which emphasis is laid on the future of California as a field for gem discoveries. Pala, in San Diego county, furnishes the remarkable new variety called kunzite, a lilac-colored spodumene. Crystals of great size and beauty have been obtained. It has been cut into gems for jewelry.

New discoveries and developments of fine rubellite and other tourmalines have also been made at Pala and likewise near Coahuila, in Riverside county. Topaz, both white and pale blue, have been identified for the first time in the State of California. It was found at Coahuila in crystals ¾ of an inch by 1 inch. Spessartite garnets were obtained near Ramona, in San Diego county. Chrysophrase was also extensively mined during the early part of the year in Tulare county. The massive green vesuvianite from Siskiyou county, which so resembles jade that it was first mistaken for that stone, has been further analyzed and examined and the name californite bestowed upon it. A second locality for it was found in Tulare county. The deposits of colored tourmaline at Mesa Grande were further developed during the year.

Outside of California, both prospecting and development work have been carried on in a few scattered districts. Turquoise has been mined at several places in New Mexico, Arizona, Nevada and in California, and many gems of great beauty have been obtained. The sapphire mines of Montana were worked by three different companies, two developing the fine blue gems at Yogo, in Fergus county, and the other the multi-colored or variegated stones at Rock creek in Granite county. Much of the material from all three localities, when not fine enough for gems, found a ready sale for watch jewels, principally among European manufacturers. The old beryl locality at Grafton, N. H., was reopened and some development was attempted. Very little was done with the tourmalines in Maine, although some prospecting took place at several localities in that State. In North Carolina, prospecting for beryl, amethyst and emerald matrix was continued.

In many of the ancient river channels of California, which are usually very much wider than the modern streams, the size of the material comprising the channel filling varies greatly, from fine gravel and sand to coarse cobbles and boulders, but in these channels at times are found boulders of quartz, quartzite or other hard metamorphic rock weighing 50 to 100 tons or more, while the greater part of the material filling the channel is small, few of the larger cobbles exceeding a foot in diameter, and not many of them. Near San Andreas, in Calaveras county, are numerous masses of greenstone with angular edges and rough surfaces, showing little signs of abrasion, though lying in a bed of gravel 60 feet in depth, and at 20 to 50 feet above bedrock, some of them on the surface. These boulders weigh from 50 to over 300 tons. The channels where they are found are narrow, less than 100 feet wide, and the surrounding rim rocks are not rugged. These occurrences indicate that the boulders were deposited in their present position by heavy floods, and that the superficial gravel was swept away quickly, as long continued scouring by moving detritus in the stream would have resulted in rounding the edges and faces of the boulders.

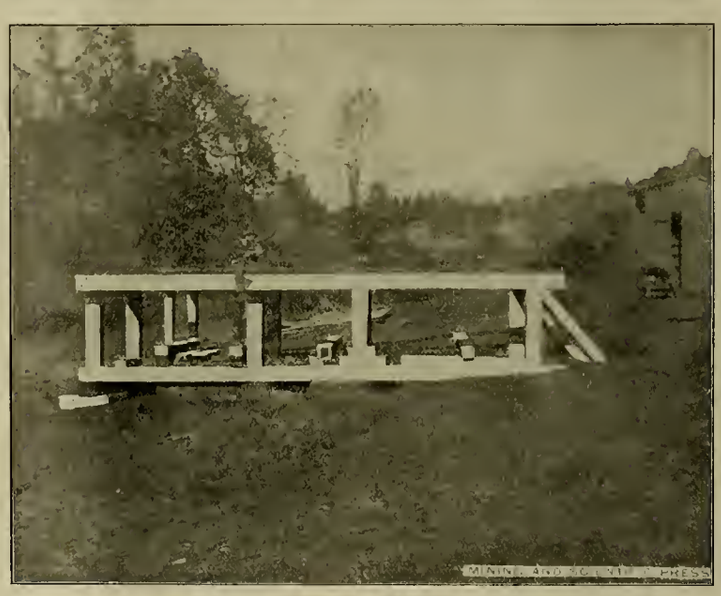
Simple Head Frame Construction.

Written for the MINING AND SCIENTIFIC PRESS

At many mines may be seen elaborate and expensive head frames, where the amount of rock handled or the depth at which the mine is being worked does not require or justify any such outlay or expense. The simplest frame adapted to either incline or vertical shafts is the two-post frame, with back angle braces. This type of frame is easily and cheaply constructed, requires the minimum of timbers, and it can be utilized with bucket, skip or cage. Skips may be dumped automatically into bins constructed in the frame, and cages may be operated as readily with this type of frame as any other, the guides being carried in front of the frame at a suitable distance, and buckets may be handled with a trip rope or even dumped automatically in this frame. It not infrequently occurs that a shaft is sunk in a flat where no dump can be obtained without resorting to artificial means. A crib may be carried up as the shaft is sunk by means of a windlass, and the material from the shaft filled in around it, and upon this insecure fill sills may be laid and the head frame built, but such a makeshift as this is only advisable where the work done is for the purpose of prospecting only and no permanent installment is contemplated.

The accompanying engraving shows a substantial frame constructed on a flat at the collar of a shaft. The conditions were undesirable, as the alluvial deposit overlying bedrock consisted wholly of loam and clay, situated in a wet, meadow-like valley. It was 13 feet to bedrock, but the vein was known to pass underneath the surface at the site of the shaft, the croppings being exposed in a creek not far distant. It was impossible to sink in the creek bed, and the shaft was located as shown. The shaft was begun and sunk to bedrock, the soft earth being carted away. Shallow pits were then dug at the surface to get down to the tough clay, and in these pits was laid a layer of broken rock to form a foundation for the heavy mudsills. There were four of these pits, located under the position occupied by the upright posts, shown in the engraving. On these sills were laid two long stringers, or sills, which were mortised to receive the tenons of the posts, the upper tenons of which were inserted in caps connecting the two posts of each set. Upon these caps were laid a second set of stringers which formed the real sills for the head frame. The shaft is situated near the forward end of the structure, the lagging showing beneath the lower sill. At the back short angle braces were placed to keep the frame from racking, and the whole was solidly bound with ¾-inch iron bolts.

The material from the shaft was dumped in and around this frame, and eventually it extended over half an acre of ground, the frame with its details of construction being buried from sight. Upon this substructure was erected a head frame 32 feet in height. It consisted of nine pieces of timber, viz., two posts, two back braces, one cap, two ties (one joining the angle braces and the other the posts under the cap) and two short upright posts between the lower tie and the cap to support the sheave wheel. The shaft was sunk to a depth of over 300 feet with this frame, the first 100 feet being vertical and the remainder inclined at a variable angle, following the vein, which had many changes of dip. The illustration on the front page is of a similar head frame constructed by the writer, who also built that above described. The conditions were not identical, though similar. In the latter case the forward end of the frame is supported upon a cap which rests upon two posts, these having their foot rest on a crib of timbers 3 feet square, the bedrock being too soft to support the post. The sills were laid on similar structures at four places along their length. The shaft was an incline, dipping at 50° beneath the engine house, it being impracticable to place the latter on the opposite side. The track in the shaft was projected upward at the same angle into the head frame. Self-dumping skips were used, these dumping automatically by allowing the forward wheels to run onto a horizontal track, until they were stopped by a bumper, the hind wheels being lifted off the track by the pull of the engine until the contents of the skip poured out. At 2½ feet above the collar of the shaft a gate was provided by cutting out a section of the track about 18 inches in length. This section was provided with hinges. If it was desired to hoist water, these were thrown back and the skip wheels ran out upon a flat section of track arranged there for the purpose, and the water poured out into a box and flowed away. The illustration shows the frame in process of construction. There are several temporary pieces shown, used for holding platforms, etc., which were subsequently removed. Owing to the length of the back braces, a counter-brace was put in to give the frame steadiness and to afford a support to the timbers carrying the track upward from the collar of the shaft. These timbers, 8x8 inches, rest on the cross tie midway of the auxiliary braces. All posts and sills were provided with mortises and tenons, and the ties were dovetailed in, as were also the vertical posts.



Sub-Structure for Head Frame, Built on Flat Ground.

One-inch iron bolts bound the sheave supports in place, between the cap and tie, carrying the sheave. The rock from the shaft was dumped in front of the frame until a sufficient space had been provided and the ground had settled sufficiently, when an ore bin was built, into which the skip dumped.

The short angle-braces under the cross ties connecting the main posts were inserted as precautionary, the spread between the posts being 10 feet, those under the lower tie particularly being necessary, owing to the shock incident to the striking of the skip wheels against the bumper, which would occur occasionally.

This type of head frame is recommended wherever it is possible to secure timbers sufficiently long, and even where they can not, splices may be made which will make a very strong frame. Shorter timbers usually cost less per foot than those of unusual length, which in some regions must be cut to order. In the case of the first frame above described, the material was ordered late in the fall, and one of the long timbers intended for angle braces failing to arrive at the mine, a brace was built of inch boards nailed together, the lengths being variable and the ends overlapping. This frame was subsequently taken down and removed to another mine, and every stick of timber was reused without change of any kind being necessary.

During the recent warlike demonstrations made by the Colombians, in South America, the American manager of the Darien Mining Co. and his staff at Cana closed the property and retired to Panama to await the result of developments. Doubtless this was a wise course to pursue, for while the United States Government would, no doubt, demand proper satisfaction of the Colombian Government for any damage to property of Americans, or for any indignity or injury inflicted upon Americans in Colombia, the miners showed their discretion in leaving a position so wholly unprotected as that at Cana.

Ordinary Transformer Connections.

Written for the MINING AND SCIENTIFIC PRESS by WM. H. KRITZER.

The common transformer consists of a laminated iron core for procuring a magnetic circuit upon which two coils of copper wire or flat ribbon are wound, the layers being separated from each other by some specially prepared insulating material. These coils are entirely distinct. The one called the primary is connected to the main circuits; the other coil, called the secondary, is connected to the circuit to which the current is delivered. When the current that is taken from the mains is sent through the primary coil it sets up a magnetism in the coil, which rapidly alternates with the changes of the current.

This changing magnetism sets up an alternating electro-motive force in the secondary, and this secondary current depends upon the number of turns of wire or ribbon in the secondary coil. If the secondary turns are less in number than the primary, the secondary electro-motive force will be less than the primary. The winding of the secondary is sometimes made for several different voltages, having its terminals arranged for either series or multiple connections; others are movable in order to obtain a practically constant current.

One of the necessary requiremeuts of a good transformer is that it will withstand undue heating, which in the high voltages may be dissipated by artificial or simple radiation from the surface of the containing case, by air blast, or by the circulation of water through pipes immersed in oil, or by the constant removal of heated oil and its return after having been cooled. A transformer never gives out quite as much power from the secondary as it takes in from the primary mains, because there are losses of two kinds: first, the iron loss due to the magnetic reversals in iron; second, copper loss, resulting from the passage of current through the conductors. Experience and test have made it evident that the installation of one large transformer instead of several small ones is very much more economical in first cost, regulation and running expeuses.

Ordinary transformers, having parallel connections and built for the same potential and frequency, may be connected together in a variety of ways that need no explanation outside of the accompanying diagrams.

Where continuity of service is very important in the three-phase system, the "delta" connections are of great advantage, as the removal of one transformer does not interrupt the distribution, and the removal of two trausformers still admits of power transmission on a single phase or circuit. The advantage of the "star" connection over the "delta" is that for the same transmission voltage smaller transformers can be installed.

Transformers used for raising the voltage are known as step-up transformers; those used for lowering the pressure are known as step-down transformers.

When transformers are identical as to make and type it will generally be found that the secondary ends can be connected exactly like the primaries—i. e., if the two right hand primaries are connected together, then the two right hand secondaries will usually go together. However, if manufactured by

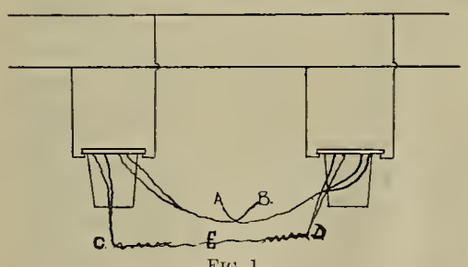


FIG. 1.

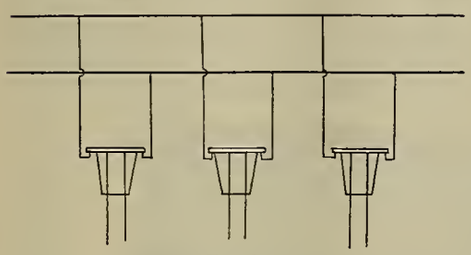


FIG. 2.

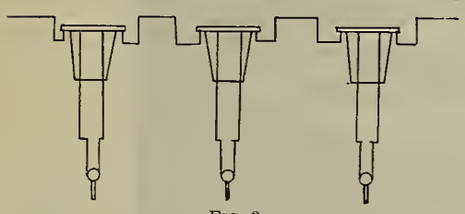


FIG. 3.

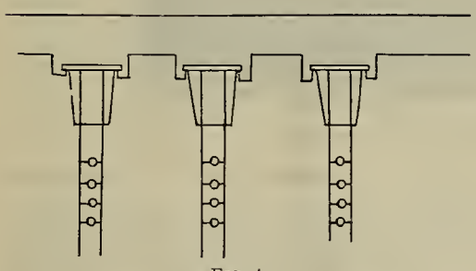


FIG. 4.

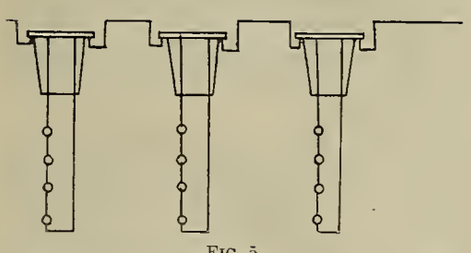


FIG. 5.

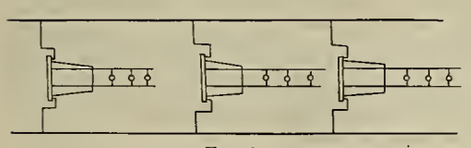


FIG. 6.

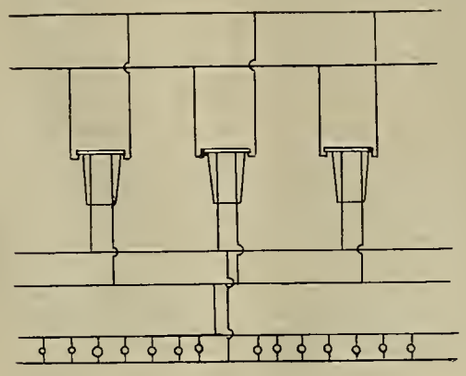


FIG. 7.

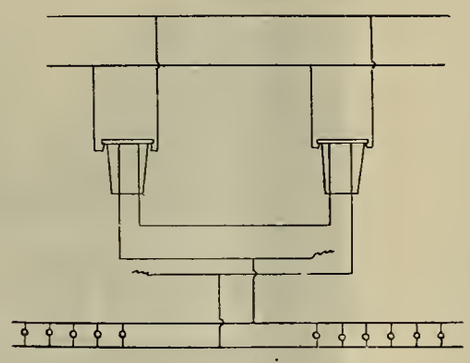


FIG. 8.

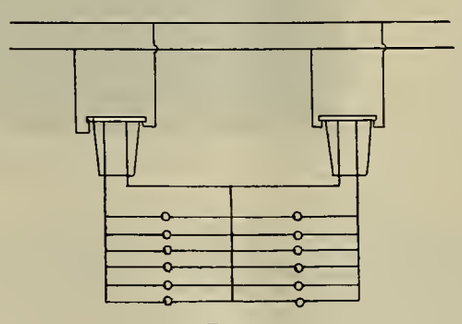


FIG. 9.

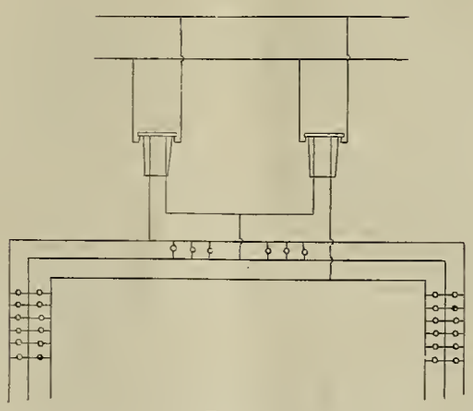


FIG. 10.

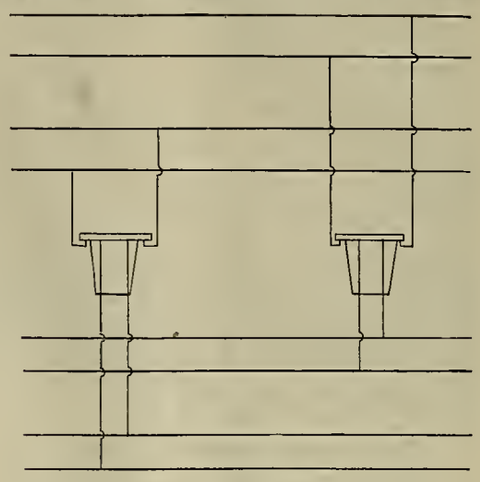


FIG. 11.

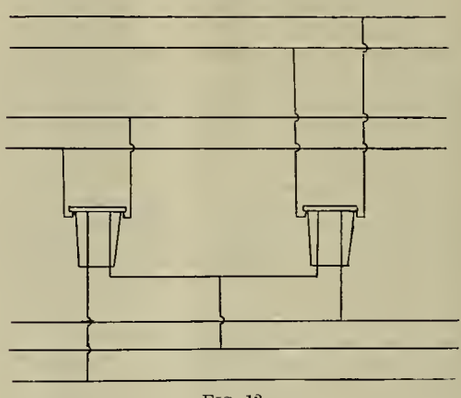


FIG. 12.

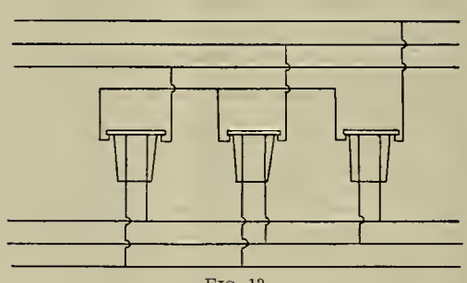


FIG. 13.

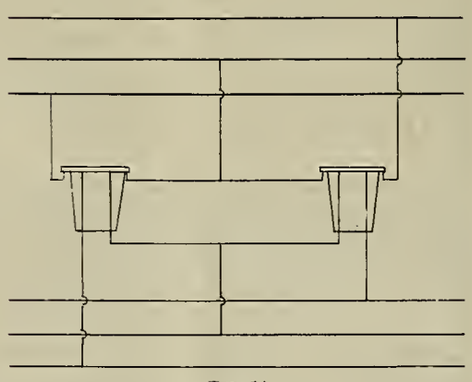


FIG. 14.

different makers it is necessary to test them in order to avoid the possibility of connecting them in such a way as to short circuit the one on the other, for if they are to be run in parallel the windings must have the same polarity at a given instant, and although it is not imperative that they be of the same type it is decidedly preferable.

This polarity cannot be determined by any ordinary method, but it is possible to find out whether or not transformers agree in this respect by connecting

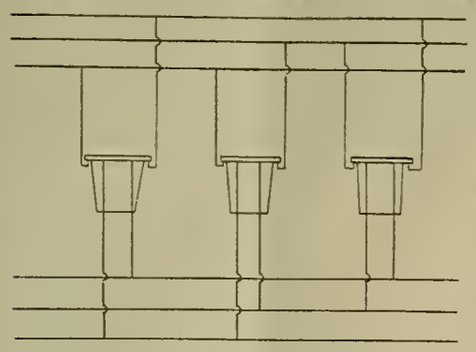


FIG. 15.

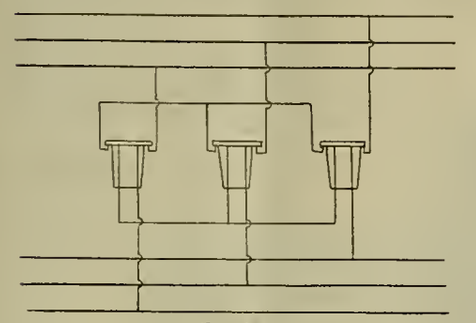


FIG. 16.

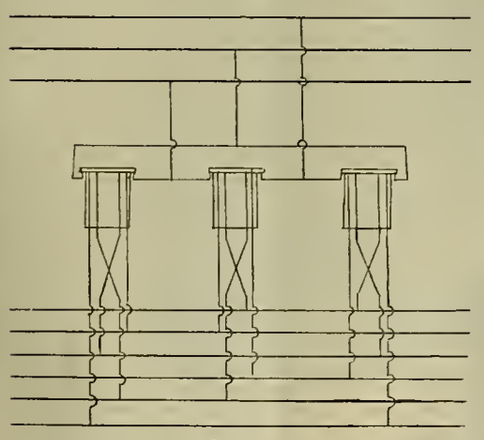


FIG. 17.

the two to the primary circuit (see Fig. 1), then connect one secondary terminal of one transformer with one of the other transformers by means of a small fuse wire E; touch the remaining secondaries together. If the fuse melts the connections are wrong, and in making them permanent C must connect with A and D with B. If the fuse does not melt, the connections—C to D and A to B—may be made permanent.

Fig. 2. Transformers for common two-wire system.

Fig. 3. Transformers for arc lamps.

Fig. 4. Transformers in series with lamps in parallel.

Fig. 5. Transformers in series with lamps in series.

Fig. 6. Transformers in parallel with lamps in parallel.

Fig. 7. Transformers for secondary circuits—secondaries in parallel.

Fig. 8. Transformers for secondary circuits—secondaries in series.

Fig. 9. Transformers for secondary three-wire system.

Fig. 10. Transformers for secondary circuits—secondaries on three-wire system.

Fig. 11. Transformers for two-phase circuits—with four line wires.

Fig. 12. Transformers for two-phase primary—and three-phase secondary.

Fig. 13. Transformers for three-phase circuits.

Fig. 14. Transformers for three-phase circuits.

Fig. 15. Transformers for three-phase circuits—Delta connection.

Fig. 16. Transformers for three-phase circuits—Star connection.

Fig. 17. Transformers for three-phase primary circuit to six-phase secondary circuits.

The Geology and Copper Deposits of Bisbee, Arizona.*

Written by F. L. RANSOME.

The following paper aims to present in condensed form the salient results of a detailed geological study of the Bisbee quadrangle, Arizona, carried on during the latter part of the year 1902. It is essentially an abstract of the final official report which will shortly appear in the series of professional papers of the United States Geological Survey, accompanied by maps, sections and illustrations.

I. GEOGRAPHY.—The Bisbee quadrangle, which includes the Warren mining district, lies in Cochise county, in the southeastern part of Arizona, adjoining the Mexican boundary line. The area of the quadrangle is about 170 square miles, and includes the southeastern half of the Mule mountains, one of the smaller of the isolated ranges characteristic of this part of Arizona. The Mule mountains, while less markedly linear than the Dragoon, Huachuca, Chiricahua and other neighboring ranges, have a N. W.—S. E. trend. They may be considered as extending from the town of Tombstone to the Mexican border, a distance of about 30 miles. On the northwest they are separated by the broad, flat floor of Sulphur Spring valley from the Chiricahua range, and on the southeast by the similar broad valley of the Rio San Pedro from the Huachuca range. The maximum width of the range is about 12 miles, and its greatest elevation attained by Mount Ballard, west of Bisbee, is 7400 feet above sea level.

The town of Bisbee, with an estimated population of 6000, is crowded into a few narrow confluent ravines near the heart of the range, 7.5 miles north of the international boundary. It is connected by the El Paso & Southwestern Railroad to the east with the new town of Douglas in Sulphur Spring valley, with Deming and El Paso. To the west, branches of the same road run to Naco on the Mexican boundary, to Tombstone and to Benson on the main line of the Southern Pacific Railroad. At Douglas, connection is made with the Nacosari Railroad to Cos, and at Naco with the Cananea, Yaqui river and Pacific Railroad to Cananea, thus bringing the new smelters at Douglas within reach of the important mines at Nacosari and Cananea in the State of Sonora, Mexico.

II. GENERAL GEOLOGY.—The first attempt to describe the geological environment of the Bisbee copper ores was that of Wendt, in 1887, followed thirteen years later by the more comprehensive account by Douglas. Both these papers, however, touch but briefly on the geology and structure of the Mule mountains, being concerned mainly with the ore bodies and the metallurgy of the ores. Dumble's reconnaissance notes published in 1902, although necessarily fragmentary, are really the first step toward any general knowledge of the broader geological features, and to him is due the first recorded recognition of the extensive Cretaceous deposits of the Bisbee region.

The rocks of the Mule mountains may be primarily divided into five main groups: (1) a pre-Cambrian basement of crystalline schists; (2) a Paleozoic sedimentary series; (3) a Mesozoic sedimentary series; (4) Quaternary valley deposits; and (5) intrusive igneous rocks.

One, standing upon Mount Ballard, can look out over the clustered ridges and peaks composing the mountain range and to a certain extent trace the general distribution of the rocks by the character of the topography. The Quaternary deposits floor the broad valley plains stretching away from the intricately embayed line marking the foot of the mountains. The N. W.—S. E. diagonal of the Bisbee quadrangle, a line which passes very near the town of Bisbee, and corresponds with the course of Tombstone canyon, roughly divides the mountainous part of the quadrangle in two topographical divisions. Northeast of this line the mountains are sculptured from comparatively soft Mesozoic beds, striking approximately with the trend of the range (N. W.—S. E.) and dipping at generally moderate angles toward Sulphur Spring valley on the northeast. The slopes of these hills are comparatively smooth, although the occurrence of hard fossiliferous limestone in the middle of the generally arenaceous group has occasioned a persistent cliff of erosion, conspicuous from points near Bisbee. Southwest of this line, pre-Cambrian schists and Paleozoic beds, both cut by eruptive rocks, prevail. These are more resistant of erosion and more heterogeneous in character than the Mesozoic beds and have a far more complicated structure. Their degradation has consequently resulted in a more rugged and less regular topography.

THE PRE-CAMBRIAN BASEMENT.—The rocks forming the pre-Cambrian basement, the oldest rocks known in the Mule mountains, are fine-grained sericite schists, derived from the ancient sediments. These, which have been called the Pinal schists, were probably original shales or arkose sandstones, which were folded and metamorphosed into their present crystalline condition before Cambrian time.

THE PALEOZOIC SEDIMENTARY SERIES.—After long erosion the Pinal schists were reduced to a surface of very slight relief, which in Cambrian time was submerged beneath the sea and covered with the sands that are now represented by the Bolsa quartzite (Cambrian), from 400 to 500 feet in thickness. The Bolsa quartzite has at its base a thin conglomerate, which rests with unconformity upon the eroded edges of the Pinal schists.

The submergence of the area continued, and about 750 feet of thin-bedded, cherty, fossiliferous Middle Cambrian limestones, named the Abrigo limestone, accumulated on top of the Bolsa quartzite. No record of Silurian time has been discovered in the Bisbee quadrangle. Overlying the Abrigo limestone, apparently in perfect conformity, are 340 feet of dark-colored, compact, rather thin-bedded limestones, with some intercalated shales, all carrying an abundant and characteristic Devonian fauna, consisting chiefly of brachiopods and corals. This formation is distinguished as the Martin limestone.

The opening of Carboniferous time was, in this region, unmarked by any interruption of the continued subsidence. No unconformity has been detected between the Devonian and the lower Carboniferous (Mississippian) rocks. The latter consist of white or light-gray granular limestones, often made up almost entirely of crinoid stems. The thickness of the lower Carboniferous limestone may be provisionally given as 700 feet. The beds are often 6 feet or more in thickness, and commonly form cliffs overlooking slopes carved from the less resistant Devonian and Cambrian limestones. This formation has received the name of the Escabrosa limestone.

There is in the Mule mountains no discoverable stratigraphic break between the lower and upper Carboniferous beds. Subsidence apparently continued, and the generally thinner beds of upper Carboniferous (Pennsylvanian) limestone accumulated to a thickness of over 3000 feet above the lower Carboniferous. The upper Carboniferous limestones are usually more compact in texture than those of the lower Carboniferous, and are more fossiliferous. They are also somewhat more variable in color, pinkish and yellowish beds being of frequent occurrence. This formation has been named the Naco limestone.

The local Paleozoic section from the Pinal schists very nearly to the top of the Escabrosa limestone is well exposed on the northeast face of Escabrosa ridge, about 1.5 miles west of Bisbee. The beds of the Naco limestone are best seen in the hills just north of Naco Junction (5 miles southwest of Bisbee), and the conformable relation between the Escabrosa and Naco limestones is well shown near the Whitetail mine, about 2 miles due south of Bisbee.

(TO BE CONTINUED.)

* Abstract Trans. Amer. Inst. Min. Eng.

Annual Report of the Director of the Geological Survey.

The twenty-fourth annual report of the Director of the United States Geological Survey, now ready for distribution, shows that the several branches of that organization greatly enlarged the scope of their work and increased their activities during the last fiscal year. The period covered is from July 1, 1902, to July 1, 1903, for the work of which Congress had appropriated the sum of $1,337,470.

The survey as now organized is divided into five branches—the geologic, topographic, hydrographic, publication and administrative.

The geological branch includes the divisions of geology and paleontology, of mining and mineral resources, and of physics and chemistry. The administration of the division of geology and paleontology was in the hands of the geologist in charge of geology, while scientific supervision rested with the chiefs of sections. The various sections included those of areal geology, Pleistocene geology, pre-Cambrian and metamorphic geology, petrology, economic geology of metalliferous, economic geology of non-metalliferous minerals and paleontology. A new section was created during the year—that of petrology.

A new feature of the work of the division of geology and paleontology was the preparation and publication of a bulletin entitled, "Contributions to Economic Geology, 1902," which is intended to be the first of an annual series.

In Alaska five parties were engaged in field work during the summer of 1902. An account of the investigations made is given in the report.

The year's work of the division of topography may be summarized as follows: Two base lines were measured; primary azimuth observations were made at four triangulation stations; 395 triangulation stations were occupied or located; 1487 miles of primary traverse were run; 36,275 square miles were covered by detailed topographic mapping, this area being distributed through thirty-six States and Territories; 29,160 miles of levels were run; and 1826 bench marks were established, and at each of these an iron post, a bronze or aluminum tablet, or a copper or aluminum plug was set in place. In connection with the Alaskan surveys, about 20,080 square miles were mapped topographically. About 45 miles of the boundary of the Bighorn Forest Reserve of Wyoming were surveyed and marked with special iron posts, this work completing the survey of the reserve; also 154 miles of the boundaries of the Black Mesa Forest

Reserve and 12 miles of those of the Mount Graham Forest Reserve of Arizona were surveyed and similarly marked. In the office ninety-seven atlas sheets were completed and the entire revision and redrafting of the large topographic wall map of the United States was commenced.

About 7500 square miles of forest reserves were examined during the season. The appropriation for this work amounted to $130,000.

This report is published for gratuitous distribution and may be procured on application to the Director of the Geological Survey, Washington, D. C.

Compressed Air Power Plant at the St. Louis Exposition.

The central compressed air power plant at the St. Louis Exposition will contain two main compressing units; one cross-compound two-stage Cincinnati-gear compressor, having 13 and 24-inch steam cylinders, 22 and 14-inch air cylinders and 24-inch stroke, with a displacement at 125 R. P. M. of 1300 cubic feet per minute, and one cross-compound two-stage Meyer-gear compressor having 12 and 20-inch steam cylinders, 18 and 11-inch air cylinders and 18-inch stroke, with a displacement at 100 R. P. M. of 530 cubic feet per minute. The first machine is to supply the general compressed air requirements of the Exposition, the second is to supply the transportation exhibits. The larger machine is stated to be the first compressor of its type thus publicly exhibited.

The general construction of one of these machines is shown in Figures 1 and 2. The frames are of massive construction, with a long bearing on the foundation; the steam and air cylinders, joined in the direct line of thrust by heavy cast-iron housings, are also supported by bed plates under their entire length.

The steam valve gear is of the four-valve type. Steam distribution is effected by means of short double-ported slide valves, working at either end of the steam chest on a valve face as close as possible to the cylinder bore, the port volume being restricted as far as the large valve area will allow. The exhaust valves are of the Corliss rotary type and are placed at the bottom of the cylinder. This construction has been followed in order to produce a valve gear having the essential advantages of a Corliss, namely separate passages for the steam and the exhaust with corresponding reduction in cylinder condensation, together with short, straight ports and small clearance.

The air valve gear is, however, the distinguishing feature of this machine, designed to combine positive action, noiseless operation and durability of the mechanically moved valve with the elasticity of the poppet valve. Noise or rapid wear of the poppet valve, due to the impact of the valves closing at the reversal of stroke, is stated to be eliminated by mechanically closing the passages underneath the poppet valve, and leaving a cushion of air upon which the latter seats.

These machines are built by the Laidlaw-Dunn-Gordon Co., Cincinnati, O.

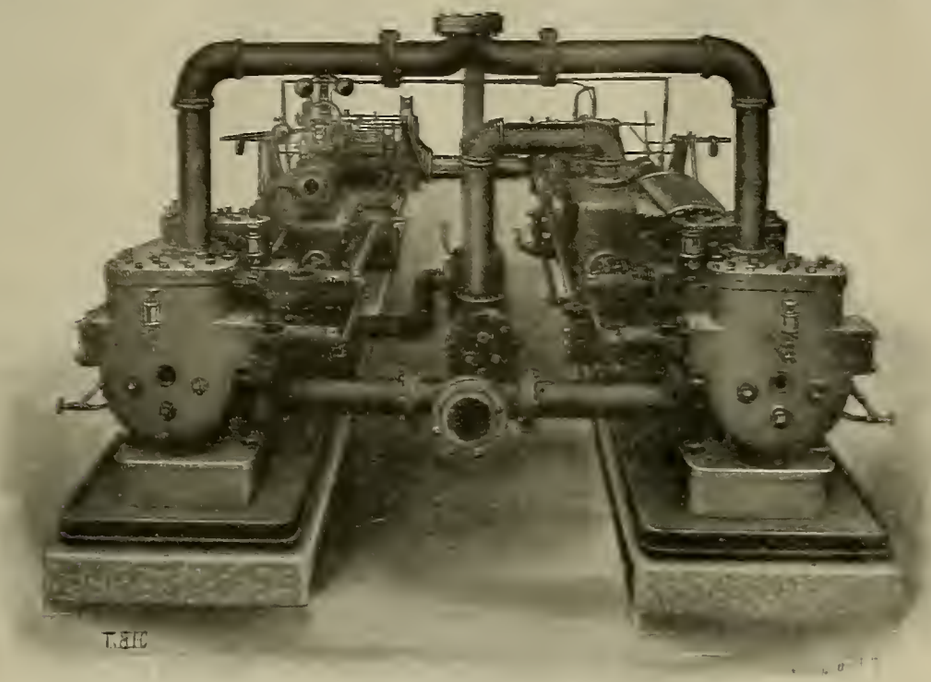


Fig. 1.—Compressed Air Power Plant.

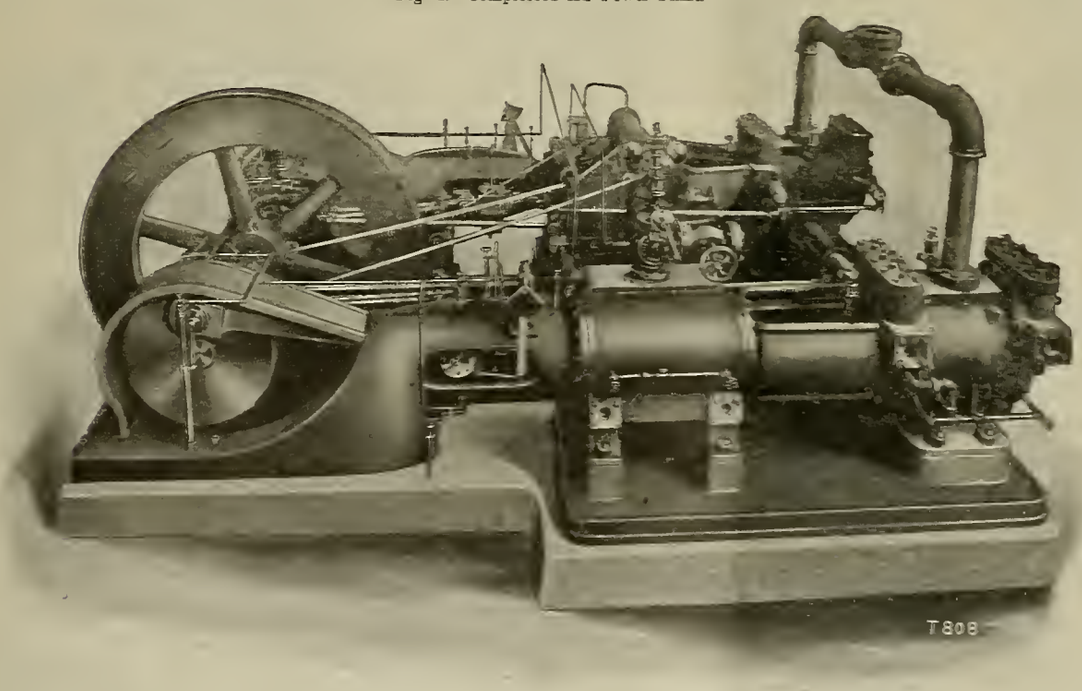


Fig. 2.—Compressed Air Power Plant.

Contact-Metamorphic Deposits in the Sierra Nevada Mountains.*

Written by H. W. Turner.

In the Dardanelles quadrangle of the map of the United States Geological Survey, 3 miles northwest of Tower peak, there is a considerable mass of quartzite, marble and dark, fine-grained gneiss. At the edge of the coarsely crystalline white marble, having a width of about 400 feet, is a white schistose rock, which under the microscope shows pyroxene. Granitoid rocks and quartz veins cut both the marble and the pyroxene schist. The granitoid rock is a fresh quartz-diorite, containing primary augite and titanite. One of the quartz veins at the contact of the marble and pyroxenic schist has been prospected, and much green epidote, garnet, blende and some molybdenite have been found in it.

In the Yosemite quadrangle, east of Iron creek and on the eastern slope of the mountain, at an altitude of 9215 feet, there are numerous streaks and bunches of garnet-pyroxene-epidote rocks, in which open cuts have been made that in some cases show sulphides, notably blende. From one cut issues a sulphurous gas that is doubtless forming from the oxidation of sulphides. Adjoining the schists containing these contact-metamorphic deposits are metamorphic lavas, probably meta-andesites, containing streaks and bunches of magnetite.

In the Yosemite quadrangle, on the southeastern slope of Mt. Hoffmann, several cuts exposing sulphides have been made in a schist lense enclosed in a granitic rock. A shaft also has been sunk on a lode composed of garnet, epidote, quartz, calcite and a little galena and molybdenite. The lode is at the granitic contact. Not far distant, but not directly connected with this lode, is a mass of marble.

In the Mt. Lyell quadrangle there are two series of schistose rocks, one composed chiefly of quartzite and slate, which I have called the Tioga formation, and the other, composed chiefly of metamorphic volcanic rocks, which I have called the Dana formation. Most of the metamorphic volcanic rocks of this district, including both lavas and tuffs, are now schists. Iron mountain is largely made up of these volcanic schists, containing veins of magnetite, which have been exploited to some extent. The property is now owned by the Minarets Mining Co. The magnetite ore shows traces of copper carbonate, but the original copper mineral has not been determined. The magnetite is associated with a green, massive, fibrous hornblende, which contains prisms 2 or more inches in length of a light-colored mineral, possibly apatite. An analysis of the ore shows from 0.243% to 0.454% phosphorus, but no titanic acid. Although the magnetite veins are not at the immediate contact of the neighboring granitic rocks, they should, perhaps, be classed with contact-metamorphic deposits.

In the foothills of Madera county, Cal., there is a belt of contact-metamorphic schists (chiefly mica and chiastolite schists), containing copper deposits at several places. Two of these deposits, the Ne Plus Ultra, belonging to the California Copper Co., and the Buchanan, were examined. The ore of the Ne Plus Ultra mine is chalcopyrite in a gangue composed largely of a colorless hornblende, resembling tremolite. There are also at this place many dikes of diorite-porphyry. In the clay schist country rock there are numerous crystals of chiastolite, often 2 inches in length. These chiastolite schists belong to the Mariposa formations. Granitic rocks occur not far distant toward the east. At the Buchanan mine the enclosing schists contain garnet. The ore is chalcopyrite, associated with a chlorite (resembling delessite), colorless amphibole, pyrite, pyrrhotite, garnet, quartz and reddish brown biotite. Granitic rocks are near by.

*Trans. Am. Inst. Min. Eng.

SOME smelters contend that coke is essential in the blast furnace to keep the charge from packing.

Underground Handling and Transport of Ore.*

NUMBER II.—CONCLUDED.

Written by CHARLES H. SAXER and GEORGE CARTER.

A modification of the wire rope tramway, generally known as an aerial gear, is likewise being used, and, under certain conditions, has proved very effective. It consists of two standing wire ropes forming the track; these are firmly fixed at one end and attached to tightening rigging screws at the other, the wire ropes being passed through the eyebolts and securely held by clamps, these standing ropes throughout their length being supported at intervals on brackets fixed on light drill bars or hangers from the roof of the stope. The buckets, holding from 3 to 5 cwts., are fixed to bridles attached to a frame running on wheels on the carrying rope track.

These are worked by a ¼-inch or ⅜-inch traction rope attached to the top end of each bucket, and in order to adjust for the varying positions of the accumulated broken ground in the stope, are wound round two separate drums, 6 to 12 inches in diameter and about 12 inches wide, fitted with band brakes. These drums, keyed to a common axle, are fixed on an ordinary rock drill bar, the weight of the full bucket descending raising the other automatically; but, in cases where the inclination will not allow of this, a handle may be fixed to the drums and manual labor used.

In the case shown in Figs. 4 and 5, which is working at the Nourse Deep, Ltd., twenty-five 3-cwt. cars were run down a length of 150 feet in half an hour. Four "boys" are employed shoveling into and running the gear per shift, whereas previously nine "boys" shoveled the same quantity of rock over half the distance.

From these various contrivances the broken ore is deposited into boxes, platforms, trucks, etc., or into ore passes, as may be most suitable for trucking in the levels.

Fig. 4.—Aerial Tram Bottom, Nourse Deep, Rand, S. A.

Fig. 5.—Aerial Gear Top, Nourse Deep, Rand, S. A.

Broken rock from development faces has to be cleared as soon as possible after blasting, if rapid headway is to be expected, ground from drives being shoveled into trucks; that from winzes, where vertical, an ordinary hand windlass and kibble, balanced or otherwise, is used. In steeply inclined winzes the kibble slides on rail guides. Where the inclination is not great (see Fig. 6) a track is laid of light rails and a small, self-dumping skip is used, usually worked by an air winch or hand windlass, provision being made at the mouth of the winze for tipping into a truck.

In raises where not sufficiently steep for the broken ground to gravitate to the level below, shoveling by "boys" is usually done; in such cases, a shaking chute, as previously mentioned, might be used with considerable advantage. Another method, although it has not yet been sufficiently tested to have been proved economically successful, is worthy of consideration and is being experimented with on the Nourse Deep, Ltd. In this a jet of water under pressure is utilized for washing the broken ground down a stope; this is especially applicable to the final cleaning down of the rich "fines" before abandoning the worked out stope, in place of the laborious method of sweeping down with brooms at present in use. Furthermore, this method may well serve its purpose in bringing to light the rich "foot wall leader" often left in South Reef stopes, as well as allaying the dust, in which it would be of especial advantage in washing down, in flat raises, the broken ore to the level below after blasting.

TRANSPORT OF ORE TO SHAFT LOADING STATIONS.—In extensively worked mines it is also necessary that labor-saving appliances be adopted in this connection, if large outputs at a minimum cost are to be maintained. Conditions vary so much in each mine that no hard and fast rule can be laid down as regards the methods to be adopted.

Where mechanical appliances are to be used, it is advisable that main drives should be driven as straight as possible, of large section, suitable for not less than two tracks, and generally in the footwall side, keeping the reef just in the "banging" on that side, so that boxes can be set at a sufficiently steep inclination for the rapid filling of trucks. On the floor of the level rail tracks are laid weighing from twelve to twenty-four pounds. These are laid on iron sleepers and stayed at intervals with wooden binding sleepers cut the width of the drive and hitched into the sides.

The usual type of trucks used are U-shaped steel side tipping, and flat-bottom end tipping, having a capacity of from 10 to 16 cwts., these having been found the most suitable for handling. The wheels are generally fast, revolving with the axles; but in cases where there are sharp curves, especially at shaft stations, fast and loose wheels on opposite sides are advantageous. The bearings are generally lubricated with grease by hand, and there is room here for the adoption of a good form of automatic or continuous lubricator.

For the transportation of the trucks to and from the loading stations at the shaft, various systems are in use, hand labor being almost exclusively used in the mines here at the present day, and is carried out by white men, Cape boys and natives.

Animal haulage is being used only to a very small extent, and likewise mechanical; but with this latter method there is room for a considerable extension of its application, and especially if a large number of rock drills are concentrated in the stopes on one level, thus insuring a large quantity of broken ore being handled continuously.

In this connection, we believe that one of the first adaptations of a main and tail haulage system on the Rand in metalliferous mines was installed in the Nourse Deep, Ltd., and this arose from the fact that the shaft in the western section of this mine was not equipped for handling large quantities of ore, thus necessitating its transport to the central shaft.

This haulage first consisted of one air winch having two drums, one loose on the shaft, and each equipped with clutch and brake, the tail rope being carried overhead and guided around pulleys. To obviate the excessive wear and tear, this method has since been improved on by using two air winches, one at either end of the haulage, the larger one, of 7-inch diameter and 12-inch stroke, single cylinder, hauling the full trucks with a main rope of ⅞-inch diameter, while from the opposite end of the smaller winch of 5-inch diameter and 8-inch stroke, double cylinder, hauls back the empties with a rope of ½-inch diameter.

The trains consist generally of eight 16 cubic foot trucks. The level through which this haulage has to work is most unfavorable, having a number of sharp curves, as will be seen from the diagram; it is 1300 feet in length and has only sufficient room for a single track for the greater part of this distance, and, under the conditions which exist, its efficiency over hand tramming has been proved, as the cost over

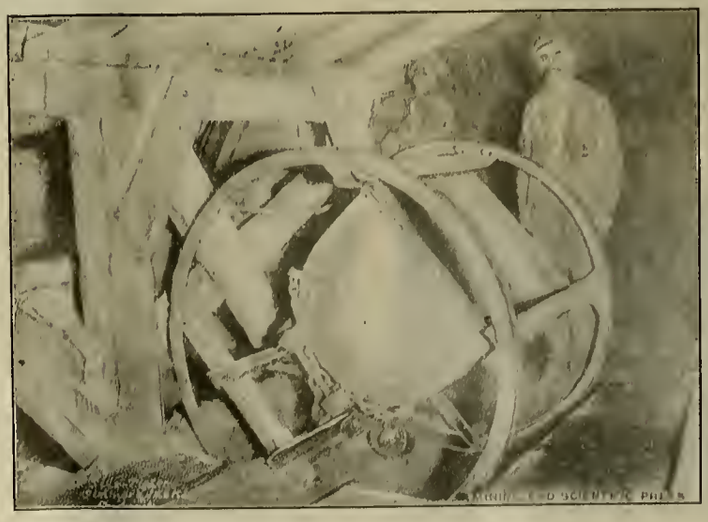


Fig. 6.—Side Tipler, Simmer and Jack Mines, Rand, S. A.

*Trans. Chem., Met. and Min. Soc., S. A.

this length works out an average of 8d per ton, inclusive of maintenance.

One "boy" drives the winches at either end and a white man travels with the trains and has complete control, by means of electric bell signals, anywhere along its length. This practically means that, as far as labor is concerned, it requires only one man and two boys to carry out this tramming.

On reaching the hooking-off point the trucks are detached singly and run by means of a sharp downgrade to a set of points, from which they continue on a short up-grade, sufficient to keep them automatically opposite the bin.

When the ore is dumped, which may be done by a tipler (see Fig. 6), and the truck righted, it is allowed to run back across the points to the hooking-on point on the return empty track.

At either end the drive is widened to allow of this double track being laid for a sufficient distance. Owing to the sharp curves, the rope has to cross the track at various points, and at these points hardwood rubbing blocks or rollers are suitably placed to prevent contact with rails. The rope is also guided around the curves by rollers set vertically. These are about 12 inches long and 9 inches in diameter, being made of circular wood blocks inclosed in a steel pipe, having bearing pins on either end working, preferably, in hard wood journals kept well greased.

The life of the rope is a comparatively short one, being largely influenced by the acidity of the mine water and the bending strains to which it is subjected in this particular case.

A similar haulage is being installed in one of the lower levels of this mine, and, as will be seen from the

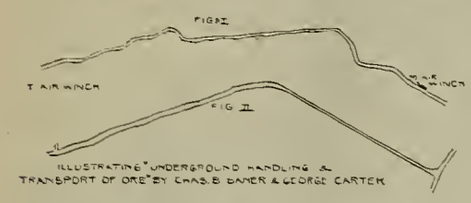


diagram (see diagram), the working conditions will be much more favorable.

This drive, as originally driven, was comparatively straight, and has been further straightened by stripping the sides to a sufficient width to allow of two tracks being laid where necessary.

The length of this haulage will be 1160 feet, and power will be supplied in a similar manner to that previously described.

This system up to the present seems to be the most suitable for local conditions, and can be utilized either where a level has been driven its entire length, when stationary air winches can be fixed at shafts and extreme points east and west, or where the level is still being driven and tramming from stopes at various points has to be carried on simultaneously; the air winch, operating the tail rope, can be mounted on a traveling hogie, which can be moved to and temporarily anchored at any desired point.

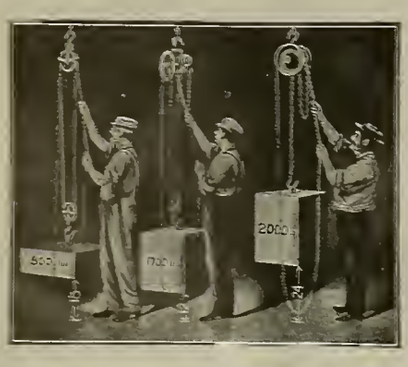
Main levels, where possible, should be laid out with a suitable grade in favor of the full trucks.

Other devices, although not at present in use, might be proved to be suitable, such as self-acting incline planes, endless rope haulages, electric motors, compressed air motors, etc., or even a belt conveyor.

Some of these, although often utilized in colliery practice, have, so far as we know, up to the present, not been extensively used in metalliferous mining, but might receive greater attention in the near future than they have done hitherto.

Labor Saving in Lifting.

Herewith is illustrated the weight and height a



man can lift in half a minute with two blocks such as furnished by the Yale & Towne Manufacturing Co., 9–11–13 Murray street, New York.

Regarding these labor saving devices the Yale & Towne Co. say: With the differential three men can easily lift a ton a foot "by pulling 216 pounds and overhauling 30 feet of chain; with the duplex one man does it by pulling only 87 pounds, but overhauling 59 feet of hand chain; while with the triplex one man pulls 82 pounds and handles only 31 feet of chain. You can prove this at our expense if you wish. Write us for a triplex block for trial use."

The Manufacture of Gun Cotton and Nitroglycerine.*

NUMBER III—CONCLUDED.

Written by BRYANT S. DRAKE.

Life could hardly be supported in the midst of the fumes, yet as soon as the charges are all run down, four men, each with a handkerchief over his nose and mouth, and a rubber squeegee, shaped to fit the trough, in his hand, chase down the portions of the charge remaining in the troughs. The fumes thin out very quickly—in four or five minutes one can see the entire distance of 600 feet. The charge runs from the troughs directly to the separating tanks, and is allowed to stand while the nitroglycerine rises and the surplus acids sink, till a distinct dividing line can be seen. The nitroglycerine is then drained off to the washing tubs by means of a submerged funnel, and washed with water, sodium carbonate, salt water and fresh water in succession. In washing, the nitroglycerine changes from a dark oily liquid to a turbid, whitish one, and once separated from all free acid, loses its greatest inflammability and becomes comparatively safe. So the washings are continued until the nitroglycerine is neutral to test paper.

The next step is to run it upon the filters. These are simply large cloths, similar to the familiar gunny sacking. The waste acids, as separated from the nitroglycerine, are run to a second separating house, and the remaining nitroglycerine is removed. The acids are then separated by heat, and the H_2SO_4 is reconcentrated by evaporation, but the HNO_3 is not capable of being strengthened in this way, and is practically of no value.

The nitroglycerine is tested by heat for its stability and its ignition point, and the amount of free acids in it is determined. The percentage of nitrogen is also determined by the nitrometer the same as for gun cotton.

Nitroglycerine is not used in the free state, as it is too violently explosive. The chief factor in the development of the industry was the discovery that its explosive violence and its stability could be regulated by mixing it with some absorbent. The product thus obtained is a dynamite. Naturally there are several classes:

(a) An explosive mixture:
  1. Nitrate class (Judson powder).
  2. Chlorate class (Vigorite powder).

(b) An explosive compound:
  1. Nitro substitution compound (Castellanos powder).
  2. Nitro derivative compound (Explosive gelatine.

All dynamites, of whatever class, are manufactured by similar processes. There are three main operations:

1. Mixing the base.
2. Incorporating the nitroglycerine.
3. Packing the cartridges.

Each operation is done in a separate building, and each building is surrounded by bulkheads similar to those around the nitroglycerine mixing house. These bulkheads are from 15 feet to 20 feet high and from 4 feet to 8 feet thick at the base, and are made of two concentric rows of heavy timbers, filled in between with solid earth. The dry mixing is done in an iron tub by means of brass stirrers actuated by an electric motor. Into this tub the ingredients are dumped in a pulverized state, and, when thoroughly mixed, the charge is taken to the wet mixer, weighed and placed in wooden vats. The nitroglycerine is then poured from wooden buckets, and thoroughly incorporated by means of wooden spades in the hands of Chinese laborers.

The finished dynamite has the appearance of brown sugar or moist pine sawdust. It is filled into cartridges and boxed ready for shipment. The papers of which the cartridges are made are rolled and pasted by girls, the only female operatives connected with the plant. A skillful girl can roll as high as 300 cartridges an hour, but such a pace is not long kept up save for the making of a record. The pasted paper cylinders, closed at one end, are dipped in melted paraffine, allowed to drain and dry, and then carried to the packing houses by Chinese coolies. The filling of the cartridges is done by a packing machine. These machines fill from fifteen to twenty cartridges at a time, the dynamite being rammed in by a wooden plunger. The top of the cartridge is then creased and folded over, and the cartridges are packed in boxes.

The Chinese are a bit superstitious, and when electric lights were installed to enable working later on short and dark days, they refused to work when the lights were burning, and the experiment came to naught. The operation of packing is very dangerous, and white men will not stick to their jobs long enough to become expert and make it less dangerous, and so the Chinese superstition has to be tolerated.

The finished and boxed cartridges are stored in magazines awaiting shipment. All transportation is carried on by a narrow-gauge railroad, operated by compressed air locomotives. These little trains carry the boxes to the loading switches of the Santa Fe and Southern Pacific railroads, so that steam locomotives do not run into the works to points where stray sparks might do damage. Fire is always to be feared in the works, and the burning of grass in fields near by is anxiously watched, and the foreman will, on slight provocation, send all the available men in the yards to extinguish it before it gets anywhere near the grounds.

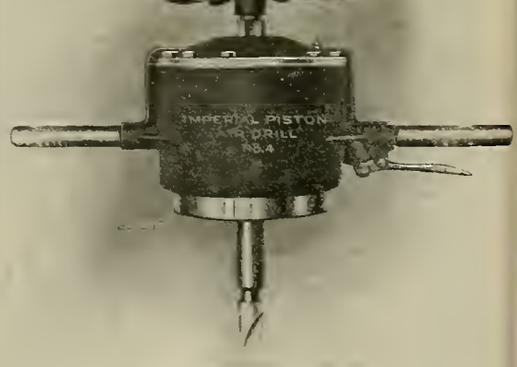
The condition of the workmen at the plant is as good as can be expected, considering that the men do hard labor and have dangerous occupations. Workmen on the outside, as those who handle the supplies, build track and perform similar day labor are called, receive $2 per day, and can get half a day off at any time by applying to the foreman. Regular promotion of faithful employes is the company's rule, the rise being from outside labor to the acid, gun cotton and nitroglycerine works in succession. The scale of wages rises in successive departments. An experienced employe, who does his work faithfully, is rarely discharged, and is sure of promotion if he abstains from drunkenness. The men in the gun cotton works, and especially those who do the dipping of the cotton, are constantly exposed to the fumes of the mixed acids, and this is the most undesirable position in the works. The acids affect the teeth and lungs. Good teeth will be decayed in six or eight months. Fatalities occasionally occur from breathing the acid fumes. When a man is disabled here he is placed in an easier position; in event of illness, he is treated at the company's expense, and is sure of a job when he is again able to work. The families of fatally injured employes are pensioned, and able-bodied children may obtain employment without fear of discharge, even though their services are of little value to the company. The nitroglycerine works are the most dangerous, and no married man will be employed there. Those who desire to live in the quarters furnished by the company may do so, and they are provided with comfortable rooms, bedding, water and light. The rooms are taken care of by a Chinese servant. The company also operates a boarding-house, where meals are furnished at 25 cents each or $15 per month. Emergency supplies are kept on hand to treat injured employes before they are taken to the hospital, and medicines are furnished for the general indisposition of the employes, from biliousness to ingrowing toenails, but no remedy is provided for laziness. The natural alkali of the surrounding region, together with the waste from the plant, makes the available water fit only for fire protection, and the drinking water is shipped in in iron tanks and stored for use at convenient points about the works.

The power plant which furnishes electricity, compressed air and water for fire protection is operated by steam engines driven by oil-burning boilers. The fire protection is unique in its way. Near each building are one or more nozzles connected with the mains and mounted on vertical pipes in such a way as to be capable of being pointed in any direction. The object of this is that one may train a stream of water upon a fire, clamp the nozzle and then retreat before an explosion occurs. All the buildings are connected by telephone, and a "central" is provided for all switches and connections.

*Abstract California Journal of Technology.

Piston Air Drill.

Herewith is illustrated the Imperial piston air



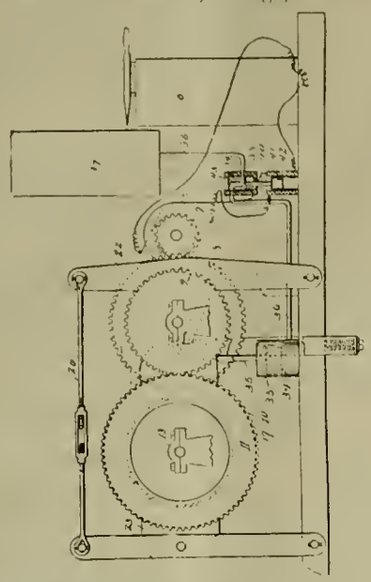
drill No. 4, adapted to drilling up to 3 inches, reaming and tapping up to 2½ inches, and rolling flues up to 4 inches diameter; air consumed per minute, 35 cubic feet; weight 57 pounds. This is one of a line of pneumatic tools made and furnished by the Rand Drill Co., 128 Broadway, New York.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 26, 1904.

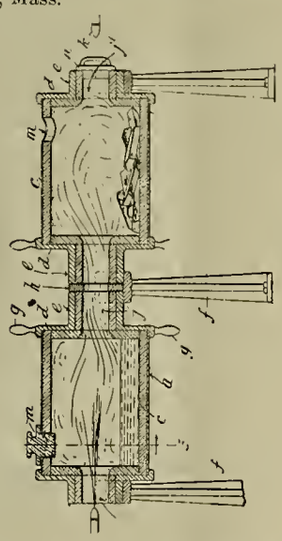
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

BRAKE FOR HOISTING MACHINES.—No. 750,283, F. K. Hoover and A. J. Mason, Chicago, Ill.



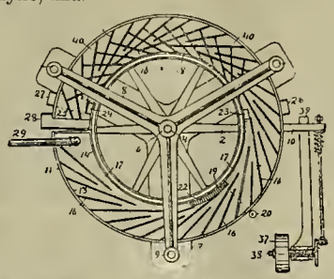
In hoisting apparatus, combination with brake pulley, of brake shoe applied to periphery thereof, back strut supporting brake shoe against pulley and constituting one link of toggle whereof other link is constituted by sector of brake pulley between axis and brake shoe, means connected to brake shoe normally tending to draw same in direction to spread links of toggle, and means for counteracting brake shoe actuating means during hoisting of load.

MELTING FURNACE.—No. 750,748; J. F. Barker, Springfield, Mass.



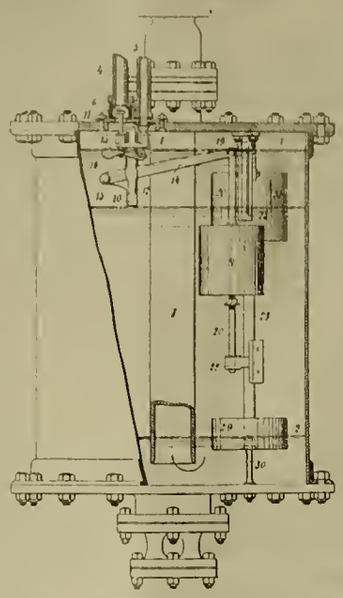
Combination in melting furnace, of two separate chambers to receive charges of material, chambers being independently revoluble on common axis, there being passage from one chamber to the other; with means to introduce gaseous or liquid fuel into either of chambers.

ORE CONCENTRATOR.—No. 750,281; T. H. Hicks, Fort Wayne, Ind.



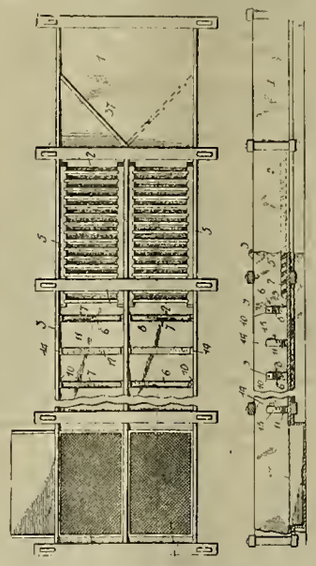
In ore concentrator, spirally descending concentrating trough, series of riffles 16 arranged diagonally upon bottom of trough and converging toward inner wall thereof; and means to differentially oscillate trough.

PNEUMATIC FLUID ELEVATOR OR PUMP.—No. 750,326; A. Montenegro y Van Halen, Madrid, Spain.



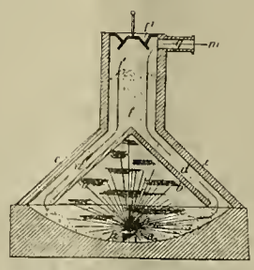
Apparatus for raising liquid by compressed air comprising closed chamber provided with liquid and air inlet and outlet, valve operating lever, float for actuating lever, two catches adapted to engage valve lever in raised and in depressed positions respectively, lever for operating catches, and float actuating last mentioned lever, catches being simultaneously operated through last mentioned lever and float, one to release and other to be free to engage valve lever as last named float reaches end of upward or downward stroke.

COMBINED CONCENTRATOR AND AMALGAMATOR.—No. 750,706; H. J. Russell, Crescent Mills, Cal.



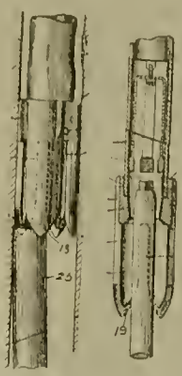
In concentrator, combination of flume, riffles arranged transversely on floor of flume, revolving catchers rotatively supported in flume and adapted to be rotated by flow in flume, screens placed at lower end of flume and arranged to receive discharge from flume, chute situated beneath screens, feed box supported near chute, and means whereby flow is conducted from chute to feed box, pivoted tables arranged to receive flow from feed box, tables having surfaces covered with woolly fabric, and concentrates tank beneath tables.

ELECTRIC FURNACE.—No. 750,753; R. C. Contardo, Sevres, France.



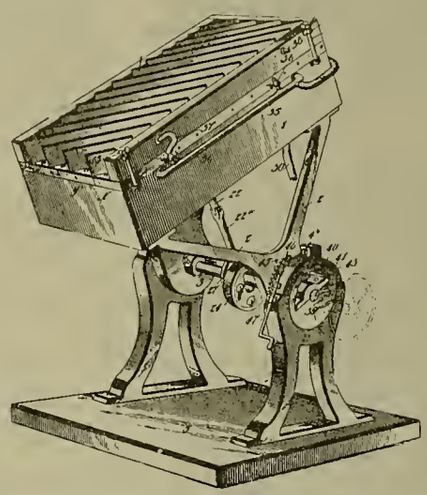
Electric arc furnace, comprising hearth having inclined surface, electrodes above same, arch above hearth consisting of two symmetrically and downwardly inclined surfaces, and side walls parallel to arch forming inclined flues, and vertical shaft above arch connected to side walls, and means for opening and closing charging opening of shaft.

FISHING TOOL FOR OIL OR LIKE WELLS.—No. 750,491; C. A. Sargert, Sheridanville, Pa.



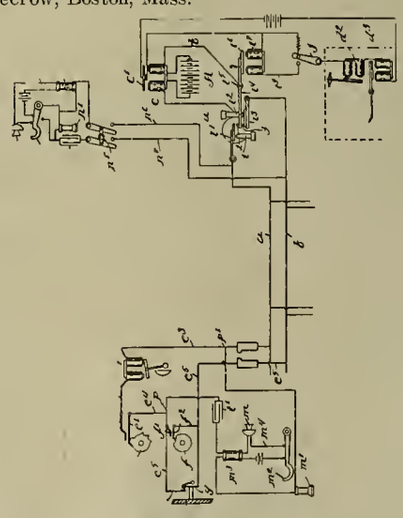
In fishing tool, head or socket, guide reins projecting down therefrom, guide reins having tapering ends and beveled inner edges.

PNEUMATIC DRY ORE SEPARATOR.—No. 750,366; E. M. Jahraus, Dayton, Ohio.



Ore separator box having pendent arms which are journaled on such axis, eccentric on axis, jointed piston rod connected with eccentric, air piston arranged in box and reciprocated through medium of piston rod, toothed arc formed on side of one of pendent arms, hand worm shaft journaled on one of fixed supports, its worm engaging toothed arc.

ELECTRIC SIGNALING APPARATUS.—No. 750,268; W. E. Decrow, Boston, Mass.



In electric signalling system, combination of battery and two main circuit wires a, b, leading from opposite poles thereof, constituting normally open circuit, signal receiving apparatus adapted to be operated by circuit, plurality of box-number circuit-operating devices, switch for each set of connecting wires for opening and closing it, means for operating switch, answer-back bell included in series with box-number circuit operating device in each set of connecting wires, and means for operating bell which is operated by signal receiving apparatus.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

Rich beach diggings are reported found on the tundra between Hastings and Little Derby creeks, 3 miles below Fort Davis, near Nome, and half a mile back of the present beach. These diggings are two claims wide and 2 miles long. As high as $2 per pan has been taken out, the ruby sand being 7 feet deep. Fifty men are putting up cabins in preparation for summer work.

Nome reports say the Norton Bay M. & Dev. Co. of San Francisco, Cal., has opened up high grade, white-quartz wash. Their property is so situated that they can work twelve months in the year.

ARIZONA.

Cochise County.

The Shattuck-Costello group of copper claims, near Bishee, is reported sold for $1,100,000 to A. M. Chisholm of Duluth, Minn.; M. Pattison of Superior, Wis.; A. Guthrie of St. Paul, and T. Bardon of Ashland, Wis. The property comprises 120 acres.

Graham County.

The average daily production of ore from the Detroit C. Co. stopes, near Clifton, is 700 tons, exclusive of waste, being the figure on ore going to the smelter and concentrator, says the Standard.

Work on the Coronado C. Co. group, near Clifton, is being resumed. The upper tunnel will be driven 200 feet, at which point it is expected the Coronado lead will be struck.

Mohave County.

At the Dempsy-O'Dea mines, near Chloride, one of the shafts has reached depth of 105 feet and is in ore. The owners will continue work on the group as long as it is possible to windlass out and then a hoisting plant will be built. Dempsy & O'Dea are owners.

The Vivian mine near Kingman, being operated by T. Ewing and J. Ross, of Los Angeles, Cal., is getting ore in bottom of shaft. A hoisting plant has been put in operation.

The crosscut from the bottom of the 400-foot shaft on the Gold Road mine, near Acme, has cut the vein and is showing 17 feet of the ore. The ore is being drifted on. J. D. Spargo is superintendent. The values are in free-milling gold. Additional machinery will be put in at the mine and it is proposed to enlarge the mill. Electric installation will be made at some point on line of Santa Fe Railroad, from which transmission line will be run to the mines for operation of all machinery. At present gasoline engines are used for power.

Yavapai County.

The Bradshaw Mountain C. M. & S. Co., which has mining interests at Middleton, has bought the Val Verde smelter for reducing the ores of the company. They will take charge of the smelter this month.

Superintendent Bowman of the Rainbow G. Co.'s property at Crown King has let 100-foot contract. The mill site is being prepared and the machinery will be installed in the spring.——The Crowned King M. Co. has made application to the Government for 4000 cords of wood to be used at the mine and mill.——At the Peck mine the work of unwatering is progressing. The main shaft is 500 feet deep with several long drifts.

The Dividend Con. G. M. Co., at Chaparral, reports the mill being enlarged.—— It is reported operations will be resumed on the Midnight Test mine at Groom Creek.

W. H. Bates, of Prescott, interested in the Welcome mines, 5 miles from Martinez, half way between Congress and Octave, reports ore struck in the Welcome at depth of 80 feet from the surface. The miners are raising.

Yuma County.

In Planet district in nortbern Yuma county B. Blanchard is working eight men on his group of copper claims 12 miles south of Planet. Two-horse whims have been set up and work is going ahead under superintendence of S. Butler. He will sink two of the vertical shafts on the group to depths of 200 feet and then crosscut for the ore bodies.——T. Chichester has men at work on the Mineral Hill group, owned by M. Pickerell of Prescott. ——C. Hawley has, the past six months, been steadily developing gold prospects in the quartzite belt, 2 miles from Planet.

On the Planet mine, owned by the Copper M. Co. at Planet, work is being confined to exploration of territory south of old surface workings which formerly produced high-grade copper ore. The drifts which have entered the hill over 300 feet beyond the old stopes, and at a vertical depth of 150 feet, have been run entirely in iron and copper ore. J. S. Jones is president of the company.

CALIFORNIA.

Amador County.

Robinson & Glenn, working the Whitmore mine, near Pioneer, have the mill in operation.

One hundred stamps are dropping at the Kennedy mine at Jackson—sixty in the new mill at the east shaft and forty in the old mill at the north shaft. The principal work is being done through the east shaft, the hoist there handling a 4-ton skip. Rock is being taken from the 2550, 2450, 2200, 2100 and 1800-foot levels, and about 250 miners are employed.

Calaveras County.

At the Columhus mine, near West Point, owned by B. A. McKinzie, near the Lone Star mine, the vein ranges from 2 to 5 feet in width. Owing to had weather, it is closed down till spring.

Del Norte County.

F. C. Marlowe, superintendent of the Haynes Flat mine, at Haynes Flat, near Crescent City, says little work has been done the last two weeks on account of snow. He is building flume and digging ditch, and $20,000 will have been expended when water is turned through the ditch and washing of the gravel deposit started.

El Dorado County.

The steam hoist on the Ida Mitchell mine, near Placerville, is in operation and sinking resumed in the double compartment shaft. The shaft is being sunk on incline and will pass the old workings of the Ida Mitchell. It is intended, says Superintendent D. H. Jackson, to go down 1000 feet and develop the ledge. Oil is being used as fuel and the buildings lighted by electricity. Measurements taken in the former workings show the ledge 12 feet wide.

Fresno County.

The Mt. Hamilton Oil & Land Co., which has been drilling at intervals near Alcalde station, near Coalinga, has again suspended operations indefinitely. —— After cleaning out well No. 2 of the Esperanza Oil Co., it has regained its former productiveness by resuming a flow of 400 barrels per day.

Rapid drilling is reported at well No. 3 of the New San Francisco Crude Oil Co. at Coalinga. Within thirty days the drill was penetrating oil sand at a depth of 1050 feet, having made that distance without mishaps.

The Monterey county board of supervisors has granted a right of way to the National Oil & Transportation Co. to build a pipe line from the Coalinga oil fields in Fresno county over highways in Monterey county for conveying products of Coalinga oil wells to tide water at Moss Landing. All the right of way over private property has been secured and the company will start work next week laying 6-inch pipe. This line will carry 10,000 barrels of oil per twenty-four hours from the wells.

Kern County.

The Uncle Sam M. Co. is developing the Hard Cash mine, near Randsburg.

Monterey County.

The Cavanagh oil well, near Bradley, is a 100-barrel well at a depth of 1400 feet, of 40° gravity oil.——The Combined Oil Land Co. continues development work on its land near San Lucas. J. D. Hoff, secretary, reports that its drilling outfit, working 9 miles from San Lucas, has a well down 640 feet, showing an oil-bearing stratum. They are prepared to sink to 2000 feet.

Nevada County.

The Omega Placer M. Co. has been incorporated to operate in Omega section, near Nevada City, with R. M. Wilbur, J. Underwood, F. W. Norwood, R. J. Beatty and J. Cheshire as officers.

After being idle for two weeks, during which time numerous repairs were made, the 3-stamp mill at the Rose Hill mine, near Grass Valley, is again in operation.

The trestle at the Murchie mine, near Nevada City, is completed, being 700 feet long, double track, and runs from the mill to the hoisting works. One thousand feet of pipe is ready to he laid to carry water from the hoisting works to the mill. The pipe will have 4-inch nozzle. The work of repairing the Banner ditch has been delayed on account of the rough weather. The ditch is 4 miles long and begins at the head of Little Deer creek.

A strike is reported made last week in the Ethel mine of the Gaston Ridge G. M. Con. Co., 7 miles above Washington, in God's Country, 27 miles north of Nevada City. A. Maltman et al. of Nevada City are owners. A crosscut tunnel 600 feet long was driven to tap the ledge at a depth of 300 feet.

An area of 150 acres of land at Jones Bar near Grass Valley has been bonded to T. J. and P. H. Leonard of Sweetland for $5000. They have had hauled there a quantity of 11-inch pipe and will convey water to the ground. The side of the hill will be sluiced off down to bedrock and in this manner they expect to uncover the vein.

In the New Eureka mine at Canada Hill near Grass Valley development work is progressing. The drain tunnel, which taps the incline at depth of 75 feet, is completed and drains off the large amount of surface water. The work of sinking the incline is going ahead and in the bottom there is a ledgo 18 inches in width. A station will he cut and drifts run both ways on the ledge.

Superintendent H. Kaler of the Grey Eagle mine, at Mayhert, says huildings are going up and operations ahove and helow ground will be started. Kaler has men extending the tunnel of the West Lindsey mine, which is owned hy A. H. Tickell of Nevada City. The tunnel is on the ledge.

Work was resumed at the Phelps Hill mine, near Nevada City, last week. E. S. & M. C. Irwin, C. A. Poage, A. H. Bayless, W. H. Murchie, L. A. Walling and E. E. Irwin of the company filed location notices on five claims comprising 450 acres of mineral and timher land at Phelps Hill, heing the Orion, Ajax, Fair View, Tiptop and Surprise Placer. These claims double the holdings of the Phelps Hill Dev. Co., says President Ketcham. Machinery for a sawmill will be set up on the property in the spring.

Placer County.

Work has started on the opening up of the Blue Lead gravel mine at Bangor. Men were put on last week. It is proposed to pump out some of the shafts, particularly the Catskill, and prospect the ground. If satisfactory, the work of driving the tunnel from Kentucky Ranch will be started. As considerable of the gravel is cemented, it is thougbt a stamp mill will be built near tbe mouth of the tunnel. Formerly the cemented gravel was handled by an arrastra.

Plumas County.

It is reported the Crescent mine at Crescent Mills will soon he unwatered and reopened.

At the Morning Star mine, on Nelson creek, near Quincy, Spaich & Co. have men on tunnel work. They are also drilling a raise from the tunnel to reach the channel.——The Continental mine has been equipped with plant and is ready for active work in the spring.——Gaspar & Anderson are running a tunnel to develop a back channel on east branch of Nelson creek.

San Bernardino County.

The Trio M. Co., near Manvel, has opened into a body of ore carrying native copper. This mine has 300 feet of tunneling and 100 feet of shaft.

Santa Barbara County.

The Brookshire Oil Co., operating 8 miles soutb of Santa Maria, reports striking a flow of oil in its well at a depth of 1900 feet. The property is north of the Pinal Co.'s holdings. The stream of oil shot out over the top of the derrick.

Shasta County.

Graphite deposits are reported located by F. H. Robertson and C. J. O'Brien, of Redding, in the hills 8 miles west of Redding. The ledge is 2 feet in width.

The Summit mine, a chrome property near Chromite, near Redding, has heen bonded to S. Gibson.

The Dry Slime mine, near the railroad connecting the Iron mountain mine and Keswick smelter, at Keswick, has heen bonded to A. M. McDonald of Oakland.

Sierra County.

The Alleghany M. Co. has bought the Alaska, Balsam Flat and other adjoining placer claims, near Alleghany. The mines have been under a bond to the company for some time. This gives them a large area of mineral ground covering several miles of the main channel.

Siskiyou County.

The Klamath G. M. Co. has located several quartz and placer claims on lower Humbug creek, near Hawkinsville, which will be opened up during the coming spring. Development work is progressing on the Punch Creek and McKinley quartz mines, and also the Spengler placer mines. —— Tbe warm weather of the last week, together with rain and snow, has started a good supply of water in the creeks and gulches. The placer miners are ground sluicing and operating hydraulic giants.

The New York mine at Indian creek, near Fort Jones, is heing worked steadily under management of J. B. Scott, by electric power for both mill and mine.—— A. C. Brokaw is working the Golden Eagle mine, also on Indian creek.

The ledges comprising the Punch Creek group on Humbug creek, near Hawkinsville, have been taken over by the Mono M. Co. and work will be increased during the coming spring and summer. They intend putting up a 12-stamp mill to operate hy electric power.

Fry & Macauley are developing the Sheba quartz mine at Patterson creek in Scott valley, near Fort Jones, with their mill in operation.

The Siskiyou M. & Dev. Association has closed down its coal mine, near Ager, as the machinery was unable to handle the large amount of water coming into the shaft. They will start up again hefore May 1st., after putting in heavier machinery. They have 100 tons of lignite coal on hand which will he used for fuel when operations are resumed. The mine is on the Southern Pacific Railroad, 3 miles south of Ager. The company has run an incline of 800 feet on the vein, and a vertical shaft of 145 feet cutting the coal at 2000 feet from where they left off on the incline.

Trinity County.

W. M. Walker and W. D. Miller of Hayfork have a hond on the Maple Creek group of quartz mines and are developing them. They expect to start the mill this month.

Tulare County.

The Fountain Springs section, between Porterville and White River, is heing opened up. J. M. Groves is developing claims in Fountain Springs gulch. A winze 100 feet deep has been sunk in the 75-foot level, showing a vein 18 inches all the way down, which assays $20 in gold. There are 170 tons of rock on the dump. Groves, with F. Marshall, is preparing to put in a 3-stamp mill and a 5 H. P. crude oil engine.

Tuolumne County.

An 8-foot vein of high grade milling ore has heen uncovered in crosscut, at 500-foot level, in the Golden Rule mine at Stent.

An air compressor will be placed at the Horse Shoe Bend mine near Columbia and machine drills operated. It is reported the company will hegin operations at the Arbona mine near Tuttletown, which has been idle for a year.

Fifteen men have been put to work at the Densmore mine, near Columbia, and prospecting will he done to relocate the ore shoot.

E. G. Kennedy has bought the Big Fern mine, situated on north side of Tuolumne river, 3 miles north of Jacksonville.

A 4-stamp mill is being built ou the Vivian and Concord group of the Republic M. Co., above Parrotts Ferry, near Columbia.—A. A. Irish of Los Angeles has honded twenty acres of the Trevithick ranch, above Sonora, and will prospect the mines thereon.—Operations on the Mt. Lily mine are expected to resume this month, says Superintendent C. Grimm. An air compressor, drills and other machinery are being put in.

Work is going ahead at the Vine Spring mine, near Columbia, and the stamp mill was put in operation last week, also the cyanide plant.

In main tunnel of Over mine, on Bald mountain, near Columbia, at point 1000 feet from mouth and 350 feet from surface, a station has been cut out and machinery is being set up for sinking on main shoot. The machinery will be run with water power and the 500-foot pipe line connecting same with ditch above by way of the stopes is in position. It will give 400 feet pressure.

The mill at the Del Monte mine of the Sierra G. M. Co., near Groveland, is crushing ore. In the mine work in the raise to connect with the west shaft is progressing. By this raise a body of ore is opened, the vein showing 8 feet in width. It is intended to raise from the 200-foot east drift to the surface, at distance of 250 feet from the shaft.

Work continues at the Hull mine, near Groveland. Drifting is heing done and ore is being taken out. Sinking will be resumed this month. The management has leased the Duleek plant and the mill will he started up next week. Fourteen men are at work in the mine under Superintendent A. J. Froehlich.

At the Dutch mine, at Quartz, the mill is in full operation with electric power. The ore is coming from the stopes above the 600-foot level south. The shaft is down 1480 feet and the 1400-foot level is being drifted south, being in 340 feet. Superintendent A. Trittenhach says he is drifting to connect with winze that is being sunk at the 1250-foot, and lacks ahout 25 feet of conuection. The shaft has heen retimbered from the 600-foot level up to collar. Fifty-five men are at work in mine and mill and 1800 tons is the monthly output of ore.

The Rawhide mine, near Jamestown, is running its 40-stamp mill by electric power.

Superintendent Hoskins is unwatering the Norwegian mine, near Tuttletown.

At the Jumper mine at Stent, Manager M. B. Kerr is running the 60-stamp mill by electric power. The new twenty stamps are housed and are expected to

be ready to run before March 1st. The concentrating room is completed, also the cleanup department. The ore bins are full and kept supplied from the mine by day shift alone. With the sixty stamps 5500 tons are reduced monthly. To obtain the rock needed for the additional stamps a few drills will be put on during night shift. There are twenty baby drills used in the mine. The compressors are not being run at night and mucking and timbering are mostly being done during those hours. Stoping is being done north and south from the main Jumper shaft from all of the levels above the 800-foot. Also ore is being taken from the middle vein of the Golden Rule mine and trammed through the 500-foot level to the Jumper shaft, there raised and sent to the mill. After connection between the two mines was made a crosscut was driven 250 feet to the foot wall, where the middle vein was struck, and it is being opened up. There are two grades of ore in this property. The proportion of sulphurets in the milling ore averages from 3% to 4%.

Superintendent E. C. Loftus, at the Santa Ysabel mine, near Stent, is sinking on the new shaft, and is down 370 feet. The shaft is of three compartments and an incline. It is proposed to send it down to the 2000-foot mark. It is said to be in diorite.

COLORADO.

Boulder County.

The Gold Nugget mill, near Rowena, is closed for the winter, but will be enlarged and reopened in the spring with double capacity, says the Eldora Record. The mine will be run all winter.

The Sugar Loaf G. M. & M. Co. has been formed with J. W. Enos of Boulder. The company's holdings are the Ragged Top, Lafayette, and Song Bird claims, near Sugar Loaf, held under bond and lease. The group joins the Livingston on the south. The vein is 7 feet wide, and carries values of $10 per ton with a shoot of tellurides. A gasoline engine, electric hoist and electric drills will be put in.

Oil has been struck on the Orcini ranch at 500 feet east of Otero well No. 1, near Boulder. The oil was struck at 1467 feet depth and rose to 600 feet high in the hole. Drilling was stopped in a fine-grained oil sand, and pumps will be put in. The well is owned by D. McDonald, D. Orcini et al. of Boulder.

Clear Creek County.

The Newhouse tunnel at Idaho Springs has been connected with the Cascade Electric lines, and hereafter what power is needed will be furnished by the electric company. Since the completion of the Gem raise, the air has become good throughout the tunnel workings, and a blower will not be needed. The Gem Co. has its own power plant, so that transportation of the ore and waste is all that the tunnel will be called on to do for the Gem.

L. S. Kenworthy of St. Louis, Mo., has bought the Pacific and other lodes in Jackson and Cascade mining districts, near Georgetown, for $50,000. Development will be started this month.

It is reported the Riley bond and lease on the Fred Rogers and Government lodes, near Georgetown, have been sold to the Kelly tunnel people for $2000. It is expected the Kelly tunnel will resume operations before April 1st, as during the last three weeks they have taken options on several properties along the course of the tunnel.

The Occidental Dev. Co. and its associate companies have been incorporated under the name of Occidental United Metal & Coal Co., organized under laws of South Dakota. The holdings of the new company comprise the Fraction group, gold and silver; at Idaho Springs, the Kitty Clyde, gold and silver, Idaho Springs; the Spandulix group, gold, Granite, Colo.; the Tamarack group, copper, Riverside, Wyo.; the Uranium group, in Montrose county, Colo.; the Duplex group, gold and silver, Spanish Peaks district, Colo., and the Occidental coal and fire clay lands, in Huerfano county, Colo. The officers are: E. L. Palmer, Danielson, Conn.; A. G. Boehm, Lawrence, Mass.; J. I. Davis, R. C. Miller, H. Robbins, O. S. Pierce and F. E. Hathaway.

Gunnison County.

At White Pine, the Akron tunnel is again being driven ahead. They are running two machine drills on the vein in the drift. It is reported the company will put additional machinery in the mill, and that they have bought the Tomichi valley smeltor.

At Bowerman the Independent mine has been bought by A. E. Reynolds and twenty men are developing the property under W. J. Fine. An air compressor and hoisting plant will be put in. The Independent G. M. Co. has been incorporated by J. C. Bowerman, S. Dunn, A. E. Reynolds and W. J. Fine.

Jefferson County.

Colorado Springs men, including I. W. Bonbright, O. B. Wilcox, J. K. & A. H. Robinson and G. R. Buckman, have incorporated the National Dredging Co. They propose to carry on dredging operations chiefly in Jefferson county, Colo., but also in Colfax county, N. M. The bed of Clear creek between Denver and Golden will probably be the object of first work.

Lake County.

The Huckleberry mine, in St. Kevin district, near Leadville, is making a showing under lessees. They have opened a body of silver-bearing ore from which shipments are going out.——The Golob concentrating mill in California gulch is being operated by W. F. Deaner et al., and they are handling thirty tons a day. This material comes from the Gilt Edge shaft No. 1, where a body of zinciferous ore is being mined.——Shipments from the Fitzhugh shaft on Fryer hill are steady, and Estey & Kyle, lessees, report improvement. The ore being shipped is sulphide, running 30 to 127 ounces silver per ton.

La Plata County.

(Special Correspondence). — With the mountains barren of snow until Jan. 21st, conditions in the La Platas have been favorable for work, and the mine managers have pushed work to the utmost, with the result that more mines are at present being worked and more men employed than at any time during the past fifteen years.

The Neglected mine, a producer of high-grade tellurium ores, and which has been shipping for two years, is milling its dump at a profit and shipping the usual amount of rich ore from the development work in the mine.

At the Bonnie Girl, the boarding house, bunk houses, store and flume have been completed and the frame for the mill is assuming shape. The first unit of the mill will be fifty stamps, which will be supplemented by 150 others as soon as the first unit has been perfected to the satisfaction of the management.

The May Day, the new prospect which was sold recently, is doing extensive building. The second payment of $10,000 was made early this month. The shaft is now 125 feet deep and drifting in both directions has begun on the 100-foot level. An air compressor and air hoist are to be installed and a tunnel started at the river level to tap the vein at depth of 500 feet. The vein is about 30 inches in width and averages well.

Another old mine is being reopened in the Comstock, the first location made in the La Plata district thirty years ago, and assays show that not all the rich ore was taken out. It was worked for several seasons after its location, but the rich gold chute was lost and mining became unprofitable, for the nearest smelter was at Pueblo, whither the ore must be hauled by ox teams. It has a record of over $60,000, and no stoping has been done farther than 40 feet from the shaft. The work of cleaning out the old shaft has been completed and it is found to be but 140 feet in depth. Drifting, crosscutting and sinking are going on, and good ore is being taken out, though the values are in silver.

Mancos, Jan. 28.

San Miguel County.

Near Ophir the Mary group, in Swamp canyon, owned by J. Manifold, J. W. O'Brien of Ophir and J. D. Gale of Boston, Mass., will be further developed. The group shows a vein of ore carrying a streak that runs high in silver and lead. Work on the foundation of a concentrating and amalgamating mill will be started this month.

T. W. Beam, manager of the Japan-Flora M. & T. Co., says he has fifteen miners at work on its group, near Telluride. Drifts on the Japan will be driven each way from the tunnel and a raise made connecting the tunnel level with the old workings. This raise will be 500 feet. The workings of the old Japan proper are filled with water. Until this work is completed, the working force will be limited to development on the tunnel level. The re-organized Japan-Flora Co., besides taking over the Ajax and the Valley View group, has also acquired mill site in the valley below the Pandora mill of the Smuggler-Union M. Co. It is intended to build a milling plant to be connected with the Japan tunnel by aerial tram. At same time development will be started on the Ajax and Valley View properties. R. W. Davis, Jr., is superintendent.

San Juan County.

A contract for 400 feet of extension on the Ruby tunnel in Ruby basin, near Silverton, has been let by the Ruby Basin M. Co.——Improvements are to be made in equipments on the Hercules mine and mill on Sultan mountain, near Silverton

Summit County.

The Old Union M. & M. Co. has been organized to operate on the Union lode and adjoining claims on Mineral hill, near Breckenridge. They will be worked through the Smith shaft. G. C. Smith is manager. The ore produced has shown values in lead, silver and gold. A shaft-house 50x75 feet is completed and machinery is being set up.

The coming season will see building of one or more gold-dredging boats to operate in the gold-bearing deposits of French gulch, near Breckenridge, says B. F. Hall, Jr., manager of the French Gulch G. M. Co. They propose operating a dredge in the placer pit they opened last season. The dredger would start on ground worth $1 a cubic yard and could operate for two months longer each season than the hydraulic plant, now in position at the pit. There would be sufficient water supplied by the company's ditches for a pond to float the dredger. Any time it might be considered desirable to clean up rough bedrock by hand labor the pumps on the dredger could unwater the pit. This property is a mile east of Breckenridge and 2 miles from the mouth of French gulch.

It is also said H. Farncomb et al., interested in the Wire-Patch group, 5 miles east of Breckenridge, up French gulch, expect to build a dredger to work the placer ground up French gulch from Lincoln City. Manager Farncomb will have the ground to be dredged prospected with churn drills to determine width and general direction of pay channel. Besides placer ground, the Wire-Patch M. & M. Co. owns several gold lodes on Farncomb hill, contiguous to the placer ground.

G. C. Smith, A. E. Keables et al. are preparing to increase work on the Union mine, near Breckenridge. An engine, boiler and hoisting drum are being placed on the shaft.——C. Kaiser, F. Case and W. H. Foster are working under a lease in the Germania tunnel, on the Germania mine.

Teller County.

The strike of high-grade ore made by Lessees Harrison & Selver on the W. P. H. claim on Ironclad hill, Cripple Creek, is showing the shoot averaging 21 inches wide, carrying native gold and sylvani e. —— A bigh-grade shoot of smelting ore has been opened up in the tenth level of the Granite mine, owned by members of the United States R. & R. Co.

The Rio Grande sampler in Victor is treating an average of 150 tons of ore per day with one shift consisting of sixteen men. Beginning this week, another shift will be put to work and the treating capacity doubled. All other samplers of the district are running full-handed.

The Ella M. Co., which owns the Ella M. claim and others near Gillett, reports development work progressing. They are sinking a shaft and doing lateral work. There have been opened up several veins of low-grade ore which can be treated with the cyanide process. Several tests having been made, the management intends building a cyanide mill.

A strike is reported made last week in the Colorado Boss group, on the southwest slope of Gold hill, at Anaconda, through the Anaconda tunnel, by Crowder & Stevenson. The lessees have 2 feet of ore in a crosscut 300 feet from the tunnel. The ore runs ten ounces gold per ton. There is sylvanite in the rock. The Colorado Boss mine is owned by the Cripple Creek Con. Co.

The Hyde Park City district, 6 miles west of Cripple Creek, is largely deserted, says the Republican. Only one prospect is being worked. McMurray & Son are sinking a shaft in the wash and report encouraging assays from depth of 75 feet. They propose to put the shaft down to the 100-foot point before the end of winter.——The cyanide mill built by the Mount Pisgah M. & M. Co. on its property in Hyde Park district, is being dismantled for removal. The tanks, stamps and other machinery will be shipped into Cripple Creek.

The United G. M. Co. has granted lease to H. Hart on west portion of Hardwood claim, near the W. P. H. Co. on Ironclad hill, Cripple Creek. The ground also adjoins Schoernherst & Co., who are leasing on south end of the Damon. Lessee Hart will sink a shaft and at depth of 100 feet expects to crosscut and drift.

The Matoa M. Co., which has resumed work on company account on the Half Moon mine on Bull hill, Cripple Creek, is being bothered with water question. If the water does not recede materially during the next few weeks it is expected the company will either close down and wait for the drainage tunnel to benefit them or they will commence lateral work at their lowest point. The water is receding at rate of 4 inches per day. The company started sinking a shaft on the 800-foot level, expecting to go to the 1000-foot point before beginning lateral work, and after going 75 feet water has been struck, which prevents further sinking unless pumps are used.

IDAHO.

Custer County.

The White Knob M. Co. has completed the erection of twenty-one dwellings for accommodation of those employed at its mines and smelter at Mackay, the payroll showing 380 men. The smelter is daily reducing 500 tons of copper-bearing ore. In addition, high-grade rock is being shipped to outside plants, the matte from the company's furnace also being shipped. In the mines the tunnel is showing up the ore bodies. —— The McCollum group in Rio Grande gulch, near Mackay, is under development, as is the McGinty group on White Knob peak.

Kootenai County.

W. E. Smith of Duluth, Minn., president of the Antelope M. & M. Co., says, at their mine near Clark's Fork, in Peud d'Orielle district, the tunnel has been driven 90 feet and is in lead-silver ore. The ledge is 5 feet wide between the walls. More men will be put to work.

Shoshone County.

Deeds to mines in the Cœur d'Alenes were passed last week, the Federal M. & S. Co. taking over titles to the Standard and Mammoth at Wallace and the Empire State-Idaho properties at Wardner. It bought the stock in those companies last fall. It is said to have paid a total of $1,875,000 in cash and $10,462,500 in Federal stock (common and preferred). The deep level strike in the Standard mine is showing up well. The face is 18 feet wide and shows ore running 15% in lead, says President C. Sweeny. It will concentrate 5 or 5½ in 1 and will carry fifty-five ounces of silver in the concentrates. The shoot has been drifted on for 250 feet. In the level above it the ore shoot is 1000 feet long.——Ore is being taken from the 1900-foot level of the Tiger-Poorman mine at Burke. The vein is 20 feet wide and has a 5-foot shoot. They are running levels every 200 feet, instead of at 100-foot intervals, as formerly.

Reductions are being made by the American S. & R. Co. to the Cœur d'Alene mine owners for treating silver-lead ores of the district. Under the old contracts the mine owners have been paying $18 a ton freight and treatment on most of their ore, and have been getting only 3½ cents a pound for the lead contents, although the New York price on 50-ton lots has averaged about 4¼ cents. The large Cœur d'Alene interests have been demanding a readjustment of prices, by which they will be paid 90% of the New York quotations, instead of an arbitrary price. The smelters have always made an arbitrary deduction of 10% of the lead contents of the ore for alleged losses in smelting. That practice will be continued under the new arrangements. Practically, therefore, the mine owner will receive 90% of the value of 90% of the gross assay lead contents in the ore. The miners are not asking a lower smelting rate, which will remain at $8 per ton.

Washington County.

The Pactolian M. Co. at Iron Springs, near Weiser, owing to bad air in the tunnel which was being run, has suspended operations temporarily until arrangements can be made to drive out the foul air. The company has set up an engine on the ground, which will drive a blower.

Two rates for moving of ores from Washington mines to smelters of that State have been made by the railroads. One is the rate made by the V., V. & E. and the S. F. & N. in connection with the Great Northern or Northern Pacific for ores from Republic camp, Ferry county, to the coast, says the Spokesman-Review. This tariff provides that on ores from that camp, where valuation of product is less than $100 per ton, the freight to Seattle, Everett or Tacoma, Wash., or Liverpool, B. C., will be $4 per ton. The other rate is made by the Northern Pacific, in connection with the Great Northern, via Adrian cutoff, from points along the Washington Central branch. From Coulee City, Hartline, Almira, Wilhur, Creston, Davenport, Reardan and Medical Lake the rate to either Tacoma or Everett is $5.50 per ton. This also limits the rate to ores of no greater value than $100 per ton. Both these rates apply only to carload lots of 30,000 pounds minimum.

KANSAS.

Neosho County.

(Special Correspondence). — Less than two years ago drilling started in Chanute oil district and there are at present twelve to fifteen companies paying dividends. The Colorado-Kansas Oil, Gas, L. & M. Co., with offices in Chanute and Colorado Springs, Colo., has a lease on 400 acres and has two flowing wells. Work has started on well No. 3. The two finished wells are less than 800 feet deep. A pumping plant will be built as soon as No. 3 is completed. The product sells at $1.37 per barrel at the well. The Standard pipe line has been completed to the properties.

Chanute, Jan. 30.

MICHIGAN.

Keweenaw County.

The third head of stamps at the Mohawk mill, near Allouez, is in operation. The other three are being repaired. The rock house is in use. The daily output of shafts No. 1 and No. 2 is 1000 tons, and there are 300 drills operating. It is reported that the Mohawk and the Ahmeek properties may be consolidated. It is said a union of these would free the lands owned by both from every disadvantage in the removal of vein matter, besides reducing operating costs. The Mohawk shafts would become tributary to the entire adjoining Ahmeek tract to the west, permitting its being mined to fullest advantage, whereas under existing conditions the latter property can only be reached by vertical shafts, which would have to be extended to considerable depth. The Ahmeek tract consists of 920 acres, but the location of boundary lines with regard to the strike of the lode is such that only two shafts can be sunk from the surface on the plane of the formation, and these are already under way. They are located at the south end of the property and 1440 feet apart. The Mohawk, on the other hand, comprises 800 acres of land, of which the Kearsarge lode underlies 600 acres, and in addition to this it traverses the tract for a distance of 10,000 feet. Present boundary lines prevent the obtaining of maximum depths at the Mohawk shafts, particularly those to the north.

Ontonagon County.

The annual report of the Victoria C. M. Co., operating at Victoria, shows the amount of ground opened during last year was 5037 feet—total to end of 1903 being 25,337 feet.

MISSOURI.

Jasper County.

At Kendricktown, north of Carthage, the drill hole is completed on the land of E. J. Palmer. The hole was stopped at 163 feet, after going through 26 feet of lead and jack mixed. The jack found is rosin jack, free of all mundic (iron sulphides). The drill has been taken some distance away to prospect other portions of the lease in search of other leads. An adjoining forty acres, the Harp land, has also been leased by the same company, which is composed of S. Qualls, R. A. Mooneyham, R. Elliott, T. R. Nicholas and J. W. Gray.

Work in the Cleveland Circle mine at Oronogo will be resumed this month, after being idle a year. Ore was struck in the bottom of this shaft, but the water drowned them out.

At Carl Junction, Gates & Nail are shipping ore.——Four tons of ore per shift are being made at the Daisy Bell.——At the Seven Devils a large head frame has been built over the new shaft and a tramway built from it to the plant. The shaft is 100 feet deep, in ore, and will begin producing this month.——Work has been renewed in the Ishpeming mine C shaft. The Ishpeming new shaft is completed. Pumps and other machinery are in and ready to run.

MONTANA.

Madison County.

In Norwegian mining district, near Pony, Duncan Bros. are retimbering the shaft at the Elephant Tail claim and propose putting in machinery to sink below water level. They are down 20 feet below water level.

The Conrey Placer M. Co. has bought the Van Brocklin ranch, near Virginia City, for $10,000. The company is planning for an electric power plant to be built near Alder.

Fergus County.

The J. Burke one-half interest in the Burke-Sweeney eight sapphire claims near Yogo has been bonded to H. Cruttenden for $15,000. It includes all water rights and appurtenant privileges. The claims are the Fourth of July, Victor, Klondike, Kelly, Hope, Gem, Minna and Line claims, which join the properties of the New Mines Syndicate on the south.

Silver Bow County.

The Montana Supreme Court on the 1st inst. reversed the decision of Judge Clancy, of Butte, in the injunction suit of J. MacGinnis against the Boston & Montana C. Co., which caused the shutdown of the Amalgamated properties last summer. The case involved the injunction issued by Judge Clancy against the Amalgamated C. Co.'s holding and voting stock in Montana companies. The decision will release the Boston & Montana dividends, provided the Supreme Court does not grant a rehearing.

NEVADA.

Esmeralda County.

(Special Correspondence).—At Goldfield a strike of high grade ore was reported this week in the January claim, which joins the Combination mine on the west. The vein has been opened for 6 feet. One feature of the strike is that it was made under the leasing system, which has been inaugurated at Goldfield. Lauka, Warner & Duval have subleased the February claim. Patrick, Jones & Kendall have both the January and February claims under lease.

At the Combination mine, in sinking the 5x8 shaft 80 feet and drifting 40 feet, it is said to have produced its purchase price ($75,000). The east drift is in 50 feet and the values average $150 per ton. Shipments continue. The company intends to build a reduction plant, which, it is thought, will use the cyanide process.

Myers & Murphy have their shaft on the Silver Pick group down 35 feet and values are satisfactory. The group is north of the Combination. At depth of 60 feet they intend to crosscut for the main vein.——Four leases have been let on the Florence group, which adjoins the Combination on the southwest. J. P. Sweeney and L. L. Patrick have opened up ledges on their leases, the rock panning free gold.——Kane & McMahon have a ledge on their group opened up in three places. This is 4 miles north of the Combination.——J. P. Harvey, for P. Clark of Spokane, Wash., has a bond on a group adjoining, which has extension of same ledge. Harvey has been doing development work.——J. H. Spiking has made a strike of ore showing free gold near Kane Spring, 8 miles east of the Combination.

Clarke & Barnes propose building a mill to treat custom ores, and have secured options on several water rights and millsites.——Goldfield has been connected with the outside world by telephone and telegraph, and the population in four months has increased to 400.

Goldfield, Jan. 31.

The Montana-Tonopah M. Co. at Tonopah reports that the main shaft of the Montana has reached a depth of 695 feet, and will be sunk to 755 feet, where a station will be established and a crosscut started north. The north crosscut from the 612-foot level is in 415 feet. The east and west drifts on the McDonald ledge on this level are showing up ore, and on the same ledge in the 517-foot level a drift to the east has been started. The west drift is in 222 feet and shows a face of shipping ore. A scarcity of teams the past week or two has interfered with the shipment of ore.

At Goldfield, south of Tonopah, the Goldfield M. Co. of Nevada has been incorporated under Arizona laws, with R. L. Johns, M. N. Clark, H. T. Bragdon, A. C. Eisen and W. M. Stansbury as directors. The company owns the following claims in Goldfield mining district: January and February, adjoining the Combination; September, half a mile south of the Combination; October and St. Paul, adjoining the September, and the Henry Clay and Cracker Jack, on the same ledge as the Columbia.——A number of leases have been let during the past two weeks on the Florence group, adjoining the Combination on the east.

Work has begun on the Douglass mines, near Tonopah. The first work will be an extension of the Curtis tunnel, which is in 127 feet on the Snow Ball claim. Another 60 feet is expected to carry it into the body of ore which was followed from the surface to within 40 feet of the tunnel level. Work has been resumed in the Bounce mine at Douglass and a raise is being opened from the 400-foot to the 300-foot level on the ore body.

Lincoln County.

The Southern Nevada M. Co. at Searchlight will put in a cyanide plant to handle the mill tailings, says Manager Perew. It will have 100 tons daily capacity.

Storey County.

Drill hole No. 7 in the Occidental mine at Virginia City is down 440 feet and last week cut quartz and porphyry, the quartz showing gold and silver values. In the Edwards location of the Occidental the east crosscut No. 3 on the 550-foot level shows improvement, the ore in the face assaying $24 per ton in gold.

The management is preparing to put in pressure and discharge columns for the water elevator system in the C. & C. shaft at Virginia City, and, as soon as the shaft is cleared of the old pumping system, the pipe will be lowered to the 2550-foot level and the shaft cleared of water.——Repairs to the shaft at the Silver Hill mine have been completed and work will begin this week in that part of the mine.

OREGON.

Baker County.

E. Cleaver, of Sumpter, interested in the Myers group, near Medical Lake, operated by the Indiana M. Co., says the hoist is in operation. Pumps were also put in. The hoist has depth capacity of 500 feet. The shaft was sunk 80 feet by hand on the ore body. J. W. Messner, of Sumpter, is manager of the company, and also of the Prairie Diggings mine, operated by same people.

G. M Anderson, of Inwood, Iowa, president of the Keystone M. Co., reports operations progressing at the Keystone group, Quartzburg district. It is the purpose of the company to put in additional machinery. Sinking will be continued by hand for a short time, and a hoisting plant will be built. H. Hendryx of Sumpter is manager.

Preparations are being made to put up a milling plant at the New York mine, near Greenhorn. Superintendent C. C. Nepple says work is going ahead satisfactorily, the vein improving as depth is attained.

The Auburn Deep M. Co. of Sumpter is resuming work at the Auburn placers, owned by this company at Auburn. J. Reed is superintendent. They will run a crosscut from the 100-foot level in the shaft northward, to cut the pay channel at its lowest point. In sinking the 240-foot shaft, at depth of 87 feet, a pay channel was struck. This was covered to depth of 3 feet with a black loam and beneath was 6 feet of gravel. The channel pitches north. A prospecting drill will be put to work.

Grant County.

Manager Wright of Sumpter, of the Blue Bird mine, and also of the Black Butte, says Superintendent E. C. Allen reports work of overhauling in the latter mine progressing. It has been several years since the Black Butte was operated. On completion of this preliminary work it is intended to put in a hoist with 500-foot depth capacity. The plan is to make a raise from the main working level to the surface, a distance of 80 feet, then put in a hoist and begin sinking. This property is near Prairie City. At the Blue Bird the number of men underground has been increased.

Jackson County.

J. W. Opp is taking out ore from the upper ledge of his mine on Jackson creek, near Ashland, and has started his quartz mill in operation.

After four months' work the landslide at the Sborty-Hope mine workings, near Ashland, has been overcome, and the property will be further opened up. They will let contract for 350 feet of drifting on the Golden Spike claim of the company.——It is reported the Montreal & Oregon G. M. Co., which owns the Ashland mine, west of Ashland, is preparing to resume operations.

Josephine County.

The Galice Con. M. Co., near Grant's Pass, is operating several giants on Galice creek this winter. One of them is working near mouth of creek. This ground was idle for several years on account of lack of water to work it properly. D. Green, foreman, says next season it is expected the company will open the creek at the mouth and sluice out entire contents of creek bed.

In Grave Creek district, near Grant's Pass, the Vulcan mine has been equipped with machinery and is crushing rock. A 10-stamp mill has been built. The Vulcan is on Browning mountain and near the Greenback mine.

The Wolf Creek M. & Dev. Co. is carrying on operations in both placer and quartz properties on Wolf creek near Grant's Pass. The creek bed is being worked for distance of 6 miles of its course. On the ledge which is under development men are running a tunnel which follows the vein, having width of 7 feet.

SOUTH DAKOTA.

Custer County.

The Mile High M. Co. has started operations on its mines, west of Custer.

Lawrence County.

H. J. Mayham et al. will develop a group, recently bought, at the bead of Elk and Bear Butte creeks, 5 miles south of Lead. The group includes thirty-two claims.

UTAH.

Beaver County.

C. Rae of Chicago, Ill., has an option on the Talisman, Stalwart and San Juan patented claims near Milford, and on three patented claims in Granite range, which include the Roosevelt Hot Springs. The option is for ninety days for $200,000. Men will be put to work this week. The first-mentioned group is in Star district.

Juab County.

The Uncle Sam Con. C. Co. of Tintic has begun shipping concentrates from its mill, near Eureka, which are said to assay 35% lead and 20 ounces in silver, with some gold. The management is also shipping first-class ore.

J. Knight, operating the Salvator mine on Godiva hill, near Eureka, reports he is shipping ore.

Salt Lake County.

(Special Correspondence). — The Ohio C. Co. started its mill at Bingham on the 23rd. They are daily sending 150 tons of ore to the mill and about 50 tons of first-class ore to the smelter. O. A. Tibbets is manager of the company and T. A. Varden superintendent.

Bingham Canyon, Jan. 31.

The name of the company operating the Bingham-Centennial mine at Bingham has been changed to the South Columbus M. Co.

The United States smelter at Bingham has its entire battery of five furnaces in operation. Plans for the new lead smelter which the company proposes to build are progressing and work on grading and construction is expected to begin this month.

The Winnamuck mill (remodeled) has resumed operations. The Copper Belt railroad extension to its hins was completed last week. The daily capacity is 150 tons. At the mine, 3000 tons of concentrating ore that carries an average of 4% copper has been broken in doing recent development work.

Iron County.

The Johnny mine at Stateline will resume this week. The mine is said to be showing improvement.

Morgan County.

J. E. Hartman of Park City, vice-president of the Park City Co-operative M. Co., says he will start work this week on the Copper Mountain group, owned by the company, in Morgan county.

Summit County.

The Koarns-Keith concentrator of Park City is in full operation, handling an average of fifty-five tons of ore per day, from which fourteen tons of silver-lead concentrates are produced. Four more concentrating tables are to be set up; these, however, will not increase the output of the mill to any material extent, but will enable the plant to handle its present tonnage with greater ease. It is the intention of the company to ultimately increase the capacity of the plant to 700 tons a day.

Manager W. P. Jenny of the Woodside mine, near Park City, reports recovering the ore body which they had for a time lost track of. Assays show, silver 30 ounces, lead 40% and gold $5.

Work is being done at the Park Summit mine, near Park City, under J. E. Lucy. It is north of the Scottish Chief and is owned by J. H. Rinley et al.

Washington County.

The Utah & Eastern M. Co.'s Dixie mines and smelter, near St. George, are maintaining steady output of copper and six tons of bullion are coming from the furnaces daily.

WASHINGTON.

Ferry County.

Superintendent C. Hill reports work continues on the Taylor group, north of the Tom Thumb mine, near Republic. It is owned by Seattle men.——A drift is being driven on the 140-foot level of the Nob Hill mine and work on the raise is being hurried to secure better ventilation and admit of more rapid stoping. Ore shipments continue.

WYOMING.

Albany County.

Pitchblende has been found in Halleck canyon district, east of Laramie. The Arena M. Co., composed of Denver, Colo., Salt Lake City, Utah, and Laramie men, has been working fourteen claims in Halleck canyon for the past eight months.

FOREIGN.

The world's output of tin for 1903, compared with 1902, is reported by W. T. Sargent of London, England, as follows:

Shipments from Straits Settlements to Europe and America:

	1903. Tons.	1902. Tons.
January	4,685	4,035
February	3,437	4,363
March	5,465	4,642
April	3,296	4,022
May	5,602	4,182
June	4,846	4,984
July	4,641	3,710
August	5,181	5,190
September	4,481	4,808
October	4,188	3,790
November	3,806	4,335
December	3,175	3,770
Totals	52,215	51,831
Shipments from Straits to India and China—January-December	3,150	1,925
Totals from Straits	55,365	53,756
Shipments from Australia	4,157	3,206
English production	4,300	4,300
Bi-monthly sales of Banca and Billiton	18,900	19,000
Bolivian exports to Liverpool and Continent	9,790	10,150
Totals from all parts	92,512	90,412

AFRICA.

Rhodesia.

The gold output of Rhodesia for month of December amounted to 18,750 ounces.

Transvaal.

The Transvaal Chamber of Mines at

Johannesburg gives the following corrected figures for output of gold in fine ounces for 1903, compared with 1902:

	1903			
	Rand. Ozs.	Outside. Ozs.	Total. Ozs.	1902.
January	192,934	6,345	199,279	79,341
February	187,027	8,526	195,553	81,105
March	208,456	9,009	217,465	104,127
April	218,900	8,971	227,871	119,389
May	221,109	9,716	234,125	138,602
June	228,167	10,153	238,320	112,780
July	242,070	9,573	251,643	140,179
August	262,569	9,349	271,918	162,750
September	267,513	8,684	276,197	170,802
October	275,664	8,880	284,544	181,440
November	272,107	7,706	279,813	187,375
December	278,710	7,351	286,061	196,023
Totals	2,859,476	101,273	2,963 719	1,705,413

AUSTRALIA.

New South Wales.

At Neeld's Proprietary mine at West Wyalong an additional 160 feet is being sunk from the 400-foot level. It has been decided to abandon working of vertical shaft on the underlay. A cyanide and crushing plant capable of treating 420 tons per week has been built and will be in operation this month.

The Victorian company, which bought the McGregor claim at the Bark Hut goldfield, near Gundagai, has completed a ten-head battery, which is in operation.

Victoria.

Melbourne reports say the geld yield of Victoria for year 1903 was 822,424 ounces, being an increase over 1902 of 44,686 ounces.

Western Australia.

In consequence of the shortage of water at the Sons of Gwalia mine, near Leonora, it is intended to sink a water shaft 2½ miles east of the mine, where it is thought sufficient supply will be obtained. On two or three occasions recently delays have been caused through there not being sufficient water for the boilers, though amplo is available for milling purposes.

The total gold yield of Western Australia since the first records were kept (1886), up to Jan. 1, 1904, has been 12,208,704 ounces, valued at £45,713,579.

Recent development work is reported to have increased the Kalgurli mine tonnage of ore reserves at Kalgoorlie. The deepest level is at 1050 feet, but a winze is being sunk below that point on east side of the ore opening up at the 1000-foot level. The average grade of rock taken from the winze is 17 dwts. per ton. Northward, free gold with streaks of telluride are showing in face of workings. At the 1000-foot level the south drive parallel with the eastern boundary is going ahead. The face of this drive is 100 feet distant from the point where it is thought the Brownhill-Oroya shoet enters Kalgurli ground. The work of driviug through the intervening ground is expected to be finished by March 1.

The main ore body of the Great Boulder mine at Kalgoorlie has been crosscut at the 1750-foot level. Once more the results foretold by diamoud drill—heing obtained from hore-hole prospecting in this mine—have been confirmed by bulk sampling, says the Western Australia Journal. The existonce of 30 feet of high-grade ore at vertical depth of 1750 feet is proven.

BRITISH COLUMBIA.

The report of the Bureau of Provincial Information for the year 1903 says that in addition to labor troubles there were other couditions that affected mining progress during the year. During February and March the copper mines and smelters of Kootenay, Rossland and Boundary districts were partially shut down by the strike of coal miners at Fernie. Later the coal miners of Nanaimo, Extension and Cumberland, on Vancouver Island, struck, lasting into August. In the Kootenays not only coal and coke, but gold and copper production was restricted. In the Slocan and East Kootenay the situation, as regards successful mining deposits of silver-load ores, has not heen encouraging for some time, the sole reason heing high cost of marketing the product since the American market was closed to British Columbian producers. In the early part of 1903 the decline in the price of metals also interfered. Carihoo, Atlin and Omineca districts suffered from shortage of water supply. In the summer affairs changed for the hetter, and since then there has been ahundant evidence of a general revival of mining in the Province. During the last six months of the year the production of copper-gold ores aud of coal has heen greater than ever before, and many mines are being reopened and equipped with machinory.——Atlin district's gold production in 1902 was 20,000 ounces, value $400,000, and the estimates for 1903 show an increase to $450,000.——On the Fraser river, at Lytton, two dredgers have heen operated with success.——The gold yield in 1903 from Carihoo is estimated at hetween $300,000 and $350,000, or 25% to 30% less than for 1902—attributahle to the shortage of water supply.——In the Lardeau, in every instance the positien of the more important mines has improved. Considerable machinery has been put in, notably a 20-stamp combination silver mill at the Silver Cup, aerial tramway at the same, aerial tramway of 8000 feet length at the Great Western, and stamp mills at the Eva and Oyster Criterion mines at Cambourno.——The Slocan shows for 1903 the lowest eutput since the beginning of the district as a producer, being but 14,000 tons of galena and 2000 tons of zinc ore. Since the Govornment granted a beunty on lead productien last summer a number of mines have been reopened. This will assist the 1904 production.——Rossland's production of approximately 400,000 tons during 1903 is an increase of 20% over 1902.——The production of approximately 700,000 tons hy the Boundary district is an increase of 25% over 1902.——On the who'e, the general outlook for British Columbia for 1904 is promising. The following is the Bureau's estimate of the output for 1903:

METALLIFEROUS MINES.

	Tons.
Coast	100,000
Slocan	16,000
Nelson	50,000
Rossland	375,000
Boundary	685,000
Other districts	50,000
Total	1,276,000

COAL MINES.

	Tons.
Vancouver Island collieries	870,149
Crow's Nest Pass Coal Co. (coal)	650,000
Crow's Nest Pass Coal Co. (coke)	166,000
Total	1,686,149

ESTIMATED VALUE OF MINERAL AND COAL PRODUCTION, 1903.

Gold (placer)	$ 900,000
Gold (lode)	6,000,000
Silver	1,500,000
Lead	500,000
Zinc	50,000
Copper	4,500,000
*Coal and coke	5,250,000
Miscellaneous	500,000
Total value	$19,200,000

*For the purposes of this estimate, coal is valued at $3 a ton and coke at $4.

Boundary District.

The Granby Smelter Co. of Grand Forks has a hond on the Shamrock III and Reliance mineral claims in Summit camp. Development work has hogun. The Shamrock III and Reliance adjoin the Senator and Fromont, which were bonded by the smelter company in Decem her. Ore from the Senator is heing shipped to the smelter, quarried from a glory hole on the surface.

East Kootenay District.

Montreal men have incorporated the Imperial Coal & Coke Co., Ltd., to operate 88 square miles of coal land on Fording river, north of the areas owned hy the Crow's Nest Coal Co. at Michel and Fernie.

The Crow's Nest Pass Coal Co. output of coal for 1903 was 661,118 tons at Coal Creek, Michel and Morrissey, as compared with 441,236 tons for 1902; and the coke output was 167,739 tons, as against 120,777 tons in 1902, reports D. Davis, comptroller of the company. Last year there were 424 coke ovens in operation at Coal Creek, 341 at Michel and 148 at Morrissey and the company has under construction 123 more coke ovens at Michel, 92 at Morrissey, making a total of 1128 ovens. He states that the mines are heing steadily developed with view to increasing output. Tho output last year was affocted by the striko, which closed operations in February and March.

Rossland District.

Amalgamation of the companies owning tho Velvet and Portland mines on Sophie mountain, near Rossland, is being negotiated. It is expected with resumption of operations the reduction works will he built, and the pyritic smelting method used. Tho Rossland-Velvet wagon road is expected to be completed.

CANADA.

Ontario.

The nickel of the world is at present derived principally from two sources—Sudhury district of Ontario and New Caledonia, a French penal colony in the southern Pacific ocean.

Yukon Territory.

A second pay streak, which is said to parallel the first found on Lower Dominion creek, in Klondike district, has been struck on the lower henches opposite 235 below, according to Dawson reports. J. H. Powell, one of the men who mado the strike, says the new pay streak is in the third tier. The first found pay streak is on the first tier of henches. Both are on the right limit. The gold in the second pay streak is not high grade, hut of sufficient quality to warrant working. Other miners along Dominion creek are sinking shafts to find pay gravel on second and third tiers of thoir mines. Last winter second hedrock was found on Three A, El Dorado fraetion, but the shaft filled with water and drove miners from work.

MEXICO.

Chihuahua.

J. S. Sullivan, manager of the Santo Demingo and El Potosi mines of Santa Eulalia, has bought the Tres Mercedes, Promontorio and Santa Eulalia mines in same camp for $100,000 gold. Development work will be started this month.

J. T. O'Hara of the Shoo M. Dev. Co. of Colorado says he has an option on mining ground 10 miles west of the Santo Dominge mine, of the Corralitos Co., near Sabinal station, on the Sierra Madre Railroad.

It is reportod the Santa Eulalia M. Co. (Hearst) proposes building an aerial tramway from its mines at Santa Eulalia to the Mexican Contral Railroad.

The Palmilla mine of P. Alvarado, at Parral, has yiolded bullion during the last three years to value of $500,000 gold, says the Chihuahua Entorpriso. Alvarado has 20 feet of high-grade gold and silver ore.

Parral reports say the Adela mine of W. Petit, in Santa Barbara section, has been sold for $2,000,000 geld to G. Beckman, of Parral, and J. B. Hyslop of the San Francisco del Oro mine. The Adela is equipped with mill, tram and other machinery.

W. P. Dunham et al. of Denver, Colo., who hought the Pinos Altos mines, near Ocampo, will increase the capacity of the mill and put up additional reduction works.

T. H. Oxnam of Los Angeles, Cal., manager of the Palmarejo and Mexican G. F., Ltd., mines at Palmarejo, says machinery is on the ground for the slimes plant.

D. R. Morgan, mine manager of the Torreon smelter, says they have closed down the Americano mine at Terrazas camp, hauling to the station all the ore that was out. He says the company has mined only enough rock to be sure of sufficient fluxing ores for its smelters, and that at present it has lead ores that can he mined cheaper than those of the Americano. In the ten months the mine has been worked hy the Torreon smelter 15,000 tons of ore havo heon taken out of shipping grado. The ore was practically quarried out and with no waste.

Dale Bros. and F. McDonald are again owners of the Americano mine at Terrazas and have started taking out ore for shipment.

The Tecolotes mill of the Guggonheims at Santa Barhara is shut down temporarily for installation of electric machinery. Electric power will he suhstituted for the gas engines, and it is said gas will he used as fuel. The narrow gauge ore railroad will be changed from steam to electricity.

Parral camp is shipping 10,000 tons of ore monthly to the smelters, and this could he increased 50% if the Mexican Central could supply cars, says the Chihuahua Enterprise. The patios of the ore-huying firms are crowded, and it is estimated that there are 750 cars of ore waiting transportation. Notwithstanding the falling off in tonnage shipped the last few months, the value is largely made up in increased grade of ores, due to improvement of ore in depth and the more extensive working of hetter grade mines.

Coahuila.

O. S. Newell of San Antonio, Tex., of the Jimulco C. Co. operating at Jimulco, says they will put up an aerial tramway for ore transportation from their mine to the railroad, a distance of 4 miles.

The Magafil C. Co. of Concepcion del Oro, Zacatecas, proposes huilding a lead smelting plant at Saltillo. Manager W. J. Browning, at Saltillo, says construction will hegin this spring.

The Mexican Coal & Coke Co., owning 20,000 acres of coal lands in Muzquiz district, 13 kilometers west from Barroteran, is producing 2000 metric tons of coal daily. The property is equipped with 226 coke ovens, the maximum capacity of the latter heing given as 7000 metric tons of coke per month. E. Ludlow is manager.

The Reforma mine, owned and operated hy the Jimulco M. Co., is 13 kilometers south from Jimulco station on the Mexican Central Railroad. Development consists of one two-compartment vertical shaft, down 260 feet, and of four tunnels, hesides crosscuts, drifts, etc., says the Mexican Investor. Tho ore carries gold, silver and copper values, and 1000 tons are produced monthly.

Colima.

M. de F. Reuix and J. W. Furness of Colima are preparing to open up and operate iron mines near Colima.

Durango.

(Special Correspondence).—Cushing & Walkup, owners of the Trinadad mine, have on hand large amount of matte ready for shipment. This mine is in Topia district in western Durango. The ore carries high-grade gold, silver and copper values.

R. C. Kirk of San Francisco, Cal., is starting up work on his mine at Puehhito, near Vivovillas. The ore is free-milling geld and silver.

Work is being done on the mines of D. M. Burns at San Dimas. The property consists of several claims, the most productivo of which are the Candalaria, Contra Estaca and La Puerta. The Candalaria is a geld and silver claim and was worked by the Spaniards. Over 12,000 feet of work has been done in the main tunnels and shafts. The Contra Estaca carries gold and silver.

The Provedora mino is closed down pending sale to American partics. It is owned by Mazatlan and Guadalupe de los Reyes men. It is a gold and silver claim in Topia mining district, between the Elota and Barraganes rivers. A 10-stamp mill, operated by steam power, handles the ore, and concentrates are shipped to Mazatlan.

The mines at Mina de Vacas, in Mozquital district, are being worked by an American company. The ores are silver bearing, with values in lead and gold.——A streak of silver ore has been struck in the Carrizo mine, owned by J. Loya of Cosala.

Durango, Jan. 28.

C. B. Flynn of Parral, manager of the Maverick M. Co., operating in Avino camp, says development work is being increased. Some of the properties have been worked extensively, but most of them are now. The ores carry silver, gold and copper. The Avino district is 30 miles from Durango and 10 miles from the National Railroad. Water and timber are abundant.

L. F. Morris, manager of the Huahuapan M. Co. at Huahuapan, says they will put in additional machinery and other improvements te increase development.

The Restauradora M. Co., of Guanacevi, H. H. Hughes manager, is putting up a cyanido plant to treat 100 tons of ore daily. The amalgamation process has been used heretefore.

Guanajuato.

La Luz M. Co. of Colorado Springs, Colo., owning the Refugio and Santa Clara mines, near La Luz, proposes building an entirely new plant, to have capacity for treating 500 tons of ore per day and to be operated by electric power. There are three double-compartment vertical shafts, respectively 980, 600 and 700 feet in depth, with crosscuts, drifts, etc. The ore carries gold and silver values. The properties aggregate 280 acres. G. N. Bryant is manager.

A company has heen organized in Mexico City to take over and exploit the cinnahar properties of de Rilly (the Las Palmas y Annexas), in San Felipe district. P. de Rilly is manager, and has started operations. It is claimed three lodes show assays of 3% quicksilver from the outcrop.

Hidalgo.

J. M. Erskine says ho will build a stamp mill at his mines near Ahuechuetes.——P. J. Howard and S. Farrol, operating near Pachuca, propose to put in additional machinery.

San Luis Potosi.

The Santa Maria de la Paz mine, consisting of 179 pertenencias, in Catorce district, 6 kilometers northwest from Matehuala, owned and operated hy the Negociacion Santa Maria de la Paz of Matehuala, is being developed through thirteen shafts, eleveu levels and various crosscuts, drifts, etc. The maximum depth attained is 1600 feet, while some of tho workings are over 6000 feet in length. There are said to he eight lodes cutting the property, the ore carrying gold, silver and lead. The equipmeut consists of six double steam hoists, six pumps, five engines, fourteon hoilers, two electric generators for lighting the minc, camp, etc., air compressors and concentrators. Ore and concentrates are shipped to the smelters in the vicinity.

Sinaloa.

(Special Correspondence). — Minney, Garvin & Boland of Los Angeles, Cal., are working tho Trinadad mine, west of Guadalupe de los Reyes. The ore is free-milling gold, with small values in silver appearing as depth is gained. The vein mattor is decomposed quartz and lime. They are testing the ores with Huntington mill with daily capacity of eight tons. The mill is operated by water wheel, water being obtained from the Elota river. The mill is 6 miles from the mine, the ores being packed hy burros at cost of $5.75 per ton, Mexican money.——G. Cunningham has resumed work at tho Barrateros mine, 6 miles north of Cosala. It was an antigua carrying high silver values.

Guadalupe, Jan. 26.

A 10-stamp mill is being built hy the Lluvia de Oro M. Co. at its mines at Choix.

Sonora.

(Special Correspondence).—A new single-compartment shaft has heen started on La Gloria mine of La Dura M. & M. Co., and is down 75 feet. A double-deck

cage will he put in. The shaft will be sunk to 500 feet. They are hoisting with buckets aud small air hoist until larger plant can be set up. At La Prieta mine, belonging to same company, the double-compartment shaft is down 1020 feet. From this level a crosscut of 900 feet is being run, of which they have already driven 300 feet. P. Schabarum is superintendent and A. S. Graff assistant superintendent.

The Golfo del Oro M. Co., near the Yaqui river, is working forty men, and lately made a 50-ton shipment to the Yaqui S. & R. Co. at Toledo, 10 miles from the mines, with satisfactory results. E. T. Page is superintendent.

La Dura, Jan. 30.

J. E. McIntyre, chemist for the Ruby G. & C. Co., operating at Batamote, says the company has a large quantity of ore ready for reduction, and is hauling fluxes, fuel, etc., preparing to start the reduction works. G. W. Crowe is manager.

The mill of the Cerro Prieto mines at Cerro Prieto, in Magdalena district, owned by C. N. Thomas et al. of Chicago, Ill., will be increased from 20 stamps to 120 stamps, says the Bisbee Review. The Caliche Mountain M. Co., consisting of Tener Bros. and others, is working a property 12 miles from Cerro Prieto on which are three ledges, 5 to 8 feet wide, carrying $12 per ton in gold.

H. K. Chenoweth of Nogales, Ariz., interested in El Dormido mine, near the Cerro Prieto mines, in Magdalena district, reports a strike of high-grade gold ore on El Dormido.

J. L. Sheperd of Nogales, Ariz., president of the Trimetallic M., S. & R. Co., says he will increase development work on the company's mines in Sonora.

Twelve miles east of Magdalena, J. J. Sullivan is working the Calabasas placer grounds and reports progress.

The Cinco Senores mine at Picacho, near Douglas, Ariz., is reported sold to Detroit, Mich., men. This group of claims is an extension of the Picacho mine of Phelps, Dodge & Co.

Tamaulipas.

The Mexican Petroleum Co. is building an oil refinery at Ebano to have capacity of 800 barrels daily. Other improvements will also be made, including a railroad, on which work is under way, 6 miles long, between the refinery and the oil fields.

Zacatecas.

The San Luis del Oro mine, consisting of 88 pertenencias, 2 kilometers south from Zacatecas, owned and operated by the San Luis del Oro M. Co., is being developed through four shafts, the depths being, respectively, 220, 150, 130 and 150 feet. The equipment consists of a 20-stamp mill, 1000 pounds per stamp, two double steam hoists, one pump, two engines, four boilers and a fifty-ton cyanide plant. The plant, while not running at present, will be started up this month. Development work is progressing and ore is being stored.

The London Exploration Co. has bought the Guanatillo mine for $100,000 gold. The mine is near Ojo Caliente and consists of eight pertenencias. It is a silver producer.

VENEZUELA.

Caracas reports say the Federal High Court has handed down a decision in the asphalt case. The court gives judgment that the claim of Warner & Quinlan of Syracuse, N. Y., to possession of the Felicidad asphalt mine, a portion of the asphalt lake in the State of Bermudez, claimed also by the New York & Bermudez Asphalt Co., who hold a concession to work the lake, is null and void. The Felicidad mine was bought in 1898 by Warner & Quinlan. The court bases its opinion on the argument that, while the concession of the Bermudez Co. was valid, no claim to the Felicidad could he granted, and that Warner & Quinlan had bought the Felicidad mine without receiving proper title from the vendors.

Trade Treatises.

Queen & Co., Inc., 1010 Chestnut street, Philadelphia, 59 Fifth avenue, New York, "Fifty years, 1853–1903," make fine showing of their engineering and scientific instruments in their catalogue, which they will send to any desired address.

The 1904 catalogue of the Frue Vanuer from Jas. S. Brownell, the Western manager, 132 Market street, San Francisco, Cal., gives a historical sketch and description of the machine, describes also its method of working, discusses in detail the requirements connected therewith, with practical information, and illustrations regarding the entire suhject of ore concentration, of general interest to millmen.

Personal.

J. N. KELLY of Bodie, Cal., is in San Francisco, Cal., on mining business.

H. S. WOOLLEY has been reappointed assayer of the mint at Boise, Idaho.

J. DRYSDALE, owning mines near Calgary, Alberta, Canada, is in San Francisco, Cal.

J. BENDER of Hamilton, Ohio, interested in California mines, is in San Francisco, Cal.

J. E. MCINTYRE is chemist for the Ruby G. & C. Co., operating at Batamote, Sonora, Mexico.

R. HAYES BARNES is in charge of the Black Hawk mine for Los Angeles parties, Soulsbyville, Cal.

H. K. WHEELER has returned to Los Angeles, Cal., from inspection of iron deposits on the Mojave desert.

H. S. SIMMONS of New York City, interested in Nevada mines, is in San Francisco, Cal., on mining business.

E. LEVY is assistant manager of the Le Roi Two C. Co. at Rossland, B. C., going there from Denver, Colo.

G. SNYDER of Salt Lake City, Utah, of the Western Exploration Co., is in San Francisco, Cal., on mining business.

LAFAYETTE DURKEE, inventor of the Durkee electric drill, has gone south for the winter on account of his health.

I. W. BARNETT, interested in mines of Chile, South America, is in San Francisco, Cal., from Antofagasta, Chile.

C. C. TYLER, interested in Borneo oil fields, is in San Francisco, Cal., from Koetei, Borneo, en route to London, England.

T. G. HAILEY of Pendleton, Or., is president of the Golconda M. Co., operating near Sumpter, Or., vice C. B. Wade, resigned.

F. L. BOSQUI of Mill Valley (Eastland P. O.), Cal., is in Goldfield, Esmeralda county, Nev., making ore tests for cyanide treatment.

J. H. HOPPER, C. E., has returned from San Francisco, Cal., to Sonora, Tuolumne county, Cal., where he has mining interests.

C. J. ALFORD of London, Eng., is in Egypt, visiting the Um Rus, Fatira and Eridia mines of the Egyptian Mines Exploration Co., Ltd.

W. L. WATTS, E. M., of Los Angeles, Cal., is making mine examinations in the State of Mexico, Mex., and in the surrounding territory.

B. MOODY is superintendent of the California King G. M. Co. and is at the mines at Picacho, San Diego county, Cal., from the Black Hills, S. D.

W. E. DEFTY of Phœnix, Ariz., manager of the Arizona-Mexican C. Co., is in Sonora, Mexico, with a party of Eastern men, examining mines.

R. ECKMAN, former superintendent of the Columbia mine, is superintendent of the Midway mine, near Sumpter, Or., vice S. G. Williams, deceased.

G. W. ROOT, manager of the New York-Grass Valley Con. M. Co., returned last week to Grass Valley, Cal., from a business trip to New York.

J. BELL, of French Gulch, Shasta county, Cal., accompanied M. J. Lidstone of San Francisco, Cal., to Dale, Cal., to engage in mill construction.

G. W. MYERS, representing the Chrome Steel Works of Brooklyn, N. Y., has returned to San Francisco, Cal., from Arizona and southern California.

EDMUND JUESSEN of Spokane, Wash., is manager of the Franklin mine, 48 miles north of Mountain Home, Idaho, owned by R. P. Chatin & Co. of Spokane, Wash.

J. G. HARDY, formerly superintendent of the Creston-Colorada M. Co. at La Colorada, Sonora, Mexico, is with the Dolores M. Co. at Minaca, Chihuahua, Mexico.

J. AND G. RICH AND G. ERICKSON returned to Rossland, B. C., last week from the Ketchikan district, Alaska, where they have been engaged in mining for the past nine months.

WM. SCALLON of Butte, Mont., has resigned as president of the Anaconda C. Co. and manager of the Amalgamated C. Co. properties in Montana, due to pressure of private affairs.

L. E. TOMBLIN, superintendent of the Bear Gulch M. Co., operating near Deadwood, South Dakota, has gone to Alabama for same company to inspect newly developed gold fields in that State.

C. PREUSSE has retired from the firm of Preusse, Swoyer & Van Dreveldt, at Parral, Chihuahua, Mexico, and taken position as consulting engineer of a company in Tlalpujahua, Michoacan, Mexico.

T. H. BAILEY WHIPPLE has returned to the Sawyer-Man Electric Co. to the position he left last summer in order to take part in the reorganization of the sales department of the Nernst Lamp Co. of Pittsburg.

PROF. F. E. FIELDING, for thirty years chemist for Mackay & Fair, Virginia City, Nev., has resigned, and, in connection with his half-brother, H. K. Wheeler, will have charge of a Los Angeles, Cal., laboratory that they have bought.

Obituary.

W. SEBASTIAN, a pioneer miner of French Gulch, Shasta county, Cal., died Jan. 21st at French Gulch. Deceased formerly owned the Brown Bear quartz mine in Trinity county. He was aged 76 years.

W. P. MCCULLOUGH, a pioneer miner of southern California and Arizona, was killed by a Santa Fe train near San Bernardino, Cal., on the 2nd inst. Deceased was one of the original locators of the Calico mines, large producers of silver in the eighties.

W. R. THOMAS, a mining man of Nevada City, Cal., died Jan. 22d of miner's consumption. Deceased went to California from Cornwall, Eng., during the Civil War and engaged in mining in Sierra county and in Nevada county. He is survived by a widow, two sons and two daughters.

N. GREEN, a pioneer miner of Colorado and Arizona, died at Solomonville, Ariz., Jan. 18th. Deceased was born in Johnstown, Illinois, July, 1821. In 1880 he settled in Colorado and for several years engaged in mining in Silverton district, San Juan county; and in 1886 moved to Solomonville, Arizona.

T. ROSEVEAR, a pioneer miner of Nevada, died at Ruby Hill, Eureka county, Nev., Jan. 18, of miners' consumption. Deceased was a native of Cornwall, England, aged 49 years. He went to Eureka from Missouri in 1878, and followed mining on Ruby Hill for a quarter century. He is survived by a wife and eight children.

S. G. WILLIAMS, superintendent of the Midway mine, near Sumpter, Or., died at Hot Lake, Or., Jan. 19th, after a brief illness. He leaves a wife and one daughter. Deceased, as a superintendent in the Sumpter district, had had charge of the Bonanza and also of the Gem mines. In his younger days he was a cattle inspector in Texas and New Mexico, and an Indian scout.

BENJAMIN PICKARD, president of the Miners' Federation of Great Britain and Liberal member of Parliament for Normanton, Southwest Riding, since 1885, died on the 3rd inst. of heart disease, aged 62 years. Deceased was instrumental in securing the mines acts, the employers' liability acts, the miners' eight-hour bill and other laws relating to protection of employes.

G. D. DAVEY, formerly a mining superintendent of Michigan and of Colorado, died at Grass Valley, Cal., Jan. 23d from miner's consumption. Deceased was a native of Devonshire, Eng., and at age of nineteen went to Michigan. Later, in Colorado, he was superintendent of a copper mine for a few years. Twenty-five years ago he went to Grass Valley, and with exception of two years spent at Virginia City, Nev., has heen connected with Nevada county mines. He leaves a wife and two daughters.

HENRY CABLE, a pioneer mining man of Sumpter district, Oregon, died at San Jose, Cal., Jan. 20th, aged 52 years. Deceased was one of seven hrothers who went to Oregon when young men, engaging in mining with their father. They located the Monumental mine, and operated placers on Granite creek. Later they became interested in Cable Cove properties. In 1887, deceased located the Columbia mine on Cracker creek, and later the Climax, and Cracker-Oregon.

Dividends.

Bunker Hill & Sullivan M. & C. Co., Idaho, $33,000; payable Feh. 5.

Commercial Paragraphs.

THE George E. Dow Co. of San Francisco, Cal., will place a three-triple compound pump of 300,000 gallons daily capacity in the Halifax mine, Tonopah, Nev., at the bottom of the 700-foot shaft.

THE Denver hranch of the Jeanesville Iron Works Co. recently sold the Camp Bird mine two electric power pumps, 1000-foot lift, which will be the highest electric lift in the State; also a steam pump, 600 gallons capacity, to Victor, Colo.

THE Onderdonk Engineering Co., C. S Onderdonk president, E. H. Wells vice president and J. G. Ward secretary and treasurer, have opened an office and show room at 1421–23–25 Fifteenth street, Denver, Colo., where they intend to carry a line of Babcock & Wilcox water tube boilers, Keasby & Mattison Co.'s magnesia coverings, Goubert Mfg. Co. heaters, Foster Engineering Co. regulators and other specialties.

THE E. I. Dupont de Nemours Powder Co. of Delaware, New York and Pennsylvania is credited with present intent to go extensively into the manufacture of mine explosives, including giant powder, etc., on the Pacific Coast in competition for a part of the extensive trade therein, the idea being to build a large factory therefor on the shores of San Pablo bay, near San Francisco, Cal. It is estimated that upward of 35,000,000 pounds of dynamite and 200,000 kegs of black powder were used in the territory subsidiary to San Francisco in 1903, and that the profitable nature of the business warrants active competition. Whether such promised competition will result in reduced prices to consumers remains to be seen.

THE Power & Mining Machinery Co. have a contract with the Elmira, N. Y., Water, Light & Railroad Co. for a four-cylinder American Crossley gas engine of the opposed type, with cylinders 32 inches in diameter by 36 inch-stroke, to run 138 revolutions per minute and to develop, under normal load, 1300-brake H. P. with natural gas containing 1000 B. T. U. per cubic foot. This engine will be direct coupled to a General Electric sixty-cycle alternator of the fly-wheel type, and will run in parallel with their existing steam engines and with such other gas engines as they may install in the future. This engine will be used for both lighting and power; the direct current for their railway work secured by the use of rotary converters; also with the Milford, N. H., Electric Light Co. for one 80-brake H. P. high-speed Crossley gas engine with cylinders 17x24 inches, and one Crossley suction-type producer plant of the same capacity. The Motor Engine Co., 15 William street, New York City, one 20-brake H. P. Crossley new type suction gas producer, to be installed at their Staten Island shops. The Amparo Mining Co., Philadelphia, Pa., one 190-brake H. P. Crossley high-speed double-cylinder gas engine, with cylinders 18½x24 inches; and two high-speed single-cylinder Crossley gas engines of 130-brake H. P. each, with cylinders 20x30 inches; six 9x15 foot Loomis generators, with two 10,000 cubic foot holders. This contract also includes mining machinery, consisting of crushers, Bruckner roasting furnaces, condensing chambers, etc. International Steam Pump Co., New York City, for installation at their new plant at Harrison, N. J., two 11x16 foot Loomis-Pettihone gas generators, together with two 10,000 cubic foot holders. This plant is to be used for metallurgical work about the new Harrison plant. Nogales Copper Co., Chicago, Ill., for installation in Mexico, three Crossley high-speed double-cylinder gas engines, 330-brake H. P. each, with cylinders 25x30 inches; and one Crossley high-speed single-cylinder gas engine, with cylinder 18½ x27 inches; four 9x15 foot Loomis-Pettihone gas generators, one 10,000 cubic foot holder and one 5000 cubic foot holder. This contract also includes the mining machinery for the plant. Sayles' Bleacheries, Saylesville, R. I., one 255-brake H. P. two-cylinder 22x30-inch high-speed gas engine. At this plant the water gas, generated hy the Loomis-Pettibone system, built by us, is in use for heating the singeing machinery, and the producer gas in the gas engines. The new engine is to run in parallel with another gas engine which has been running at the Sayles' Bleacheries for over a year.

THE Gihhs Engineering & Manufacturing Co. of Glendale, Long Island, N. Y., recently gave private exhihitious of a new type of tractor-drawn road train which has just been completed for the Death Valley Borax Co. of southern California. The train consisted of a tractor carrying the gasoline engine and generator (which comprises the generating set) and two

trail cars for carrying the desired load. The current generated on the tractor is distributed through a controller to motors on the drive wheels of the tractor and the trail cars. In this way each unit of the train is said to be practically self-propelling. The trail cars, each of which is of ten tons carrying capacity, are chain-driven, instead of being geared. As each car is virtually an independent unit, the tractor itself is of light construction, and the company claims, along with the advantages of special features of construction, that a large increase of paying load is possible. The test mentioned was carried out under adverse conditions, on a considerable grade covered with snow and ice. The test was witnessed by a distinguished party of expert engineers and automobilists, who later adjourned to the firm's new factory to inspect a five-ton truck of the Gibbs type, with five tons carrying capacity, that was being completed for exhibit at the annual automobile show at Madison Square Garden, New York. After luncheon, which was served at the factory, congratulatory speeches were made by Henry Norman, M. P., editor of the World's Work, who recently arrived on a visit to this country; C. E. Pickett, superintendent of the Death Valley Borax Co.; W. E. Scarritt, president of the Automobile Club of America; Dr. A. R. Ledoux, the well-known chemical expert and mining engineer, and others.

Latest Market Reports.

SAN FRANCISCO, February 5, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅝d (standard ounce, 925 fine); New York, bar silver, 55⅜c, refined (1000 fine): San Francisco, 55½c; Mexican dollars, 43@44c San Francisco, 42½c New York.

COPPER. — New York: Standard, $12.62½; Lake, 1 to 3 casks, $12.62½; Electrolytic, 1 to 3 casks, $12.50; Casting, 1 to 3 casks, $12.22½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 10s spot per ton.

Copper shows little change from last week's quotations, being a fraction lower than a week ago. James Lewis & Sons' annual copper report says that the most prominent feature of the copper trade in 1903 was the reduction in public and private stocks in England. This indicates that these stocks were drawn upon and not replenished, and that the stocks are now low, and that a buying movement must soon commence, which will have a tendency to raise the price with a resultant stimulus to increased production.

LEAD. — New York, $4.45; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; ⅛c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £11 2s 6d ℔ long ton.

SPELTER.—New York, $5.00; St. Louis, $5.00; London, £21 15s ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.50 @ 28.00; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32½c; bar tin, ℔ lb., 35@37½c. London, £126 2s 6d spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulpbate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes bigber; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; sbingles, $2.50 for No. 1 and $2.25 for No. 2; sbakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwbile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.40 ℔ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ℔ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.00 @14.25; gray forge, $13.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.50; open hearth billets, $23.00 @23.75; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@15 00
Northern 2	14 00@14 50
Northern 3	13 50@14 00
Southern 1	14 35@14 60
Southern 2	13 85@14 10
Southern 3	13 35@13 60
Forge	12 60@12 85
Charcoal	16 50@17 00
Billets, Bessemer	24 00@24 50
Bars, iron	1 30@ 1 50
Bars, steel	1 46@ 1 60
Rails, standard	28 00@30 00
Rails, light	26 00@30 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
Dealers forge	9 00@ 9 50
No. 1 railroad wrought	10 75@11 25
No. 1 cast, net ton	10 50@11 00
Iron rails	13 00@14 00
Car wheels	13 50@14 00
Cast berings	3 25@ 3 50
Turnings	7 00@ 8 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitre-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carlead lots, 11⅝c; less tban ene ten, 13¾c. Ne. 2, 40%, carload lots, 10c; less tban one ton, 12c. No. 2, 35%, carload lots, 9½c; less tban ene ten, 11½o. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less tban 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda asb, $2.00 ℔ 100 lbs.; byposulpbite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; cblorate of potasb, 12@13c; nitrate of potasb, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulpbur, 2½@2¾c; pewdered sulpbur, 2@3c; flour sulphur, Frencb, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulpbide of iron, 8c ℔ lb.; copper sulpbate, 5¼@5¾c; cbloride of lime, spot, $2.50@2.75; sulpburic acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Soutbfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, bd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Antbracite, $13.00; Rock Springs, $11.50, long ton; Colorado Antbracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 15c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural Wbite, 70c; Bleacbed, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less tban 500 lbs., per lb., 7c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purcbase, ℔ lb., 6½c; less tban 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., $1.00.

BISMUTH.—Subnitrate, ℔ lb., $1.75.

MERCURY.—Bicbloride, ℔ lb., 90c.

MOLYBDENUM.—$2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 75c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(Tbese prices are wbolesale, f. o. b. San Francisco, unless otberwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JAN. 26, 1904.

750,420.—SASH FASTENER—J. Anderson, Seattle, Wash.

750,518.—PRESERVING APPARATUS—C. Blagharn, S. F.

750,584.—ELECTRICAL VIBRATIONS—F. H. Brown, Los Angeles, Cal.

750,588.—KILN—H. M. Buck, Burlington, Wash.

750,257.—CLOSURE—E. E. Chapman, Los Angeles, Cal.

750,259.—WEIGHING MACHINE—W. H. Coffelt, Anacortes, Wash.

750,263.—FELLY JOINT—W. J. Cranford, Spokane, Wash.

750,430.—LABEL HOLDER—L. C. DeCarli, San Jose, Cal.

750,443.—GLOVE—F. W. Farrant, S. F.

750,628.—FRUIT FEEDER—I. H. Fay, Iadlo, Cal.

750,444.—PIPE COUPLING—P. E. Fisher, Spokane, Wash.

750,760.—CAN FILLING MACHINE—F. B. Fulton, Anacortes, Wash.

750,450.—FAN—O. Giltner, Portland, Or.

750,276.—VAGINAL SYRINGE—F. J. Gruss, S. F.

750,364.—NUT LOCK—F. A. Howard, Fresno, Cal.

750,284.—COMBINATION TOOL—J. Jenkins, Buckley, Wash.

750,054.—JAR HOLDER—Kate A. Johnson, Lorene, Wash.

750,286.—WATER TUBE BOILER—T. W. Johnson, S. F.

750,674.—GAS GENERATOR—W. S. May, Clifton, Ariz.

750,480.—BICYCLES—J. McLarty, Seattle, Wash.

750,677.—GOPHER TRAP—J. Morawetz, Castella, Cal.

750,490.—RAILWAY RAIL JOINT—C. L. Pope, Ely, Nev.

750,706.—CONCENTRATOR—H. J. Russell, Crescent Mills, Cal.

750,733.—TROLLEY POLE—J. J. Tartt, Los Angeles, Cal.

36,747.—DESIGN—FINGER RING—H. S. Dana, S. F.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

LABEL HOLDER FOR LIBRARY SHELVES.—No. 750,436. Jan. 26, 1904. L. C. De Carli, San Jose, Cal. This invention relates to a device for holding labels and means for attaching it to library shelves, so that the subjects treated by the books contained on the shelves may be indicated to those desiring to use them. It consists of a slip or label holder having a curved segment extending rearwardly therefrom, said segment being recurved upon itself and adapted to fit upon a correspondingly shaped segmental curve of the front of the shelf or a guide which may be fixed to the shelf.

RAILWAY RAIL JOINT.—No. 750,490. Jan. 26, 1904. C. L. Pope, Ely, Nev. The object of this invention is to provide a labor and time saving means for joining abutting ends of rails in a rigid bond without the use of the usual fish plates and bolts and to provide a smooth durable joint over which car trucks may pass in either direction without a jar irrespective of the expansion or contraction of the rails. In this construction one rail holds the other and a rail can only be taken out by removing the spikes and lifting both rails.

GLOVES.—No. 750,443. Jan. 26, 1904. F. W. Farrant, San Francisco, Cal. This invention relates particularly to that class of gloves which is used for driving, handling metals and for like services; and the object of the invention is to so dispose the seams as to get them out of the way of wear as much as possible. This is accomplished by an ingenious method of cutting and securely and neatly fastening the seams.

FINGER RING.—No. 36,747. Jan. 26, 1904. H. S. Dana, San Francisco, Cal. This invention is an ornamental design for a finger ring.

SITUATIONS WANTED.

ASSAYER WISHES POSITION: HAS OUTFIT, if necessary. Address "L.," this office.

A YOUNG MINING ENGINEER DESIRES position as assistant; assayer and good draughtsman; State licensed surveyor for California. Address C. R., care Min. and Scientific Press.

EXPERIENCED SUPERINTENDENT, ENGINEER, Metallurgist; technically and liberally educated; 15 years handling men and machinery of smelters, mills and mines. See testimonials. Address Prof. Stickney, Mountain View, Cal.

MILL AND SMELTER SUPERINTENDENT, at present disengaged, wishes similar position with responsible company; college graduate with varied experience. Best of credentials furnished and required. Address "Gluckauf," care this office

MILL FOREMAN WANTS POSITION; 20 years' experience; good references; correspondence solicited. Address Mill Foreman, 1056 South Gaylord St., Denver, Colo.

MINING ENGINEER AND METALLURGIST, technical graduate, with large experience as superintendent, manager and consulting engineer of mines and mills, desires a position. Best references. Speaks Spanish fluently. Address "Ingeniero," care of Mining and Scientific Press.

SUPERINTENDENT IS OPEN FOR POSITION to develop gold or copper properties; experienced miner; can make underground maps and models, also do the assaying; speaks Spanish; good references from past companies. Address "Develop," care this office.

WANTED—POSITION WITH MINING COMpany as manager or assistant. Examinations, surveying, assaying; also familiar with drift and hydraulic mining. Best of references. Address W. H. J., this office.

WANTED—POSITION AS SUPERINTENDENT or assistant of copper mines and smelters; competent all round man, good assayer, analyst and draughtsman; can handle labor; speaks Spanish. Address "Smelter," care this office.

YOUNG GRADUATE OF GOOD MINING school wants position with reliable mining company. Not afraid of hard work. Object, advancement. Address "Advancement," care of this office.

HELP WANTED.

WANTED—MINE SUPERINTENDENT OF EXperience, who thoroughly understands handling of gold-bearing ores and management of mine and men. Must be willing to take part of salary in stock of company until mine is on paying basis. Mine is in California. Only thoroughly competent men need apply. References required and given. Address G. Mines, care of Mining and Scientific Press, San Francisco, Cal.

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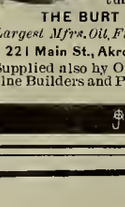

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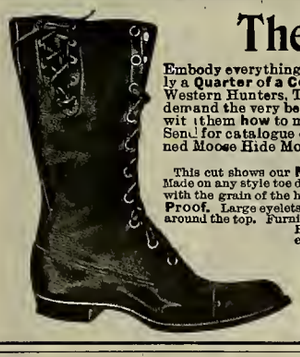

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MINING AND SCIENTIFIC PRESS.

Whole No. 2273.—VOLUME LXXXVIII. Number 7. SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 13, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

A Great Gold Mine.

One of the largest and most productive gold mines in the world is the Homestake property, at Lead City, South Dakota. The original location was called the Homestake, and was taken up in 1876, and is depicted in the left portion of the accompanying engraving, covering a part of what is now the great open cut. At that date quartz locations in the Black Hills were limited to a length of 1500 feet and a width of 300 feet. The open cut is more than 600 feet long and nearly 400 feet wide. The point of view from which the photograph was taken is the Ellison hoist. Originally there were two shafts on the Homestake proper, one of them an incline. Both were in the region of the cut. The lower one, however, shows at the extreme left. The first large vertical shaft was the Giant and Old Abe. The hoist building is seen in the middle background on the hillside. This shaft was sunk to a depth of 800 feet, where it remained for years. The Ellison shaft is the newest and largest on the property. The first mill built by the Homestake Company was one of 80 stamps, since enlarged. It is at the left of the picture, beyond the superintendent's residence. The next mill erected was the Golden Star, appearing in the center of the illustration, being connected with the Ellison shaft by steel tramway. The Amicus mill is situated to the right of the Golden Star. On the hillside back of these mills and between them are the foundry and machine shops.

The strike of the great gold-bearing zone is west of north, and corresponds nearly to a line drawn from the extreme left of the picture toward the observer. The dip is to the right (easterly) at variable angle, and the trend of the ore bodies is southward toward the observer. The higher hills are intrusive rocks (rhyolite) with some of the quartzites and shales of the Cambrian. The older formation, that in which the ore bodies occur, is Algonkian, and here consists of micaceous and hornblende schists of fine grain and containing much silica. Large masses of quartz occur in segregated lenses and veins in the schists. Locally a conglomerate overlies the schists, and this to the eastward of the Homestake zone is gold bearing. These deposits were the first in place to be mined and crushed in the Black Hills. In the quartzites and shales overlying the conglomerates, occur the telluride ores, some of which are found in the vicinity of the Homestake. Wolframite also occurs in the quartzite. The timbers and wood used in the mines and at the mills are delivered by railroad at the top of the hill near the center of the engraving. Cord wood is sent down to the several mills and hoists by means of chutes, several of which are seen in the picture. The Highland, Deadwood-Terra, Caledonia, Father De Smet and many other mines of the group lie to the northward beyond the hills forming the skyline on the left, a distance of about a mile, while southward the company's property extends to Whitewood canyon, almost an equal distance. The cyanide plants are located at two places. The first and largest is down Gold Run beyond the right of the limits of the picture. The other is over a mile distant to the northward, at Gayville, a small village in Deadwood gulch. One of the most important considerations in mining at the Homestake is abundance of water. This the local drainage and the mines do not supply. Water ditches and pipe lines have been constructed from numerous more or less distant sources, bringing water to the mines and mills. In the aggregate, these amount to several hundred miles of ditches, flumes and pipe lines.

The latest acquisition to the water system is the Spearfish plant. The Spearfish is one of the largest streams in the Black Hills. The water is pumped from the stream to Lead City, the pumps raising the water several hundred feet, on the neighboring hills, whence it flows by gravity to the Homestake. Lead is a city of about 8000 population.

General View of Homestake Mills From the Ellison Hoist, Lead City, South Dakota. (See Page 111.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, FEBRUARY 13, 1904.

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WHILE certain industrial stocks have depreciated somewhat in valne, and the investing public has been a loser thereby, mining as an investment is attractiug eonstantly more atteutiou, and there is au inquiry for legitimate mining investment, both in mines themselves aud in mining stocks of the better class.

NO one is authorized anywhere at any time to colleet money for snbseriptions for this journal without being able to show due authority in present force, and any itinerant so attempting may be considered an impostor. Nor does this journal allow any of its representatives auywhere at any time to solicit or receeive money for any mention of any kind in its reading columns. It is its boast that during the forty-four years of its existence it never yet took a dollar to put anything in its reading columns—or keep anything out—but every ten years or so it is necessary to restate that any one offering for payment of any sort to make favorable mention of mines, machinery, etc., herein, may be set down as a fraud.

A SYSTEM of mine bookkeeping is a desirable and necessary adjunct to successfnl mine management, but it, like many other useful and valuable aids to the manager, may be carried to an extreme and, in the way of segregating accounts, reach a phase whieh makes it ridiculous. It is desirable to know the average cost of mining and treating one ton of ore, and to know where these costs are placed, as to labor, hoistiug, supplies eonsumed, timbering, transportation, milling, etc., but when it is carried to the extreme of showing how many whisk-brooms were nsed np in the mill, and how many lamp wicks were burned per ton of ore mined and treated, the limit of usefulness has undoubtedly been reached.

Safety Devices for Shafts.

The reeent accident at the Independence mine, at Victor, Colo., has resulted in a wide discnssion among mining men over safety appliances for cages and skips in shafts, both vertieal and inclined. Among the various devices suggested are chairs, not only at the collar of the shaft, bnt at a point above it which would made it possible to catch the eage immediately upon the breaking of the cable in a ease of over winding, and safety clutches, so arranged and so powerful, as to hold the cage in any event, at any point in the shaft should the cable break. Manager O'Neill of the California mine, at Leadville, Colo., has suggested the adoption of a safety device similar to that in use at the California mine, which is one of the best suggestions thns far made, and is similar in operation to the chairs ordinarily placed at landiugs in shafts, though operating automatically. This device consists of two pieces of steel bolted to both guides in each compartment where cages or skips are in use, or they may be bolted to upright beams placed for the purpose, on eaeh side of the shaft. These steel bars are about 2 feet long, and are securely bolted at the lower eud to the guides or the beams, bnt the upper ends are sprung outward, into the shaft, so that at the top they are about 3 inches from the guides. In passing npward the shoes of the cage pass over the steel bars which beud inward, against the guides, sinking into a depressiou eut to receeive them, but in the event of overwinding, and the lower end of the shoes passing above these automatic chairs, the latter immediately spriug ontward, preventing the cage from deseending. Should the eable break, the cage will be held by the chairs.

If the eugine is stopped in time the cage may be lowered by drawing the spring chairs against the guides by means of a bolt welded to the bar, which passes loosely through a hole bored in the guide, and which is provided with a thread and nut at the opposite end. By turning up the nut the bar is drawn backward, releasing the cage. The position of this deviee mnst be sueh that only a limited space intervenes betweeu the top of the cage and sheave wheel after the bottom of the shoes passes the spriug chairs, so that shonld the eable break, the cage would drop ouly a few inches. A device of this or similar character shonld be provided at every shaft employing cages, and skips where guides are in use. Skips run without guides are very common in inclined shafts, and not one in a thousand has any sort of safety arrangement for stopping the skip in the eveut of a cable breaking, and this faet alone indicates that the application of a safety device to this condition is unusually difficult. The field for the iuventive faculty in this direetion is large, and a device which would aecomplish the desired object would be gladly welcomed by mine managers the world over.

The Need of Ventilation.

The explosiou of nitro powder in mines creates a qnantity of earbonic oxide, and nitrous gases, which mixed with the oxygen of the air, make a combination not only detrimental to health when breathed, but even deadly. There are numerous so-called remedies for "powder headache," but none of them aetually afford immediate or complete relief, and it is a question whether these compounds do not do more damage to the stomach and the digestive organs thau is compensated for by the partial relief of the head, by a process of deadening the nerves. Good ventilation is the best thing, as it will tend to prevent powder headache. It is also advisable to use nothing weaker than XXXX caps, aud "five X" or "six X" are even better, as these have a tendeney to ereate a more perfect explosion of the powder, with a consequent less amount of smoke and gas. Powder gas is not always visible. Carbonic and nitrous oxide may exist in considerable quantity in a perfectly clear atmosphere. This is often the case and shows the necessity of perfect ventilation. Often when a round of holes have been fired in a shaft or drift, and the smoke all driven ont by the ventilating pipes or allowed to drift away uaturally, the miners are made ill by shoveling up the rock into cars—the entire mass of broken rock being saturated with the gases of the explosion. This is particnlarly the case with rock that breaks up fine and is moist.

Rapid Shaft Sinking.

The record shaft sinking done ou some of the mines of the Rand in South Africa has a tendency to make the average mine snperintendent in Ameriea think he is not thoronghly acquainted with his business. The reeords made iu some of the shafts of the Rand, where considerable over 200 feet of shaft has been completed in a single month in a number of instances, is a matter for consideration and compels the admiration of those in the mining west of the United States, where 150 feet of shaft per month is far beyond the average, but it must be remembered that the conditions are different on the Rand from those obtaining in America generally. The shafts where these nnusual feats have been accomplished are mostly vertical. The rock is firm quartzite, not very hard, bnt good standing ground for most part. The drilling is generally done by Kaffir "boys," who strike, as a rule, single hauded, and are placed on the bottom as thickly as they can possibly be situated aud work. They are from 50 to 200 feet below the timbers while sinking, and there are no delays on aecount of broken timber; there is usually little water to handle, and it would appear that generally they have every natnral advantage, aud few of the disadvantages of mines elsewhere. Under so favorable a set of conditions it is possible to accomplish what appears to be far in excess of the ordinary accomplishment of able men in other regions. In the metal mines of the West the miner has, as a rule, hard rock, a greater or less abnndance of water, too often a shaft too small to admit of the best results in the effort expended iu the work; timbers must be earried close to the bottom of the shaft which necessitates delay in repairing damages, or in taking the necessary precautions to prevent it. Still under these adverse eonditions excelleut work is often done under competent direction, and the fact that fewer feet of shaft are completed here than in South Africa is not an index of relative incapacity on the part of either manager or workmen. Some of the most difficnlt mining engineering problems have been solved in the opening of Ameriean mines.

The Outlook for Copper.

The producers of copper are looking hopefully, if not anxiously, for an increase in the price of the metal, but with no immediate prospect of an advance, unless the war which is now actually on in the Orient results in increasing the demand for copper and for lead also. While the great industrial activity of America and Europe and the development of Africa is calliug for constautly increasing amounts of copper, the priee remains nearly stationary, for the reason, prineipally, that the prodnction is iucreased as fast as the demand is created for the metal. Not only are uew copper mining enterprises frequently entering the competitive market with their product, but the larger and long established eoncerns are in mauy iustances increasing their output. Old machinery and methods are giving plaee to the new, with a view to increasing produetion at decreased eost. The result is natural—there is no shortage in the market, and there is not immediate promise that there will be, unless it be created by an unusual demand, sueh as war, and there is no assurance that such a demand would not be promptly met by the forced output thns stimulated under the inereased price of the metal. The newly reported combination between the Amalgamated Copper Company and the Rothschilds interests, if correct, has not made its influeuce felt in the copper market as yet. It is not improbable, however, that when this influence is noticeable, if at all, it will be for lower rather than higher copper, for there are still many important mines not as yet within the control of the new combination.

THE necessity for careful examination of every elass of rock eoming from a mine is again emphasized in the occurrence reported from the Eagle mine, near Lawson, Clear Creek county, Colo., where a few days since the manager decided to ship to a smelter a qnantity of ore regarded as worthless by some of the men and which was being thrown over the dump. The result, as reported, was $35 net per ton. This is not the first instauce on reeord where rock regarded as worthless has proven eventually to be the best ore in the mine.

CONCENTRATES.

TELLURIUM in copper has the same effect as sulphur in iron, "short."

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CYANIDE has no action or reaction on metallic gold in the absence of oxygen.

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THE rock specimens from Bisbee, Ariz., are: No. 1, the variety of silica known as chert. No. 2 is probably felsite; the green color is due to iron.

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THE exact amount of zinc consumption in gold precipitation in the cyanide process is not procurable, but it is believed the aggregate so used is not above 1000 tons annually.

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THE district of Alaska has no legislative powers, therefore the manner of locating and recording mining claims is governed solely by Federal statutes and local regulations.

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ONE POUND of silica in the blast furnace combines with lime, iron, etc., to form three pounds of slag. It is figured, theoretically, that it requires 0.87 pound of coke to smelt one pound of silica in the charge.

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THE rock specimens from Indio, Cal., are black obsidian—volcanic glass—and not anthracite coal. This glass occurs in abundance near Volcano Springs, below Salton, from which vicinity those specimens probably came.

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WHERE a cage is used in a shaft a bucket may be suspended beneath the cage for the purpose of sinking, and by using long shoes on the cage, which extend upward 18 or 20 feet, the cage may be safely lowered so that the bucket rests on the bottom.

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IT is stated (Bloxam's Chemistry, page 25, edition 1903) that even among solids the phenomenon of diffusion is not unknown; thus a piece of gold laid upon a piece of lead will gradually diffuse through the lead, but it is a process requiring years.

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PITCHBLENDE is not a "flinty" mineral. It is massive, and the specific gravity is often lower than in the other uranate minerals. It is usually accompanied by base mineral sulphides, is dark in color, with gravity of 6 to 6.5. It occurs at Basin, in La Sal mountains, Grand county, Colo.

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THE suction hose of a sinking pump should be secured with ropes in such a way that the vibration caused by the operation of the pump will not cut a hole through the hose by contact with the rocks. Neglect to take this precaution often results in cutting a hole through the hose in a few hours.

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THE phenomenal richness of the chloride ores of Fryer Hill, Leadville, Colo., found there in the early days of that camp, can only be explained on the theory of secondary enrichment, for throughout the Leadville district the oxidized surface ores were uniformly richer than the ores of the sulphide zone.

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SHAFT GUIDES should extend upward from the collar of the shaft at least as high as the shaft of the sheave wheel, so that in case of overwinding the safety clutches with which cages and skips are, or should be equipped, shall not spring outward in the event of the cable breaking, and fail to clutch the guides at all.

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AT Virginia City, Nevada, an attempt to work slimes from mill tailings proved so difficult that it was determined to work the croppings of a mine in a mill and mix the relatively coarse sands with the fine slimes. The result is said to have been satisfactory. The mine croppings in this case contained gold in excess of that in the slimes.

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A BODY of ore in a vein is called an "ore shoot," and a device for passing rock from an ore bin or pocket to a car or other receptacle is known as an "ore chute." The necessity for avoiding misunderstanding and for having means of distinguishing between the two words has made this acceptance and use of the two different terms.

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IT is always economy to cover a steam boiler no matter how cheap the fuel. A cover should be employed which is readily removable for the purpose of inspection of the boiler. There are many materials used for covering steam boilers and pipes, among them wood strips, hair felt, magnesia boiler covering, sawdust, plastor of paris, paper pulp, etc.

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THE quantity of iron required to precipitate a pound of copper from solutions containing the same in the form of sulphate is variable, depending upon the character of the iron and percentage of copper in the solution; but it may be safely said to always exceed the theoretical requirement. A greater or less amount of iron oxide is always present in the precipitate.

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ARSENIC OR ANTIMONY in the zinc used for precipitating gold from the cyanide solutions is detrimental, but the presence of a small amount of lead in the metal is said to act to an advantage as there is a certain electrolytic action induced. The amount of gold a given weight of zinc thread will precipitate in a given time depends upon the strength of the solution and its value in gold.

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AN unusual variety of minerals has been found in the granite dikes near Pala, San Diego county, Cal. Prominent among them are rubellite (pink tourmaline), lepidolite (lithia mica), various other varieties of tourmaline, mica, quartz, feldspars of several varieties, and the new mineral kunzite, a variety of spodumene which occurs in transparent crystals of hyacinth color.

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PYRRHOTITE is rarely employed in the manufacture of sulphuric acid, for the reason that pyrrhotite contains too low a percentage of sulphur—about 39.6. Pyrite or pyrite and chalcopyrite are generally used for this purpose. Pyrite contains 53.4% sulphur and chalcopyrite alone but 35%. Chalcopyrite is only used incidentally, when it chances to accompany pyrite.

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THE expedient of sinking through quicksands or soft, running, wet ground by means of freezing the ground is resorted to in extreme cases, where all other methods of making progress fail. A shaft may be sunk by means of a caisson-like structure, the sections being added at the top and forced downward, as the work of excavation proceeds below, by means of heavy weights or jack screws.

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THE only minerals thus far known which produce uranium in commercial quantities are pitchblende and carnotite. Most uranium minerals are of high specific gravity, and concentrate without great difficulty by the usual process of concentration. The disposition to overload concentrating machines with the use of too much water is often responsible for poor work in this direction.

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WHEN a current wheel is raising water to its full capacity it is being employed to the best advantage. The connection of the shaft of the wheel to a pump of any description would not give as satisfactory results, owing chiefly to friction. Such a wheel would not raise a larger volume of water to the same height as before, nor as much as before—though it might raise a smaller quantity to greater height.

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THE average prospector generally profits to a greater extent by the search for gold than in hunting for rare minerals like pitchblende or some of the other rare minerals. In the quest for these he is apt to overlook something of greater value, and that which is more readily converted into money. Oftentimes he is not well informed as to the physical appearance of rare minerals and generally knows little of their chemical reactions, and is unprepared to make tests.

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THE first tunnel to be driven under the Hudson river between New Jersey and New York City is nearly finished, there still remaining about 200 feet to be accomplished. The excavation is driven through solid, hard rock, soft rock, sand and silt. A second tunnel parallel with the first is well under way, having been begun in November, 1903. It is estimated that progress will be at the average rate of 30 feet per day. This tunnel has been advanced over 1300 feet within four months.

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ONLY the best quality of fibrous ashestos is suitable for weaving fabrics of this class of material, but ashestos of inferior quality may be used in making a felt-like cloth by admixture with other substances, which is also fireproof. Fine ashestos fibers become brittle after heating to a high temperature, and for this reason it is inexpedient to cleanse asbestos cloth by placing in a fire. The variety known as crysotile is the finest in fibre and flexibility. It is found in small veins traversing serpentine.

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THE rock specimens from Volcano, Cal., are, 1, granodiorite; 2, diorite; 3, amphiholite schist, probably the result of the alteration of the diorite. It may be from the vicinity of a fissure or a vein. There is no probability that in sinking in the granite the shaft will come into serpentine, or into black clay slate, unless either of these rocks are known to exist in the near vicinity, and to be dipping in the direction of the shaft. A gold-bearing vein can exist in either the grano-diorite, the diorite or between the two.

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IN the case of trespass and the removal of ore by another person than the owner, the United States Supreme Court said, in case of Woodenware Co. vs. the United States, "that in innocent or unintentional trespass the trespasser may deduct the cost of mining and raising to the surface; but if the invasion is willful, no such deduction can be made. Where ore has been mined and raised to the surface, and a demand is made for it and refused, the owner may recover the value in the condition it was at the time the demand was made."

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IT is claimed by J. Park, an English authority on cyaniding ores, that in the treatment of concentrates the best results are obtained when the pyrites and sand exist in the proportion of five to one. He further says that "pyritic concentrates may be leached by agitation with cyanide or by percolation, as with ordinary tailings. Both methods give satisfactory results." Experiments made in treating raw auriferous sulphides have demonstrated that fine grinding is indispensable to the successful treatment of raw sulphides. It has also been shown that some sulphides are much more amenable to the process than others.

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THE mineral specimens from Chaffee county, Colo., are: The rock, impure graphite; the fine material, impure graphite, probably same as the solid rock, but crushed by earth movements. Samples might be submitted to the Jos. Dixon Crucible Co. of Jersey City, N. J., for an opinion as to its commercial value. Under the pressure of moving rock masses coal is sometimes ground to powder and altered to graphite, but it is improbable that this occurrence is due to this cause, though the presence of so large an amount of carbon indicates the probable prior existence of abundant carbon in some form in the rocks.

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IN the electrolytic assay for copper, the presence of other metals interferes to a greater or less extent with the accuracy of results. If silver be present, it should be first removed by precipitating with hydrochloric acid. Bismuth, if present, is precipitated with the copper, and it must be determined analytically in the deposit. Lead, if present in the form of sulphate, is partly precipitated with the copper, but this mineral does not interfere with the process unless it be present in large amount. Zinc and nickel do not cause any trouble and may be disregarded. Arsenic precipitates partly with the copper and not after it. After complete deposition, the deposit should be titrated with cyanide of potassium.

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THE rock specimens from Encinitas, Cal., are essentially quartz, though altered from either granite or diorite. The quartz contains a large percentage—8% to 10%—of iron sulphide, with a small amount of copper sulphide. It may contain gold and silver. The ore should concentrate readily, and, if the values are in the sulphides, these should contain enough to pay to work. The first consideration is whether or not the ore as a whole contains sufficient value to pay for mining, crushing and concentration of the sulphides and the treatment of the latter. This can be determined by samples carefully taken and assayed by a competent person. A comprehensive knowledge of the cost of mining and treatment of ores is also essential in considering the question. As the iron is sulphide, it is not likely that any material change will take place in the manner of its occurrence, other than that of its appearance in the quartz in greater or less quantity than that found at the present depth.

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IT is known from experience that blasting the full round of holes simultaneously by electricity in shaft sinking does not produce as satisfactory results as when the "cut" is fired first, followed by the intermediate holes, the end holes being fired last. When the full round is fired by the electric spark the action is instantaneous. The usual result is, in hard ground, that the cut breaks well, the next line of holes fairly well, and often the end and corner holes do not break at all. Nitro powder is very powerful, but it must be given a chance, and situated as is the end line of holes and those adjoining them in a large shaft, it may be truly said the powder has no chance under such conditions. With the cut broken out and the intermediate line of holes following, the end holes should also break as the holes previously fired have created a "stope" for the end holes. There are cases where the entire round may be fired at once and the holes all break, but where this can be done the damage to timbers is usually severe if they be required close to the bottom.

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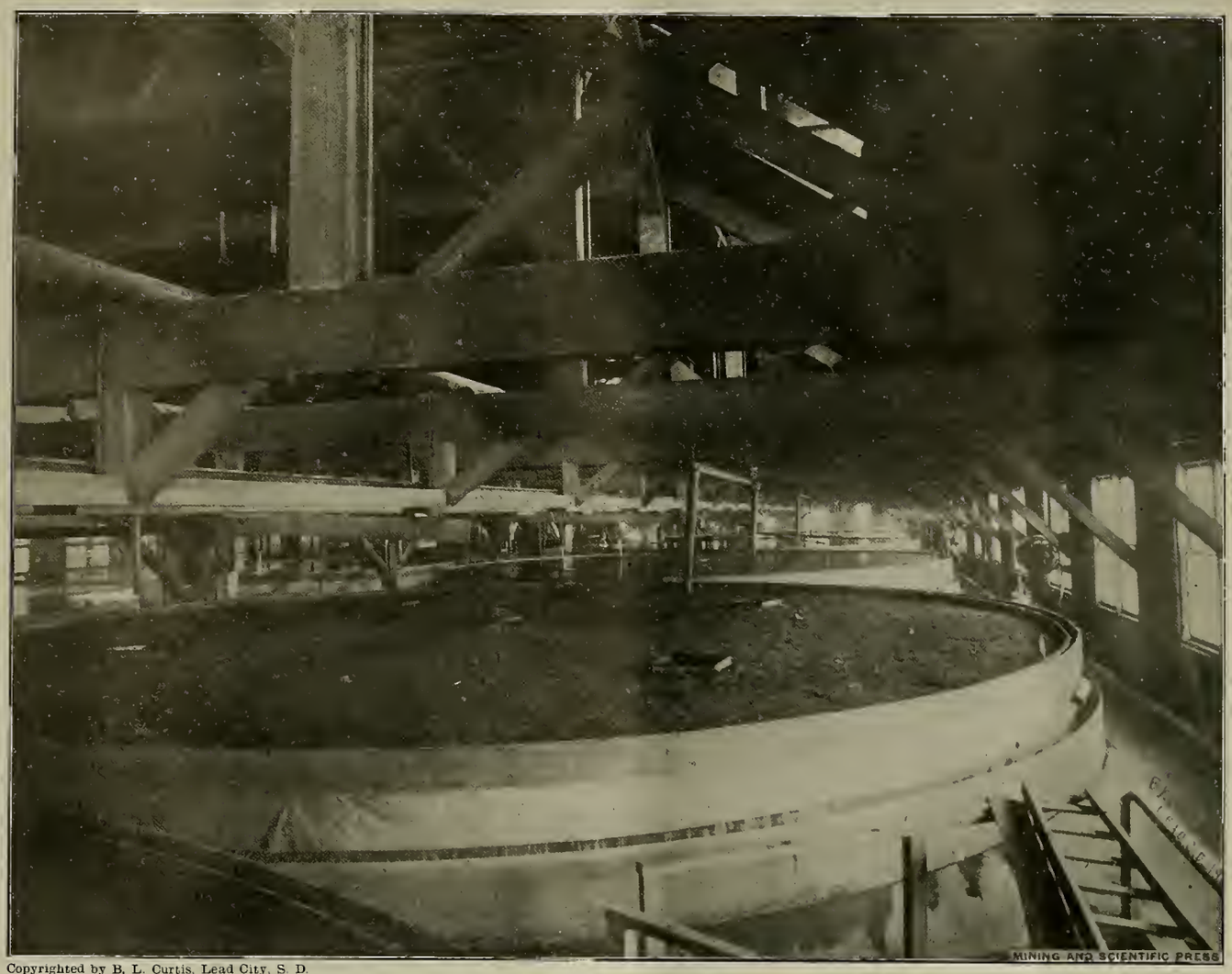
THE rock specimens and drillings from Virginia City, Mont., are: The rocks, basalt; the coarse material wrapped in separate paper is also basalt. Bottle No. 1 contains abundant quartz grains, and some feldspar; No. 2, a large amount of iron ore (limonite), colored quartz grains, transparent zonal feldspars, fragments of obsidian, opaque feldspars. Fragments of the several minerals are sub-angular. Contains less quartz than No. 1. This material evidently came from a layer of sand underneath the basalt, and is derived from an older rock. The fragments of obsidian may be accidental—coming from the upper portion of the bore hole. No. 3 consists of white, colorless and colored transparent quartz grains, and feldspar. Grains are mostly sub-angular. No. 4 contains quartz grains, feldspar and small amount of limonite. All of the sands from the four bottles are from rocks or beds of fragmental material older than the basalt flow. The fact that no gravel was encountered between the basalt and bedrock is not proof that there is no older gravel channel beneath the basalt. It may lie at one side or the other. The samples contain no mica or hornblende, which may indicate that the drill is in compact sand, and that bedrock has not yet been reached by the bore holes. Would suggest the advisability of sinking a little deeper to determine whether bedrock has been reached or not. If the limits of the basalt are defined by older rocks on either side of the gulch, then it would be advisable to bore additional holes at stated distances entirely across the lava flow in search of a possible older channel, as it is not necessary that the older channel be directly under the more recent one. If the lava flow is later than Tertiary there is a reasonable probability of the existence of an older channel beneath the lava. The ancient channels of California were formed in late Tertiary.



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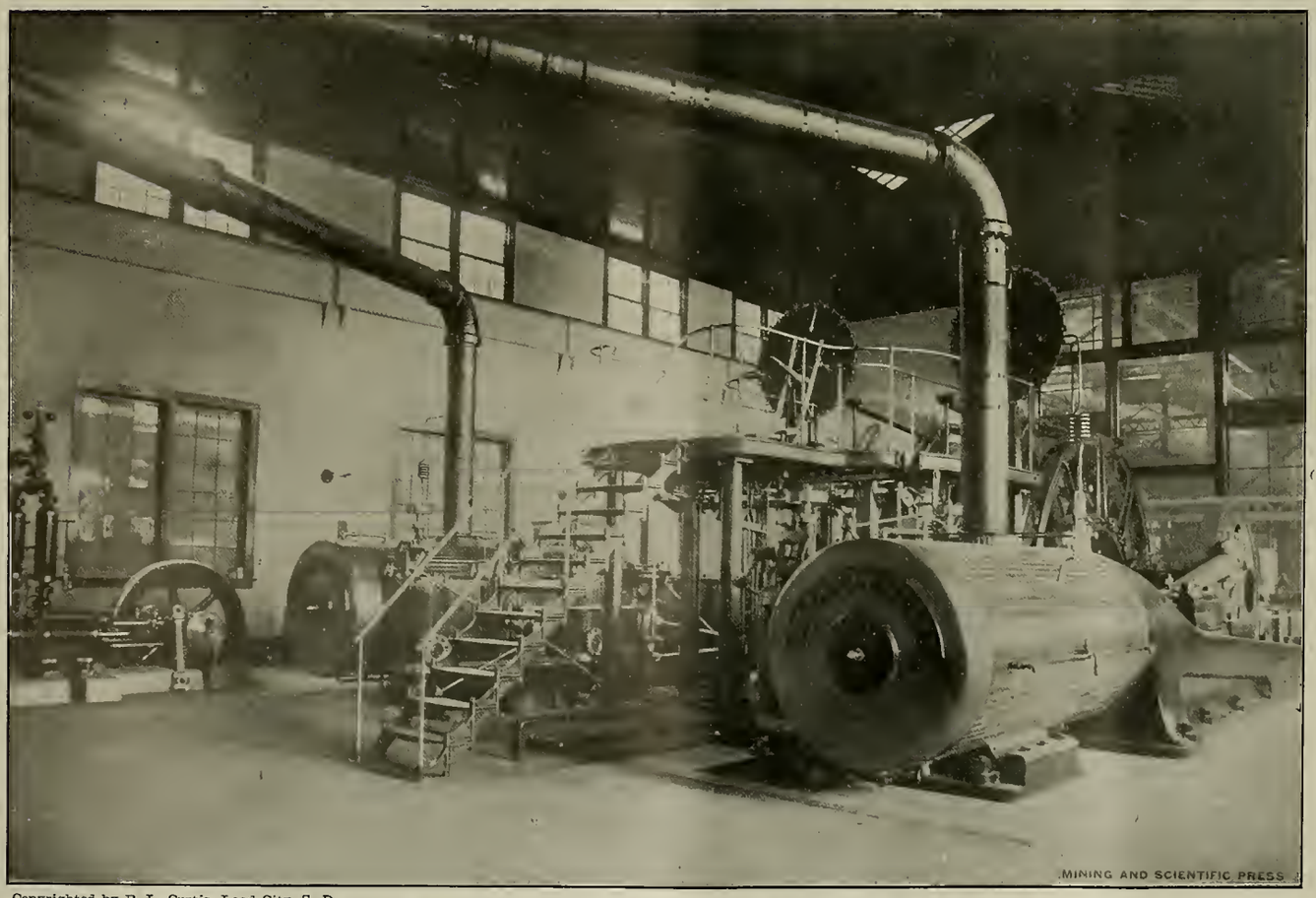
Interior of Cyanide Plant, Homestake Mine, Lead City, South Dakota. (See Next Page.)



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Hoisting Engines, Ellison Shaft, Homestake Mine, Lead City, South Dakota. (See Next Page.)

Some Features of Mining Operations in the Homestake Mine, Lead, South Dakota.

Written for the MINING AND SCIENTIFIC PRESS by
BRUCE C. YATES, E. M.*

The Homestake Mining Co., as it exists to-day, is a consolidation of the Father De Smet, the Deadwood-Terra, the Caledonia, the Highland and the Homestake gold mining companies. The property comprises some 350 locations with a total area of 2624 acres.

The ground upon which mining operations are being carried on at present lies between Deadwood gulch on the north and Whitewood gulch on the south, covering about 10,000 feet along the strike of the ledge. The principal works and the offices of the company are located almost in the heart of the town of Lead, which has a popoulatiou of about 8000. The town is built on either side of Gold Run gulch, which is a tributary of Whitewood gulch and which passes through the company's property from west to east a little south of the center. The strike of the Homestake ledge is approximately N. 35° W. and S. 35° E. The dip is very irregular.

The compauy is now operating 900 stamps and an additioual 100 stamps will be installed during the present year. The 900 stamps are grouped in six mills. The Homestake aud Golden Star with 200 stamps eaeh and the Amicus with 140 stamps are located on Gold Run gulch, the Pocahontas with 160 stamps and the Monroe with 100 stamps are located on Bobtail gulch, which is a tributary of Deadwood gulch. The Mineral Poiut mill with 100 stamps is located ou the south side of Deadwood gulch and near the uortherly end of the property. The tailings are treated at two cyanide plants. One with a capacity of 1450 tons per day is located on Gold Run below the Homestake, Golden Star and Amicus mills and treats the tailings from these mills. The other, with a daily capacity of 800 tons, is located on Deadwood gulch at the mouth of Bobtail and receives the tailings from the Pocahontas, Monroe and Mineral Point mills.

The ore is principally free milling, 72% being caught on the plates. The total recovery is approximately 88% of the assay value. (See paper on "Metallurgy of the Homestake Ore," by C. W. Merrill, Met. Eng., read before the American Mining Congress at its 1903 meeting iu Lead, S. D.*)

The main source of the water supply is the headwaters of Spearfish creek. A pumping plant consisting of two Fraser & Chalmers compound Corliss pumps, with a third now being installed, is located near the head of the East Fork. The water is pumped 400 feet to the top of the divide between Spearfish and Whitewood creeks, from which point it is carried by gravity to the main reservoir at Lead, some 10 miles in all.

A very small volume of water is pumped from the mine eonsidering that there are about 41 miles of track now open. The water was formerly taken care of by a Cornish pump, which lifted the water in three stages from the 800-foot level to the surface until about two years ago, when a Fraser & Chalmers compound Corliss pump with a capacity of 550 gallons per minute under a head of 1200 feet was installed on the 1100-foot level.

The underground haulage is done by horses and mules. The horses seem to be better adapted to the work than mules and in consequence there are very few mules left in the mine. The cost for horse haulage is $0.03 per ton per 1000 feet.

A five-ton air motor has been ordered and will be tried on one of the lower levels. If successful, these motors will, no doubt, take the place of horses on all main haulage ways. A fifteen-ton motor is now being used on the tramway level to haul ore from the crusher bins to the mills. The air is supplied at a pressure of 950 pounds by a 100 H. P. three-stage straight-line compressor which will serve both motors temporarily.

Following is a tabulated statement of the power required to carry on the different operations:

MACHINE DRILLS.

Manufacturer's Name.	Size.	No. in Use.	Purpose Used For.	Remarks.
Ingersoll	A-32-2¼-inch	48	Block holing	Six of the Ingersoll are used for Ajax drill sharpening machines and two are used for shop welding in car repair shops.
Ingersoll	B-32-2½-inch	12	Upper levels and surface	
Ingersoll	D-32-3½-inch	30	General mining	
Ingersoll	D-24-3-inch	148	General mining	
Rand	3½-inch	2	Shaft sinking	
Leyner	3-inch	3	Surface drifting	
McKiernan	3-inch	1	Shop hammer	

ELECTRIC MACHINERY.

Manufacturer's Name.	K. W. or H. P.	How Driven.	Where Used.
Edison	8½ K. W. generator	Connected to line shaft	Cyanide No. 2.
Westinghouse	22 K. W. generator	Conneeted to line shaft	Cyanide No. 1.
Edison	6 K. W. generator	Driven by 10 H. P. Ideal engine	Munroe mill.
Edison	2 (60) K. W. generator	175 H. P. upright engine	B. & M. shaft.
Gen. Elec. & C. & C.	2 (5) H. P. motors	Connected to mill shaft	Amicus mill.
Roth	2 H. P. motors		Homestake office.
Edison	2 (20) K. W. generators	Line shaft from engine	Golden Prospect shaft.
Edison	17½ K. W. generators	25 H. P. Ideal engine	Mineral Point mill.
Brush	4½ K. W. generators	Connected to mill engine	Pocahontas mill.
Gen. Elec.	4½ K. W. generators	10 H. P. Ideal engine	Pump station.

HOISTING ENGINES.

Manufacturer's Name.	Kind of Engine.	H. P.	Where Used.	Remarks.
Union Iron Works	Simple duplex	1,200	Ellison hoist	
Fraser & Chalmers	Simple geared duplex	150	Golden Star hoist	
Fraser & Chalmers	Simple duplex	400	B. & M. hoist	
Fraser & Chalmers	Simple duplex	500	Golden Prospect hoist	
Fraser & Chalmers	Simple geared duplex	150	Old Brig	
Fraser & Chalmers	Simple geared duplex	150	Golden Gate	

CRUSHER ENGINES.

Fraser & Chalmers	Compound Corliss	250	Ellison hoist	
Fraser & Chalmers	Simple Corliss	250	B. & M. hoist	
Fraser & Chalmers	Simple engine	200	Golden Prospect	
	Simple engine	100	Old Brig	
Fraser & Chalmers	Simple engine	200	Golden Gate	

MILL ENGINES.

Geo. H. Corliss	Cross compound	500	Homestake mill	
Geo. H. Corliss	Tandem compound	500	Golden Star mill	
H. Corliss	Simple Corliss	350	Amicus mill	
Fraser & Chalmers	Simple Corliss	350	Pocahontas mill	
Union Iron Works	Two simple engines	125	Monroe mill	Each 125 H. P.
Union Iron Works	Simple engine	250	Mineral Point	

AIR COMPRESSORS.

Ingersoll-Sergeant	2-stage compound Corliss	1,000	Ellison hoist	Low pressure.
Ingersoll-Sergeant	3-stage straight line	100	Ellison hoist	High pressure.
Ingersoll-Sergeant	Duplex	500	B. & M. hoist	Low pressure.
Ingersoll-Sergeant	Duplex	300	Golden Prospect hoist	Low pressure.
Ingersoll-Sergeant	Single engine	100	Cyanide No. 1	Low pressure.
Ingersoll-Sergeant	Single engine	100	Cyanide No. 2	Low pressure.

PUMPS.

Fraser & Chalmers	Compound Corliss	250	Mine—1100 feet	
Fraser & Chalmers	Two compound Corliss	325	Spearfish creek	Each 325 H. P.
One Holly, two Dean	Compound Corliss	50	Settling dam	Each 50 H. P.
Fraser & Chalmers	Simple Corliss	250	B. & M. shaft	Cornish.
Three Prescotts	Compound	40	Cyanide No. 1	Each 40 H. P.
Two Heisler	Triple expansion	40	Cyanide No. 2	Each 40 H. P.

MISCELLANEOUS.

Kind of Engine.	H. P.	Where Used.	Remarks.
Simple engine	25	Ellison shaft	Sinking engine.
Simple engine	30	Amicus mill	Derrick.
Simple engine	100	Machine shop	
Simple engine	25	Pump station	Rock crusher.

In this paper no attempt will be made to give more than a few facts in regard to the mining operations of the Homestake miue, and much of the matter contained herein may sound commonplace to many experienced mining men. If any of the methods described are original, it should be borne in mind that they have stood the test of actual miuing operations in a mine where a large daily tonnage at a minimum cost is the object aimed at.

The illustration on the front page is that of some of the company's buildings and part of the open cut at Lead. The aecompanying engravings are views of the Ellison hoisting engine and the sand vats of cyanide plant No. 1.

SHAFTS.—The Homestake Mining Co. is now operating six shafts, the Ellison, B. & M., Golden Star, Golden Prospect, Old Brig and Golden Gate. Three of these, the Goldeu Gate, Old Brig and Golden Prospect, have reached the 800-foot level, while the Ellison, B. & M. and Golden Star have reached the 1100-foot level.

Four of these shafts are located on the hanging wall side of the ledge, one on the foot wall side and one is sunk in the ledge. All are conneeted by permanent drifts driven in the "country" rock.

The Ellison is a large, three-compartment shaft; two compartments beiug used for hoisting and one for ladders and pipes. The two hoisting compartments are 10 feet by 5 feet in the clear. The third or ladder compartmeut is 10 feet by 6 feet in the clear. The Golden Star and Old Brig each have three equal compartments 4 feet 6 inches by 5 feet in the clear. The B. & M. is similar, with the exception that there is a fourth compartment reaching the 300-foot level, in which is operated a third cage. The Golden Prospect originally had only two compartmeuts, one being 9 feet 6 inches by 5 feet in the clear and the other being 4 iuches wider to provide for pipes. Later a third small compartment was added from the 500-foot to the 800-foot levels, in which are plaeed the ladders and pipes. The timbering in the Golden Gate shaft is slightly different from the other standard three-compartment shafts, but the dimensions are the same.

After the first 200 feet from the surface, the shafts, with the exception of the Golden Star, are sunk in a hard carbonaceous wall slate. The dip of the slate intersects the axis of the shafts at angles varying from 60° to 90° from the horizontal, which makes blasting the cut quite difficult.

During the early history of the Homestake and associated mining companies these shafts were not connected by underground workings. Each is now a factor in the mining operations of the compauy and through each is carried on some part of the work incident to the mining of about 4000 tons of ore each twenty-four hours.

When sinking is resumed in auy of these shafts, it is necessary to provide hoisting facilities to carry on this part of the work independeut of the regular cages. This is accomplished by using a small 25 H. P. hoisting engine, driven by compressed air, which is placed on the lowest working level of the shaft. In the operation of this engine it has been found necessary to reheat the air before it is used in the cylinder, and this is done by passing the air through several coils of pipe surrounding a small sheet iron stove, heated by coke. A bucket with a capacity of one-half ton is used instead of a cage to hoist the rock and men. No guide head is used, plank being nailed on the inside of the timbers to prevent the bucket striking on the timbers. A small sheave wheel is placed just above the station set.

The men are well protected by bulkheads thrown across the shaft just above the sheave wheel or below the station on which the engine is located. The shaft is sunk 200 or 300 feet in this manner. Stations are opened on the new levels and crosscutting is commenced. Drifts are run to other shafts of the belt, which are tapped by small raises. These raises serve the double purpose of providing ventilation and acting as a chute through which the rock is dumped as the sides are stripped down to make room for the regular shaft timbers.

Miners working in the shaft are usually under contract. The engineers, landers to dump the rock from the bucket into the cars and timbermen are paid by the day. The company furnishes tools and sharpens drills, the coutractors furnish candles, powder and pay for repairs on machines and assist in placing timbers.

The following statement shows the number of men employed in sinking at the Ellison shaft: The number of men employed on each shift is four miners (contractors), one engineer, one lander, one timberman, one carpenter two and one-half shifts, framing one set of timbers, which provides for 6 feet of the shaft.

The actual time consumed in placing one set of timbers is eight hours, but the timbermen are kept busy one shift in each twenty-four hours, running timber from the sawmill and putting in extra bracing.

(TO BE CONTINUED.)

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*Puhlished in the MINING AND SCIENTIFIC PRESS, Oct. 3, '03, et seq.

A Correction.

TO THE EDITOR:—I find in the article on "Automatic Ore Sampling," in your issue of January 30th, page 79, five lines from bottom of first column, I have used the words "cut down to the desired size by the riffles before going to the riffles," it was iutended to be—"cut down to the desired size by the riffles before going to the sample grinders."

Denver, Colo., Feb. 6. ALFRED HARVEY.

THE fact that a series of metamorphic rocks—schists or slates—are cut by intrusive dikes does not signify that the metamorphosed rocks were of igneous origin, for dikes cut metamorphic rocks which have had fragmental origin.

Tenth Annual Report of the Portland Gold Mining Co., Cripple Creek, Colo.

In the tenth annual report of The Portland G. M. Co. of Cripple Creek, Colo., for the year 1903, President J. F. Burns states that they have opened up twenty-three new ore bodies during the three months prior to Jannary 1, 1904, and have placed more ore in sight dnring that period than was taken out in six times that length of time.

Dnriug the year 1903 the company pnmped no water and the lower level of the mine is practically dry. It has been demonstrated that the Portland is not within the zone drained by the El Paso tunnel, as the drainage through the tunnel has not affected the property.

During the past year the development has kept ahead of the production, and a littlc more than 4 miles of crosscuts, drifts, etc., were made during the year, making a total in all, up to January 1, 1904, of close to 27 miles of underground workings.

For the month of November, 1903, 2717 feet of development work were done, which was the highest in the history of the company, aud other records have been broken, both as regards production and cost.

During a shnt-down of abont ten days during the strike a general clean-up at the mill took place.

It was stated in the eighth annnal report that "there was an intricate network of veins within the company's territory that are yet unexplored, but which will be intersected in exteuding onr present workings on the various levels." The recent development work in exploiting these veins has more than fulfilled the predictions.

A large number of the new strikes referred to have been made iu these veins and in nnexplored territory, resulting in increased ore reserves.

The treasurer's balance sheet shows the following:

MILL DEPARTMENT—CLOSE OF BUSINESS FOR THE YEAR 1903.

Portland G. M. Co.		$ 223,056.62
Ore account	$2,756,845.42	
Treatment charges		770,293.37
Bullion account		2,240,885.27
Bullion treatment	5,313.92	
Concentrates		121,472.98
Concentrates treatment	14,343.97	
Collective insurance	225.15	
Operating	188,413.75	
Chemicals	98,696.66	
Assay office	5,690.41	
Storehouse	89,505.27	
Residuum	64,641.52	
Coal	27,824.56	
Electric power	33,172.54	
General expense	16,004.74	
Legal expense	13,240 87	
Office expense	1,162.44	
Office fixtures	865.33	
Repairs	18,434.90	
Equipment	11,251.02	
Oil well	22,489.20	
Interest		1,338.72
By-products		35,204.15
By-products treatment	12,035.50	
Construction	12,091.58	
Freight		5.54
Portland G. M. Co. sundries account	7.80	
Totals	$3,392,256.65	$3,392,256.65

PRODUCTION.

Month.	Net Tons.	Ounces, Gold.	Gross Value.
January	6,998.857	10,500.141	$ 211,002.82
February	7,483.522	11,515.795	230,315.90
March	8,105.718	13,469.914	269,398.27
April	7,287.541	10,477.816	209,556.33
May	8,069.982	13,239.774	264,795.49
June	6,893.085	10,424.319	208,486.37
July	8,582.832	11,201.294	224,025.88
August	4,179.934	4,829.825	96,596.51
September	7,105.790	9,854.226	197,084.51
October	7,418.220	10,571.261	211,425.23
November	7,772.505	10,232.253	204,645.06
Decemher	10,346.596	14,083.061	281,661.22
Totals	90,244.582	130,399.679	$2,608,993.59

Month.	Treatment Charges.	Freight Charges.	Net Proceeds.
January	$ 58,895.83	.....	$ 152,106.99
February	53,063.71	.....	177,252.19
March	68,525.33	.....	200,872.94
April	55,583.50	.....	153,972.83
May	60,844.59	446.40	203,504.50
June	49,439.80	759.82	158,286.75
July	60,325.85	.....	163,700.03
August	26,785.08	.....	69,811.43
September	46,734.18	.....	150,350.33
October	53,276.61	169.52	157,979.10
November	55,433.13	435.76	148,776.17
Decemher	78,696.94	433.71	202,530.57
Totals	$667,604.55	$2,245.21	$1,939,143.83

From April 1, 1894, to Dec. 31, 1903, the Portland mine produced 465,741.134 tons of ore, worth $18,081,542.72.

The report of F. M. Kurie, assistant general manager, gives the following tables of costs for development work and stoping for the year 1903, which is the lowest in the history of the company:

	19,808 Feet. Cost per Foot Drifts and Crosscuts.	1451 Feet. Cost per Foot Raises and Winzes.	Cost per Ton Stoping.
Breaking—			
Machinemen & miners	$1.969	$3.458	$0.369
Shovelers	.038	.193	.218
Air and air drills	1.049	2.02	.179
Explosives	1.444—$4.50	1.617—$ 7.288	.139—$0.905
Tramming—			
Trammers	.966	.883	.175
Pipe and trackmen	.124	.009	.008
Gen. tramming expense	.098— 1.188	.103— 1.055	.034— .217
Timbering—			
Timbermen	.029	1.503	.215
Lumber and timbers	.017— .046	.947— 2.45	.310— .525
Hoisting	.583	.604	.254
General expense	.70	.735	.291
Total average cost	$7.017	$12.132	$2.192

DECEMBER COSTS—THE LOWEST FOR THE YEAR 1903.

	Cost per Foot Drifts and Crosscuts.	Cost per Foot Raises and Winzes.	Cost per Ton Stoping.
Breaking—			
Machinemen & miners	$1.841	$3.958	$0.341
Shovelers	.....	.....	.202
Air and drills	.866	1.326	.159
Explosives	1.307—$4.014	1.201—$ 6.485	.125—$0.827
Tramming—			
Trammers	.884	1.077	.152
Track and pipemen	.105	.029	.008
Gen. tramming expense	.038— 1.027	.129— 1.235	.014— .174
Timbering—			
Timbermen	.....	1.363	.15
Lumber and timber	.008	.679— 2.042	.225— .375
Hoisting	.473	.828	.208
General expense	.578	.906	.246
Average cost	$6.10	$11.496	$1.83

The pumps were not run during the year. No trouble of any kind was experienced with water.

Metallurgical Practice on the Witwatersrand, S. A.*

Discussing a paper ou metallurgical practice on the Rand, South Africa, by H. S. Denny, J. R. Williams says:

SORTING.—As I am certain that others who have gone carefully into this question, which is of the greatest importance, will deal fully with it, I will content myself with the remark that I take exception to an extraction of only "80% from all sonrces." Thus, if, for instance, you take the case of a mine where an extraction of 60% is obtaiued in the mill (of which we have several examples), to obtain 80% the secondary treatment plant only calls for an extraction of 50%. Surely, Mr. Denny will admit that he is not satisfied with 50% extraction from his cyanide plants. If 90% extraction from all sonrces is taken (this was about the average of the Rand mines subsidiary companies when in full swing before the war), Mr. Denny will find it necessary to considerably modify his figures.

MILLING.—The anthor questions the jndgment of the various managements in the nse of screens, and wonld make us believe that from the Robinson to the Heriot the same screen should be used. Mr. Denny states "there is no special differentiation, so far as the writer is aware, which, from a metallurgical standpoint, can be claimed as determining a necessity for a variation in mesh from 400 to 600." As I have the honor to be consulting metallurgist to ten compauies in this area, for Mr. Denny's information I will state that actual practice has shown us that there is every difference. As a case in point, when the Nourse Deep commenced crushing, because a 700 screen was found advantageous to the other deeps, the same screen was tried, with the result that very high residnes were obtained. Examinatiou of these residues showed that the gold was encased, but the nse of au 800 screen at once gave an increased percentage by amalgamation, and the cyanide works residues were reduced by more than a pennyweight in value. At the Ferreira Deep exhanstive experiments proved that it was absolntely necessary to use a 1000 screen. A 1200 screen was also tried, but it was fonnd that the nse of the 1000 screen was the most profitable.

Mr. Denny contradicts his own statemeuts. He says: "Although the banket ores of the Witwatersrand main reef series may be jnstly described as being remarkably uniform in mineralogical character, there are physical variations in their coustitntion that are of considerable metallurgical interest, these having a marked influence on their amenability to different methods of treatment," and fnrther says, "it is clear that in consequencc of these differences the treatment at one mine may vary considerably from that at another." May not finer crushing be one of the necessary variations? I think so and am pleased to find that Mr. Denny and myself agree. He states: "We have the cyanide process, which, in some cases, on a charge containing about 20% of concentrates, will, given a long treatment, show an extraction of 90%, bnt in others the latter figure does not reach 50%. Even in those cases where it is claimed that the process is doing satisfactory work the expeuditnre, when taken with the valne of the residnes calculated npon a comparatively clean concentrate, represents an amount in the matter of costs which certainly admits of considerable improvement," and he also forcibly shows that with finer grinding a high extraction can be obtained even in those ores of apparently a refractory natnre. I am certain that, from an extraction point, Mr. Denny will attain every snccess by his proposed system of regriuding.

AMALGAMATION.—Mr. Denny gives us what he calls a curions fact, that the extraction by amalgamation decreases from west to east. I should like some figures to substantiate this statement, and would bring to his notice that for the twenty odd companies with which I am connected the highest extraction by amalgamation is obtained on the Ferreira Deep, about the center of the Rand; that for a year before the war, the New Modderfontein, our most eastern company, gave 60.5%, while the French Rand G. M. Co., the most western of our group, gave 53.67%.

I do not nnderstand the paragraph referring to the use of lime. Does Mr. Denny want to take credit for the use of lime in the mill? I may say that as far back as 1871 R. W. Raymond in his work, "Mining Statistics West of the Rocky Mountains," makes the following remarks: "The worst form of discoloration of plates proceeds from the action of sulphates of iron or copper present in many ores, from the natural decomposition of the pyrites. The addition of lime to the water introduced to the battery, as much as will dissolve therein, will nentralize the carbonic acid and decompose the sulphates. It may be found necessary to add lime to the ore to furnish enough to react on all the sulphates," and, further on, in the stock of individnal chemicals which should be kept iu the mill, "caustic or nnslaked lime" is mentioned among others; and in a paper read by myself before this Society in April, 1899, on "The Indirect Advantages of a Slimes Plant," I gave figures showing the increase in amalgamation, as well as the saving in water.

The writer pnts down the amount of mercnry lost per ton milled at 1.3 ounce. If this is really so, and it is not an error in the decimal place, all I can say is that it denotes bad work. Ou 6000 stamps this will work ont at 2430 ponnds per day, or over 400 tons per annum. The average for the snbsidiary companies of the Rand Miues, Ltd., from January to August this year was 0.129 ounce per ton, and to show what can be done with careful outside amalgamation, I would like to place on record that Mr. Bevington, at the Village Main Reef G. M. Co., does not exceed 0.07 ounce per ton.

Mr. Denny again contradicts himself in saying: "It is obviously to the great advantage of the mines to secure from their mills a maximum crnshing efficiency—since it is only as a crnshing medium that stamps are regarded—in order to economize on capital expenditnre for plant, for bin provision, buildings, etc." Elsewhere he says: "Our most simple process is, therefore, responsible for two-thirds of our gross revenue, and as all our snbsequent operations are expensive, and are only moderately efficient, it is of the utmost importance to do everything possible to keep our amalgamation practice at its greatest efficiency. Every pennyweight of gold that passes over the plates only yields, on an average, 80% to 85% in our subsequent operations, and carelessness in amalgamation thus results in heavy loss." Which are we to accept? I should undoubtedly say the latter.

CONCENTRATION.—I fail to find anything new on concentration not covered by the concentrates committee and reported by the Chamber of Mines in their "Aunual Report for 1894," but I take exception to his taking one company as showiug what extractions can be obtained from spitzlntte prodnct. If Mr. Denny will take the case of the adjoining company he will find that the extraction ou this product amounts to 89.61% for the year ended August 31, 1903, and that the average of the Rand mines subsidiary companies is not less than 85%; thus it will be necessary for him to modify his figures. Residnes of 3.160 pennyweights do not in any way represent the average work of the Rand.

Mr. Denny gives the constituents and values of ore after passing amalgam tables, and shows ns that: 35.6% of sulphurets extracted by vanners contain 82.9% of the gold; 51.4% of sulphurets in sands contain 15.3% of the gold; 13.0% of sulphurets in slimes contain 1.8% of the gold; which is, without question, a remarkable analysis, and different to anythiug in my own experience. I wrote to Mr. Denny asking him to let me have a sample of the tailings after passing the New Goch frne vanners, with which he furnished me. On this sample I carefully experimeuted, with the result that on grinding to pass a No. 30 mesh (900 screen), the sulphurets caught by ordinary panning assayed over twelve ounces to the ton, and not 21.9 pennyweights as shown by Mr. Denny, that using the well-known method of separation by specific gravity with a solntion of iodide of mercnry, the sulphurets obtained assayed over twenty ounces to the ton, and that the sands now freed from their free gold and sulphurets had a valne of under 1 pennyweight to the ton, and not 3.35 pennyweights as stated by the author, so I fear that his figures may not be taken as reliable.

*Abstract Jour. Chem., Met. and Min. Soc.

Electrical Smelting of Iron Ore.

Smelting iron ore by means of electricity has been successfully accomplished in several countries in Europe, namely, in France, Italy and Sweden, and also to a limited extent in the United States, says Electricity.

The Ottawa Government is now looking into the feasibility of this process of redncing ore with a view to its introduction in Ontario and Quebec.

In his recent presidential address before the Canadian Institute of Electrical Engineering, R. R. Gray, the president of that body, made the following reference to the electrical reduction of iron ores: "Another valnable process, which has made considerable progress during the past year, is the reduction of iron ores by means of the electric furnace. At Livet, in France, the process is in practical operation, generators of 1200 H. P., each giving single-phase currents at 30,000 amperes being employed. The ontput is twelve tons of steel per day. At these works ferro-silicon is also made from quartz, scrap iron and coke, at less cost than that of

smelting, and copper pyrites is reduced to copper and iron sulphides rich in copper and ready for the smelting process. Steel of high quality is similarly produced in Sweden at the rate of 1500 tons per annum. With the Stassue process, the expenditure of energy is said to be 3000 H. P. per ton of iron."

The Ottawa Government is now examining into the electrical process of smelting iron because in certain localities of Ontario and Quebec there exist extensive iron ore deposits which cannot be successfully worked owing to a lack of adjacent or available coal supplies. It is thought that if the energy now wasted in many waterfalls throughout the interior of the country can be used economically in smelting the ore it will open up a splendid field for profitable enterprise. Such should be the case providing the water power it is proposed to utilize is not too far distant from the ore deposits. At the present time, however, the test of profitable operation will be severe, owing to the low price of iron and steel.

Volcanic Ash in South Dakota.

To the Editor:—The occurrence of a material, usually called white sand, but really a volcanic ash, was located some years ago in the southwestern part of Custer county, S. D., and its value in the arts and manufactures has only recently been discovered. The property consists of 640 acres and is situated near the station of Argyle, on the B. & M. R. R., and 20 miles south from Custer. The material is siliceous and its color almost pure white. The deposit is located in what appears to have been a basin or lake. It is 4 miles distant from the limestone range in a southerly direction and is in the Tertiary formation.

This ash is said to have qualities similar to pumice stone, but does not possess the cellular structure, owing to the manner of its formation and deposition. It is supposed that the material, when molten, was accompanied by steam or other gases at the time of its ejection and that the bubbles formed in it burst, pulverizing the walls of the cells into very small particles, and these were deposited in the basin or lake. This layer of ash is overlaid by a deposit of fuller's earth and rests on a bed of hard, yellow, siliceous clay. This ashy material is used, like pulverized pumice, for a polishing powder and in the manufacture of scouring soap, and it is utilized in a compound for brightening brass, nickel and other metallic surfaces. It is in good demand and a ready market is found in the Eastern States. It is being shipped at the rate of fifty tons a month, with promise of an increase.

The development work applied upon the ground thus far shows the deposit to have reached a thickness of 6 feet, and is still increasing in thickness as work advances toward the basin of the dry lake.

W. H. Darton of the U. S Geological Survey says regarding the origin of this material:

"During the White River time (Tertiary) in the Black Hills and adjoining regions there was deposition of a considerable volume of volcanic ash. It appears to have been a period of volcanic activity in the region to the west, and the ashes were borne on the winds and dropped into the waters, so as to be deposited over a wide area of country adjoining the Black Hills. There is more or less volcanic ash throughout the White river deposits as an admixture with the clay and sand; accumulations of the pure material are often found at various horizons from the lower Chadron beds to the highest formation in Pine Ridge. In the Chadron formation the ash occurs in local lenses and is a general admixture. The most notable occurrence is in the fuller's earth deposit southwest of Argyle, where there is a bed of relatively pure ash having a thickness of 3 feet. Its composition is given in the following analysis made by George Steiger in the laboratory of the U. S. Geological Survey: Silica, 64.47; alumina, 14.74; iron (FeO_3), 2.73; iron protoxide, 0.78; magnesia, 0.29; lime, 4; soda, 2.55; potash, 3.31; BaO, 0.13; TiO_2, 0.76; P_2O_5, 0.29; H_2O, 5.71; total, 99.76. Its local extent could not be determined, owing to lack of exposure. The material consists of fine shreds of volcanic glass or pumice, mainly of pure white color and translucent, mixed with occasional flakes of dark-colored glassy material. It represents a rock of rhyolitic character."

This property is in charge of the writer.

Custer, S. D., Jan. 28. Denis Henault.

Phosphorescent Sphalerite.

To the Editor:—Referring to the interesting article by Mr. Eakle on the subject of "Phosphorescent Sphalerite" in your issue of January 23, I would like to note the occurrence of phosphorescent sphalerite in botryoidal masses, sometimes 1 foot in diameter, in the caves of the surface of the National Belle mine at Red Mountain, Ouray county, Colorado. The structure was radiated, and these "nodules" had been originally attached at some one point to the side of the cave. Often nearly concentric layers were visible. In opening the mine in 1885 I often encountered them. United States Geological Survey Bulletin No. 182 gives a description of this property.

Denver, Colo., Feb. 6. T. E. Sohwarz.

Water Hoisting in Mines.*

G. A. Burr, of Chihuahua, Mex., in discussing the paper of R. V. Norris in Transactions American Institute Mining Engineers on "Water Hoisting in the Pennsylvania Anthracite Region," and an abstract of which appeared in the Mining and Scientific Press, April 25 and May 2, 1903, says:

I regret that Mr. Norris did not give more attention to the hoisting of water in inclined shafts or slopes, the only slope mentioned being Hickory Ridge slope, No. 4, of the Union Coal Co. The surface arrangement, illustrated in the accompanying

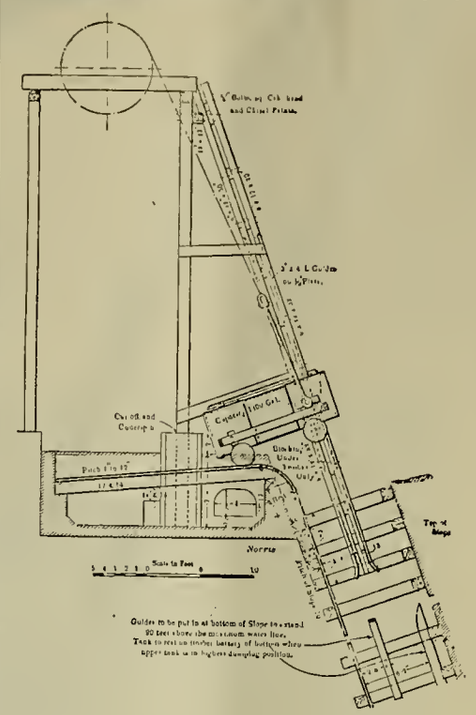


Fig. 1.

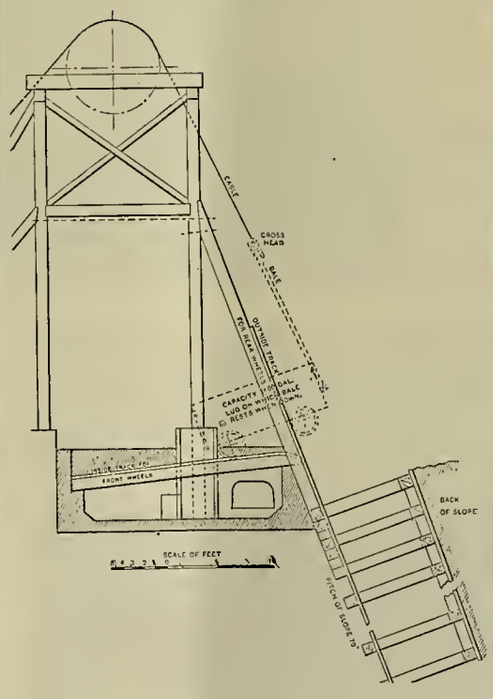


Fig. 2.

figure of his paper (Fig. 1), if not unpractical, is at least unscientific and cumbersome. It is my opinion that the back and side guides shown in this figure are not only unnecessary where rails are used as a track, but are unsafe, excepting in the case of a very firm hanging wall, or roof and sides of vein matter, having absolutely no tendency either to settle from the back or to squeeze from the sides, an effect which would inevitably force the guides out of alignment.

The accompanying illustration, Fig. 2, shows what I consider a better method of hoisting water than that described by Mr. Norris. This method is based on the general practice in metalliferous mines of the West, where skips are used in slopes; and, while it is not original with me, I have frequently used it with very satisfactory results for dumping both ore and water.

A special point to be observed is, as the stope approaches the vertical position, either the skip should be lengthened in order to have the center of gravity nearer the forward wheels, or the box should be depressed by raising the axles to its sides (instead of placing them underneath), in order to have the center of gravity nearer the rails, and thus avoid the danger of having the front wheels lift from the rails, which would result in derailing the skip.

I have been interested in Mr. Norris's paper on account of my experience in hoisting water in metalliferous mines, where the usually limited shaft area frequently precludes the hoisting of a sufficient number of sinker pumps to hoist the water.

The difficulty of solving this problem increases with the recession of the water level from the place of water discharge, and the consequent greater lift and increased duty required of the pumps. The use of tanks, or bailers, appears to me to afford a very practical solution of the problem, especially in cases where all of the pumps, including the "sinkers," have been drowned. Here the tanks can be swung into the hoisting compartments, the level of the water lowered, and the pumps recovered (provided, of course, that the tanks and the engines operating them are of sufficient capacity) without the inconvenience attending the tedious method of lowering steam and water columns, length by length, or of breaking joints and lowering the pumps.

For this method of hoisting water, where steam is used, it is needless to say that quick, direct-acting hoists, in competent hands, possess great advantages over those of the geared type.

*Trans. Amer. Inst. Min. Engrs.

Lead Bounty in Canada.

The regulations approved by the council governing the payment of the bounty on lead contained in lead-bearing ores mined in Canada are published in the Canada Gazette as follows:

That all producers of lead-bearing ores who desire to avail themselves of the bounty must notify the minister of their intention to make a claim under the Act, declaring the name of the mine producing the ore, its situation, and the names of the president, secretary and manager, as well as the name of the official authorized to make the claim.

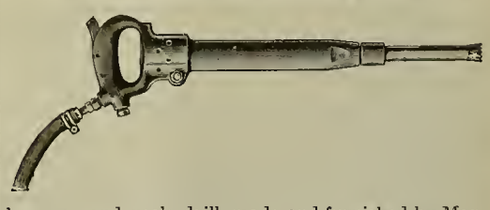
All claims must be substantiated on the oath of the manager of the mine. They may be made monthly, but no claim will be recognized unless in conformity with these regulations.

The smelting of all lead-bearing ores on which a claim for bounty is to be made shall be at all times under the supervision of an officer of the Department of Trade and Commerce, and this officer may at any time demand a floor sample of any ore delivered at the smelter for smelting purposes.

The books of any mining company coming under the Act are to be open at all times to the inspection of a supervising officer. The cost of such supervision is to be paid by the claimants and will be deducted pro rata from the bounty, according to the quantity smelted during the fiscal year.

Air Hammer Rock Drill.

Herewith is illustrated the "Little Wonder" air



hammer and rock drill, made and furnished by Martin Hardsoeg, Ottumwa, Iowa, who states that this machine drills a hole ⅞ or 1 inch 4 feet deep, and that "it will drill from 3 inches to 4 inches in quartz or granite, 6 inches to 8 inches in limestone, and 8 inches to 10 inches in sandstone or marble, in one minute." The machine weighs 17 pounds, and is stated to strike 2000 blows per minute. To operate it requires 14 cubic feet of air per minute at a pressure of from 80 to 100 pounds. As will be observed, it needs no column or tripod, but can be held in any position. Full detailed information will be furnished upon application to the manufacturer.

Phosphorescent Sphalerite.

To the Editor:—In your issue of January 23rd there is an article headed "Phosphoreseent Sphalerite," in the concluding part of which it is stated that phosphorescent sphalerite has seemingly been unobserved in this country.

About fourteen years ago I was examining a sample of ore from a lode in Graham county, Arizona. The character of the gangue I do not distinctly remember, but through it was thickly disseminated in fine grains a dark mineral that, so far as the unaided eye went, might be zinc blende or might be galena.

To determine the matter by streak I ran a knife

blade over the surface, and was surprised to see a vivid emanation of pale yellow light—and this in daylight—follow closely the path of the knife blade. Since that time I have scratched many samples carrying zinc blende, but have never met with another displaying this property of phosphorescence.

N. H. MELLOR.

Dudleyville, Arizona, Jan. 30.

Working Low-Lying Gravel Deposits by the Hydraulic Elevator System.

Written for the MINING AND SCIENTIFIC PRESS by R. H. CAMPBELL.

The system of working gold gravels by hydraulic elevators was introduced in California about twenty years ago, since which time great improvements have been made in the construction of gravel elevators, so that it may no longer be considered an experiment, and those who have made a practical study of the system under varying conditions know just what can be accomplished with them.

Hydraulicking, although practiced extensively in California, and in other gold placer countries, for nearly fifty years, is still little understood, in its scientific aspects, even by those who have operated hydraulic mines for years. Water under pressure is the first requisite, and is indispensable in operating hydraulic mines. This acquired, the next most essential thing is to so adjust the plant as to get the greatest efficiency from the water. This important item is often overlooked and the duty of the water wasted or handicapped by loss in friction.

In elevating gravel there is a rule in adjusting the parts of an elevator by which the greatest efficiency may be obtained, viz., the throat to be twice the diameter of the nozzle, and the upcast double the diameter of the throat, but this rule can not always be adhered to, and deviation must be made in order to comply with existing conditions.

Accompanying this article are shown several illustrations of the elevator in sections, giants used in washing the gravel to the base of the elevator, and all of the machinery in practical operation. Fig. 1 and Fig. 2 show sectional side elevation of the latest improved Campbell hydraulic elevator, with manganese steel-lined throat, with rubber cushion to resist the extraordinary force of the gravel when entering the elevator. This cut shows the elevator inclined at the augle at which these elevators are usually set, although this position may be varied according to the conditions.

Fig. 3 shows a Simmons double-jointed ball-bearing giant, which is one of the favorite machines used by the hydraulic miners.

Fig. 4 shows giant, elevator and the pit produced by them in a two weeks' run at Nome, Alaska, on Anvil creek, bench No. 7, of the Miocene Ditch Co., and using about 300 miners' inches of water.

The capacity of an hydraulic elevator is governed by the volume of water under pressure and the height of the lift by the pressure in feet, or hydrostatic pressure at the nozzle in pounds. The load to be lifted is measured by the water which it is necessary to use in the pit in washing the gravel to the elevator, and constitutes 75% to 80% of the whole, leaving 20% to 25% for the solids. As small as this seems, it is often more gravel than the upper or outward sluice can care for or carry away. This is accounted for by the fact that the material entering the elevator is carried to the upper sluices so rapidly that the capacity of these sluices is often choked, even with its increased grade and large volume of water.

Much depends upon the character of the material to be elevated. If heavy or difficult to run, the elevator will have much greater advantage over the sluices, for the reason that the gravel is forced through the elevator, while in the sluice it can only be carried by the natural velocity of the water on sluice grade.

There is a limit to the height to which gravel can be lifted with profit. There have been several plants installed where a lift was 90 to 96 feet vertical, but 50 to 60 feet is considered the limit to which it can be done profitably. To lift to this height successfully requires a pressure of not less than 110 to 120 pounds at the nozzle, and under this pressure the wear is so severe that the very best manganese steel is required in the wearing parts to stand any length of time. From 25 to 45 feet lift is considered within the proper limit of profitable operation.

The capacity of hydraulic elevators depends, of course, upon the conditions, but in order that one may arrive at some approximate idea of the work which can be done with them, we have to say that a 20-inch elevator with 1000 inches of water under 250 feet head, elevating 42 feet vertically, and using 700 inches of water in the pit, would put through from 1500 to 2000 cubic yards of gravel per twenty-four hours.

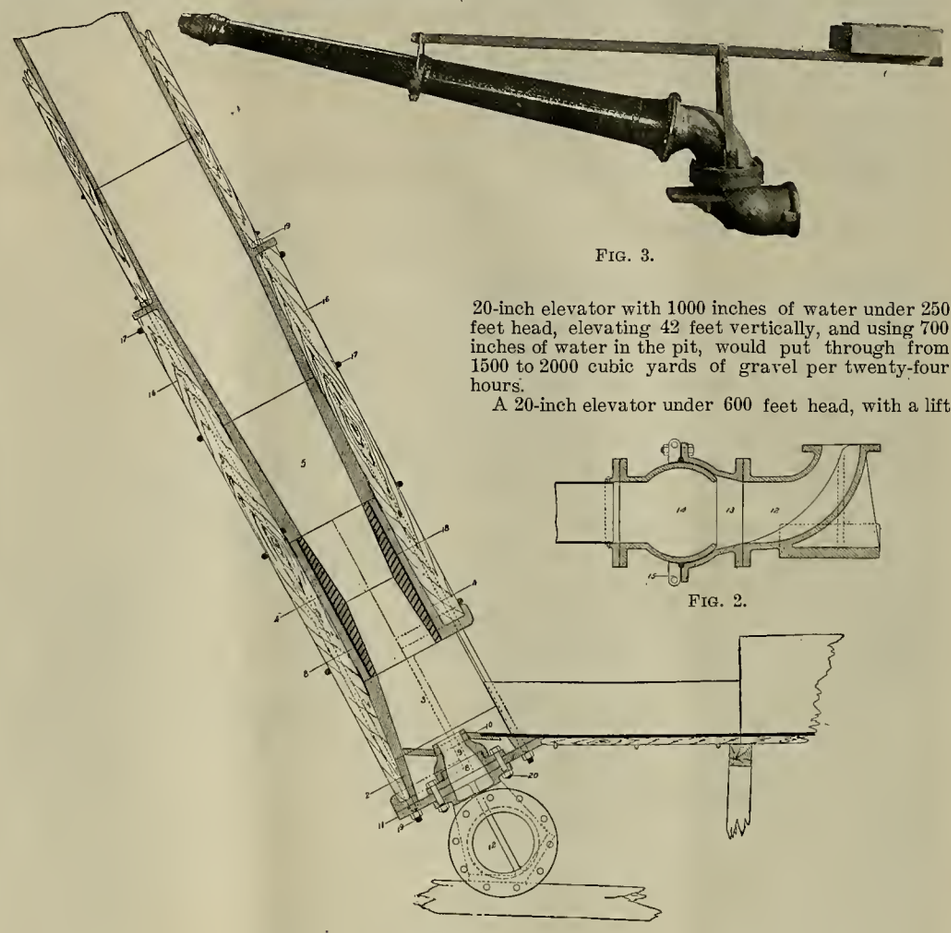


FIG. 3.

FIG. 1.

FIG. 2.

A 20-inch elevator under 600 feet head, with a lift of 90 feet vertically, with about 500 inches of water in the pit, would put through 1500 to 1800 cubic yards per twenty-four hours.

A 16-inch elevator under 350 feet head, and lifting to a vertical height of 48 feet, would put through from 1000 to 1200 cubic yards per twenty-four hours.

To determine exactly the machinery required for a plant of this kind, the following information should be given:

First—Diameter and length of supply pipe.

Second—Volume of supply water available in miners' inches or cubic feet.

Third—The pressure in pounds, or head in feet, vertically, of supply water.

Fourth—The height in feet, vertically, to which it is desired to lift the gravel.

Fifth—Amount of water flowing naturally into the pit.

Sixth—Whether it is determined to use giants for washing down the gravel, and, if they are to be used, if their water will be taken from the elevator supply pipe.

Seventh—If giants are used, their number should be stated, and size of nozzle aud head under which they will be operated.

Where the installation is of considerable magnitude and delays would prove serious, it is good practice to put in two elevators, side by side, so that in the event of being obliged to stop one from any cause the second may be at once started up.

FIG. 4.

THE Secretary of the Interior has requested the Civil Service Commission to hold an examination as soon as possible for constructing engineers in the U. S. Reclamation Service. This examination is to be similar to that held for consulting engineers last August. Competition is to be confined to men who have had responsible charge of large hydraulic works, such as dams and canals. The positions pay from $3600 to $4800 per anuum, and applications for particulars should be made to the Civil Service Commissiou at Washington.

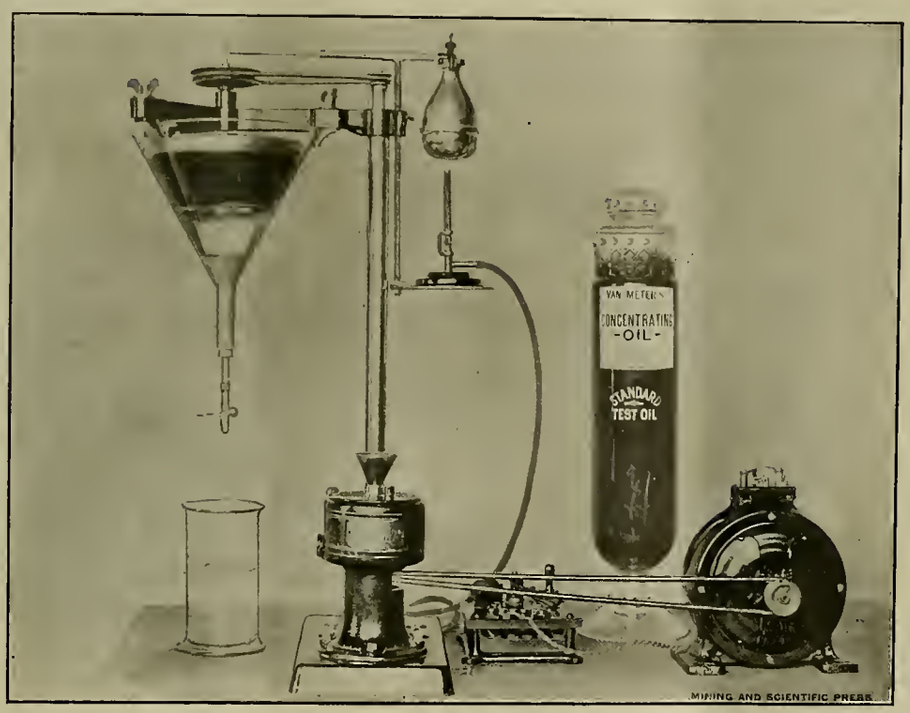
GUN METAL is an alloy of copper and tin in the proportion of 11 parts tin and 100 parts copper.

Laboratory Device.

The accompanying cut shows a laboratory device for determining the selective action of aluminated hydro-carbon oils, under different temperatures, in the concentration and separation of minerals by oil. The selective action of aluminated hydro-carbon oil for mineral particles of pulp varies, under different temperatures, and an oil may be compounded whose selective action for a certain mineral may be perfect at a fixed temperature, whereas with the same oil at a different temperature no selective action might take place. For instance, with an aluminated hydro-carbon oil compounded for the treatment of a certain silver-lead ore containing much zinc, at a temperature of 60° F. it possessed a strong selective action for all mineral particles of the ore, whereas at a temperature of 160° F. the zinc was unaffected. Working from these facts, it is claimed the zinc element can be sufficiently eliminated from many ores, producing a marketable product. This apparatus has been designed especially for assayers, laboratories and universities, for demonstrating the above principles. The manner in which the oil is kept at any temperature desired, the centrifugal action of the body of oil in producing the contact between the surface of oil and particles of mineral pulp, without agitation, have all been closely worked out.

The machine consists of an automatic working centrifugal, which separates the mineral from the oil. The glass spitzkasten or funnel contains a hollow aluminum cone, which revolves at a speed of about 200 revolutions per minute, being driven by a belt from the centrifugal separator below, connected with upright shaft inside of the support to which the spitzkasten is attached. The manner in which the lower and upper belts are connected to the shaft allows the operator to swing the spitzkasten while in operation to any position desired. The aluminum cone is used, says the inventor, for the reason that oil will not adhere to same when clean. The oil is kept at the different temperatures by steam generated in a retort filled with water and suspended over a gas jet attached to the framework holding the spitzkasten. From this retort a tube passes through the center of the upright shaft of cone and terminates within the aluminum cone.

Once the temperature of the oil has been raised above 100° F., the weight of the mineral entrapped by the oil tends to pull the oil to the bottom in sinkers. By the above device this is entirely eliminated, as the shape of the cone and spitzkasten brings into play centrifugal action, by which the mineral is held in suspension with the oil, leaving the gangne in the lower portion free from any sinkers. The gangue can be drawn off in a beaker while the apparatus is in operation by swinging to one side over the beaker, as shown in the cut. Then, by moving the spitzkasten over the centrifugal separator, the oil is allowed to pass into same, in which the separation of the mineral from the oil is effected. The apparatus is self-contained. Power may be applied by electric or other motor. A standard test oil has been compounded for use with this testing apparatus by J. W. Van Meter of San Francisco, Cal., inventor of the Van Meter system of concentration and separation of minerals by oil. All that is necessary in the testing of the ores is to find at what temperature the selective action for the desired mineral takes place. That having been determined, an oil is then compounded for use in the working plant which has the desired selective action at a normal temperature.



Laboratory Device for Testing Concentration of Ores by Oil.

Gold Mining in Southern Rhodesia.*

Written by THOMAS WARTH.

Rhodesia is comparatively a new and little known country; it will be years ere its geological formations can be located and its divisions definitely correlated. The high plateau, forming the watershed of the river systems and embracing the main area of the country, consists of granites and gneisses. A portion of it is overlaid by sandstones. It is worth noting that the country in the neighborhood of these schists is always more fertile and better wooded than that of the basement granite. This fact is a help to the gold miners, as it is in the schists that the auriferous veins usually occur. Considering the limit of the zone of their occurrence, it is possible some may be sedimentary and some igneous. These intrusive dikes in many cases appear to have been forced up before the matrix of the auriferous lodes was formed, as they have more often taken the place of the quartz than faulted it. The lodes usually follow conformably the foliations of the country, both horizontally and vertically, appearing at times to have pinched right out, and a few feet further on opening out wider than before. This makes not only the opening difficult, but the future of many mines speculative. It is generally admitted that the majority of the veins are fissures, although some, especially where the foot wall or hanging wall is granite, have been found too narrow at depth, and finally pinched out altogether.

The country is sometimes contorted. In one instance a shaft was put down vertically with the intention of cutting a reef dipping west, at 120 feet; the lode was cut through at 80 feet and then went down vertically, forming the hanging wall of the shaft. At 100 feet a drive was started south, following the strike of the reef which, after a series of corrugations, headed almost due east for a few feet and was then blocked out by country. Trenching on the surface, however, revealed what was presumably a continuation of the same reef some 600 feet back and striking in a normal direction. The enclosing country was extremely altered and was at times basaltic in appearance.

The colors are due to the presence of different sulphides, as of iron and copper; carbonates, such as azurite and malachite, which are widely distributed; oxides, etc. A great majority of the outcrops have the distinctive red-brown tinge, due to oxidation of iron pyrites. Last year a Bulawayo company, prospecting a reef for gold, struck a deposit of native copper within 60 feet of the surface, occurring in aborescent sheets between the jointing of the quartz. The Ayrshire mine in Mashonaland is an instance of gold occurring in diorite. The mine area embraces a huge intrusive dike in the granite with its longest diameter bearing east and west. The gold was first found in the diorite immediately next to a felspathic vein which appears to traverse the mass, but afterwards found disseminated throughout the entire dike. Just as the reefs differ in occurrence, nature and grade, so do they in width. Of quartz reefs, one in the Tai district, the Monarch, at one place is said to be 80 feet wide. The richness of the ore often varies in inverse ratio to the width of the vein, a reef showing a wide outcrop and giving a low assay value at surface, on proving at depth the vein stuff is less in quantity but of higher grade. As the reverse of this is also often true, it is seen that, from a speculative point of view, mining in Rhodesia is in direct contrast to the banket mining of the Transvaal, where the gold is so evenly distributed that the value of the gold contents of a mine area may often be approximately determined before a shaft has been put down. Many outcrops show visible gold, especially when by the oxidation or dissolution of the mineral constituents the stone has become honeycombed; on washing it fine grains of gold are generally discernible. On crushing, this class of ore is often found to be deceptive, the whole of the gold contents being visible and the stone containing none of the metal in combination. At the same time, Rhodesia has furnished hundreds of rich specimens of nugget gold. It was this class of outcrop which attracted the ancients.

The crystalline rocks and schistose bands containing the auriferous veins of the high plateau forming the backbone of Southern Rhodesia may be regarded as a coast, bounded on its northern, western and southern shores by sedimentary strata. On the south these are shallow and of small area, appearing to fill the hollows in, and lying unconformably on the metamorphic rocks; but on the west and north they are of greater extent.

Some 250 miles northwest of Bulawayo, and between the Gwaai river on the east and the Kalahari desert on the west, are the Waukie coalfields; to the east, between the Gwaai and Saugli rivers are the carboniferous areas of Luba, Sengwe and Sesani. Here seams of workable coal in shales and sandstones, with occasional ironstone bands, have been found, and are to-day being developed with all possible speed. The coal measures appear to lie unconformably on metamorphic rocks, and extend northward beyond the Zambesi river, having a gentle dip south to southwest. These coalfields lie close to the Victoria falls. There is no native timber, above a few inches in diameter, within 80 miles of Wankie; but the railway will reach the field this year.

The first essential for the successful development of Rhodesia is a return of confidence by the investing public. The country is still undeveloped and gives indications of rich deposits of minerals. Other requirements are a plentiful supply of unskilled labor, reasonable and reliable transport and cheap fuel.

The tendency has been for wages to increase, and 35s to £2 per month may be taken as an average figure for good drill boys. Surface boys get from 5s to 15s a month less than drill boys, but boss, or special boys, are paid up to £2 10s per month. A good white miner or mechanic gets 20s or more per day.

The principal Rhodesian woods used for mining are the mapaani, knobbesdorn and native mahogany; of these, knobbesdorn is the toughest and most lasting. For stations, and lining the bins at the different leads, Oregon pine may be used. Cordwood, for firing, should not be under 3 inches diameter; may be had from 15s to 20s a cord. A cord of mapaani is roughly equal to from 10 to 15 cwts. of coal for generating steam.

Up to the present, owing to the heavy railway rates on coal, which has to be carried about 1000 miles, as from the Transvaal or Natal, it has been customary to burn wood for charcoal for the blacksmith's forge and assayer's furnaces. All timber, native or imported, which is in contact with the ground, excepting timber in the mine, should be creosoted or well tarred, as a safeguard against the ravages of white ants.

In many districts in Rhodesia there is running water all the year round, in others the construction of large dams will be a necessity, for though the rainfall is sufficient to supply water for all purposes, it only occurs during the wet season. As a dam of any extent takes some time to build, this is one of the first problems the mining engineer should solve, that the building of the dam may run concurrently with his development. The management of the Eagle Vulture mine, in the Gwanda district, are building a dam with a capacity of 40,000,000 gallons.

The experiment of a dry crushing plant has been tried at the Wanderer mine in the Selukwe district, and is successful; and their plant, which will treat 12,000 tons a month, shows a good profit on a 4½ dwt. ore. This will probably be the forerunner of many similar plants in the country where the lack of water has been the chief drawback to profitable exploitation.

The following rates have recently been given out as specimens of present day rates on Rhodesian railways: Natives, 0.166d per mile; hay, 0.25d per ton mile; farm produce, 0.5d per ton mile; concentrates, 0.75d per ton mile. The Wankie coal, which is already being used on the section of railway between Salisbury and Machurdi, is proposed to be carried at a uniform rate of 1.5d per ton mile north of Bulawayo, and a through rate of 0.5d per ton mile south of that town. Its estimated cost is about 30s per ton delivered to the mining districts.

* Abstract of Trans. South Staffordshire and East Worcestershire Inst. Min. Eng.

The Geology and Copper Deposits of Bisbee, Arizona.*

NUMBER II.

Written by F. L. RANSOME.

POST-CARBONIFEROUS FAULTS AND INTRUSIONS.—At some time during the interval between the close of the Carboniferous aud the opening of the Cretaceous, the long-continued subsidence and sedimentation of the region were interrupted by extensive faulting, probably connected with uplift. The faults were mostly of the normal type, but there was also some reversed or overthrust faulting that may have been slightly later than the prevalent normal faulting. Following the faulting came intrusions of granitic magma, which solidified as granite, granite-porphyry and rhyolite. These intrusions took the form of dikes following fault fissures, of sills injected between sedimeutary beds, and of irregular stock-like masses. The dikes are well shown along the southwest face of Escabrosa ridge, west of Bisbee. The larger intrusions are exemplified by the granitic mass of Juniper flat, which is enclosed in Pinal schists, and by the smaller body of mineralized and altered porphyry forming Sacramento hill, just southeast of Bisbee, and intrusive into Pinal schists and Paleozoic limestoues. The latter mass is of particular significance from its connection with the principal copper deposits of the district. The intrusion of the porphyry of Sacramento hill was accompanied and followed by contact metamorphism involving the introduction of much disseminated iron pyrite into the adjacent Paleozoic limestones and the local transformation of the latter into fine-grained aggregates of calcite, tremolite, wollastonite, garnet, chlorite and quartz. The metamorphic minerals, with the exception of the pyrite, are uever conspicuously developed, and can usually be identified only in microscopic sections.

After the intrusion of the granite-porphyry, the region was eroded until the opening of Cretaceous time. It is probable that the primary mineralization of the district followed closely upon the eruption of the porphyry, and thus dates from early Mesozoic time.

THE MESOZOIC SEDIMENTARY SERIES.—At the beginning of the Cretaceous the regiou again begau to subside, and a couglomerate was deposited by the advaucing sea over the eroded surface of the pre-Cambrian and Paleozoic rocks, with their intruded masses of porphyry. This conglomerate is the basal member of the Bisbee group, an assemblage of Cretaceous strata comprising four formations. These are in ascending order (1) the Glance conglomerate, (2) the Morita formation, (3) the Mural limestone aud (4) the Cintura formation.

In places the Glance conglomerate was laid down to a uniform thickness of about 75 feet over an even surface, but elsewhere it is fouud filling hollows in a pre-Cretaceous hilly topography aud attaining a local thickuess of over 500 feet. The pebbles are composed chiefly of schist, although those of limestoue and granite-porphyry are not entirely absent. With the continued subsidence of the region, the Morita formation, comprisiug about 1800 feet of unfossiliferous sandstones aud shales, with occasional lenscs of saudy limestone, accumulated above the basal couglomerate. Couformably overlyiug these is the Mural limestone, about 650 feet in thickness, containing abundant fossils characteristic of the Comanche division of the Cretaceous. Most of these limestones, particularly the lower beds, are thiubedded and impure; but hard, gray massive beds, aggregating 40 feet in thickness, occur uear the middle of the formation aud form a cliff that is a conspicuous topographic feature of the hills uorth and east of Bisbee. The Mural limestone is conformably overlain by the Cintura formation more than 2000 fect in thickness and consisting of alternate sandstones and shales, much like those occurring iu the Morita formation. These Cintura beds of the Bisbee group are the youngest stratified rocks exposed in the Bisbee quadrangle. As their upper surface is everywhere one of erosion, their original thickness is unknown. The foregoiug Cretaceous strata were first described by Dumble and by him called the "Bisbee beds."

POST-CRETACEOUS DEFORMATION AND INTRUSIONS.—The beds of the Bisbee group have beeu deformed by folding aud faulting and are cut by a few small dikes of diorite-porphyry, excmplified by the dike at the Glance mine. The folds are generally open, dips of more than 20° being rather exceptional. The general strike is N.W.–S.E., and the prevailing dip northeast. About 7 miles southeast of Bisbee, however, where Paleozoic beds have been thrust by faulting over the Cretaceous, the latter have been turned up steeply aud are in places nearly vertical. East of Bisbee the faults are normal, but southeast of Mule Pass gulch faults of the reversed or overthrust type predomiuate. The most striking of these latter faults is that exposed at Gold Hill, 5 miles southeast of Bisbee. The summit of this hill is composed of Paleozoic limestones which have been thrust from the southwest over the beds of the Cretaceous Bisbee group for a distance of at least 2 miles.

* Abstract Trans. Amer. Inst. Min. Eng.

As Tertiary sediments are absent in the Bisbee region, this period was probably marked by the deformation of the Cretaceous and older rocks and by erosion.

THE QUATERNARY VALLEY DEPOSITS.—The Quaternary is represented by unconsolidated gravelly deposits flooring the broad valleys that surround the Mule mountains on the west, south and east. These are in the main fluviatile wash, with possibly some finer lacustrine beds at a distance from the mountains.

ECONOMIC GEOLOGY. — Prior to the year 1880, Bisbee was an unimportant lead camp, a single furnace being then in operation upon cerussite mined from the Hendricks claim, close to the town. The copper ore of the Copper Queen mine was discovered early in this year and was profitably exploited until 1884. This ore was free from sulphur and had an average tenor of 23% of copper. It was treated in two 36-inch furnaces, which, in spite of their small size, were able, with wood as a fuel, to turn out about 500,000 pounds a month. In 1882 the men composing the present Copper Queen Con. M. Co. bought the Atlauta claim, near the original discovery, and began prospecting.

In 1884 the Copper Queeu ore body, which had been worked for 300 feet down an incline, was exhausted. The outlook was gloomy and work was almost abandoned, when a secoud ore body was simultaneously discovered from the original Copper Queen incline and from the Atlanta workings. In order to avoid legal complications, the two companies combiued as the Copper Queen Con. M. Co., which gradually absorbed the neighboriug properties by purchase. In 1886 the old smelting plant became inadequate and was rebuilt. Greater economy was necessary, as the average tcnor of the ore in copper had fallen to about 8%, and the price of copper had also notably declined.

Shortly after 1890, the completely oxidized ores showed signs of failing. But in 1893 the works were remodeled by the introduction of converters, and sulphide aud oxide ores have since that time been successfully worked together by the matte process. The iutroduction of these couverters was due to James Douglas and marked the beginning of a new epoch in the smelting of copper ores in Arizoua.

Up to the end of 1902 practically all of the copper from Bisbee was the product of the connected group of miues owned by the Copper Queen Con. M. Co. Recently, however, extensive ore bodies have beeu opened up in the Calumet & Arizona mine, and in the latter part of December, 1902, this company was turning out from thirty to forty tous of copper per day from its new smelter at Douglas.

The town of Douglas, situated in the middle of Sulphur Spring valley, on the Interuational boundary, has sprung up with remarkable rapidity during the past year. Its growth is due to the erection herc of the new smelters for the Copper Queeu and Calumet & Arizona companies and to the fact that it is the junction point of the newly completed El Paso & Southwesteru Railroad with the Nacosari Railroad into Mexico. It will uudoubtedly become au important smelting point, not only for the Bisbee ores, but for those from Mexico.

PRODUCTION.—From August, 1880, to the end of 1902, the total output of the Copper Queen Con. M. Co. was 378,047,210 pouuds of copper. The product of the receutly opened Calumet & Arizona mine within this period is 2,066,647 pounds; so that the total recorded productiou of the district is 380,113,857 pounds of copper. The maximum output was in 1901, when the Copper Queen mines produced 39,781,333 pouuds of copper.

PRESENT UNDERGROUND DEVELOPMENT.—The Bisbee quadrangle contains two large productive mines —the Copper Queen and the Calumet & Arizona. In addition to these are a few undeveloped mines that have produced comparatively small quantities of good ore, and a number of prospects, ranging from shallow pits to shafts several hundred feet deep, connected with extensive systems of drifts.

The Copper Queen mine comprises a maze of workings connecting with the surface through four working shafts and several less used openings. The area, more or less thoroughly intersected by drifts and crosscuts, covers nearly half a square mile, where the extreme vertical range of underground exploration is about 950 feet. The workings are practically all in Carboniferous limestone. From 650 to 700 tons of ore are raised per day, chiefly through the Spray, Holbrook and Czar shafts.

The underground development of the Calumet & Arizoua mine is confined to the Irish Mag claim. The mine is operated through the Irish Mag shaft, 1200 feet in depth, situated 900 feet S.–S.E. of the Spray shaft and about three-quarters of a mile in the same direction from Bisbee. The workings are all in Carboniferous limestone. Stoping in this mine began iu the autumn of 1902, and about 300 tons of ore were raised per day before the end of the year.

GENERAL CHARACTER OF MINERALIZATION.—The Bisbee quadrangle owes its economic importance exclusively to the occurrence of ores of copper. The unimportant deposit of lead carbonate in Hendricks gulch, which was the first discovery in the district, is still being worked in a small way, and the Easter Sunday mine has supplied the siliceous gold ore used in the Copper Queen smelter for converter lining; but these, so far as known, are the only instances in the quadrangle of ores commercially exploited for other metals than copper.

For a district which has produced nearly 400,000,000 pounds of copper, the Bisbee quadraugle, iu spite of the general bareness of its rocky slopes, exhibits little superficial evidence of its mineral wealth. The porphyry mass of Sacramento Hill, southeast of Bisbee, and the schists that partly enclose it, show considerable alteration and contain abundant disseminated pyrite, which by oxidation imparts a rusty stain to the rocks; but, so far as known, no deposits of value occur wholly within these discolored rocks. Along the Dividend fault in Bisbee outcrop some dark rusty masses composed principally of limonite. Similar ferruginous ledges occur in Hendricks gulch, on Queen hill and in the limestone south of Bisbee. Experience has shown that such limonitic croppings, although rarely exhibiting superficial indications of the presence of copper, are nevertheless frequently associated with an underlying ore body. They evidently result from the oxidation of pyrite, the less soluble iron oxide and some silica remaining near the surface, while such copper ore as was originally present has been carried down by percolating solutions and redeposited at lower levels. These bodies of limonite, when not too siliceous, are the best surface indications of ore that the district affords. Many of the most important ore bodies, on the other hand, would have remained undiscovered were superficial phenomena alone relied upon to suggest exploration.

Although the rocks of the quadrangle are seamed with faults and dikes, none of the workable ore bodies occur as lodes or fissure veins. With a few exceptious they are irregular replacements of limestone. Originally pyritic, and containing probably subordinate amounts of chalcopyrite, they owe their present value to secondary coucentrations effected by processes of sulphide eurichment and of oxidation.

OCCURRENCE OF THE ORES.—The principal bodies of copper ore all lie south cf the town of Bisbee, within a radius of a mile. They occur in Carboniferous limestone, on the southwest side of a great fault (the Dividend fault), and closely associated with an intrusive mass of granite-porphyry. In the absence of the geological map and sectious, the structural relations may perhaps be most clearly presented by a homely illustration: If the half of a broken saucer be placed flat on the table with the fractured edge lying about W.N.W., and if the back of a book be laid against this edge, we shall have a rough illustration of the geological structure near the town of Bisbee. The saucer represents the synclinal attitude of the Paleozoic beds, from the upper Carboniferous Naco limestoue down to and including the Cambrian Bolsa quartzite. The broken edge of the saucer is the great fault, while the book is pre-Cambriau Pinal schist, against which Naco limestouc has been dropped by this fault, with a throw of more than 1500 feet.

(TO BE CONTINUED.)

An Important Matter.

TO THE EDITOR:—I have read with much interest the article, "An Important Verdict," in your issue of the 6th inst. The ground is well covered by the article except that no explanation is offered as to why the engineer lost control of his engine. This is a vital point to be considered in trying to prevent such lamentable occurrences. I was once a witness of a precisely similar accident. Oue of my engineers was hoisting a car, and when it reached the collar of the shaft he attempted to shut off the steam, but found he could not do so. We were equipped with three brakes—one ou the main shaft of the hoist and one on each drum. These were applied instantly and stopped the cage before it reached the sheave. I had the valve opened and found to my astonishment that, although it was one of the best valves in use, it had failed at a critical time from this fault in construction. The valve proper was fastened to the round valve stem by a metal pin only one-eighth of an inch in diameter. This pin had broken and the stem would turn without closing the valvc. I ordered a uew valve made with the valve stem square at the point where the valve proper was fastened to it, the valve proper being made with a square hole also. This prevented the possibility of such an accident occurring again, as even if the pin would break the square valve stem would prevent its turning.

As to the fourth count, it was the engineer's business to know, and not take for granted, that his brakes were in working order.

Strong landing chairs should always be used, that open at the rising of the cage and close automatically. This might have lessened the fatalities. The extra man is needed at the collar of the shaft and not at the engine. All possible precautions should be taken where life is involved, and in my opinion all hoists should be equipped with valves as above described. It would greatly lessen the danger of such terrible accidents. ANDREW ROCCA.

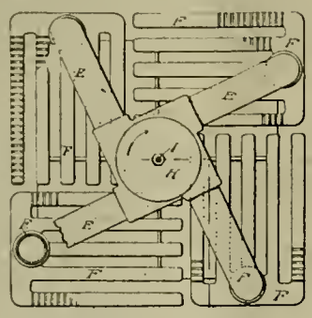
Middletown, Cal.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 2, 1904.

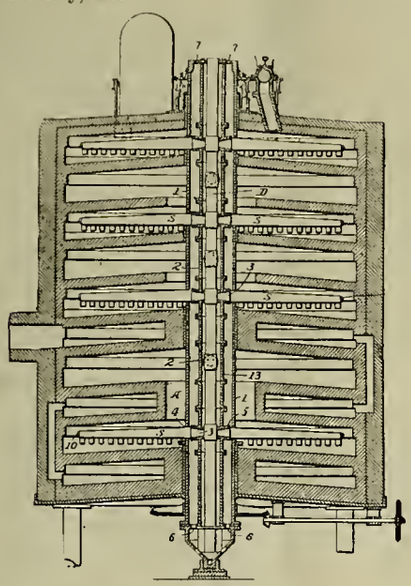
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

HYDROCARBON BURNER.—No. 751,066; W. E. Gibbs, Fanwood, N. J.



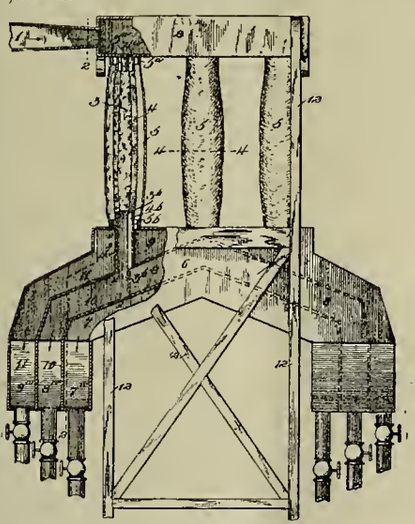
In hydrocarbon burner, combination of burner tubes having common distributing chamber, distributing pipes connecting chamber with outer portions of burner tubes, spraying and vapor driving device in chamber and means for supplying fuel and air to chamber.

ROASTING FURNACE.—No. 750,877; A. R. Meyer, Kansas City, Mo.



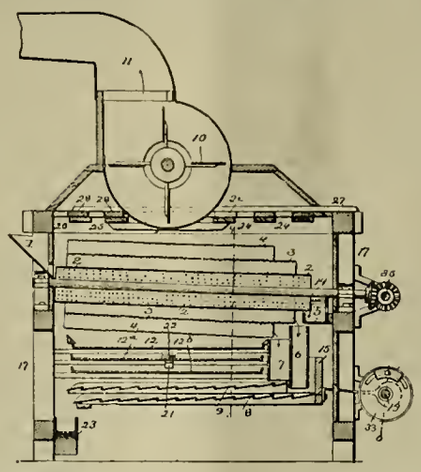
Shaft having inner and outer concentric sections with coinciding sockets, combined with radial arms having stems fitting coinciding sockets, and means for retaining parts in connection.

CONCENTRATOR.—No. 751,424; H. Wismeyer, Emporia, Kans.



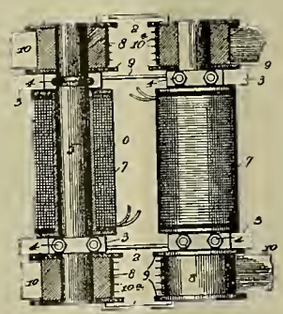
Concentrator comprising distributing chamber, separator and grader having series of compartments and pockets, series of conductors arranged intermediately of distributor and grader and composed of series of concentric tubes which are permeable to air and graded in mesh, inner tube alone communicating with distributer and other tubes being closed at top and communicating separately with respective compartments of grader.

COMBINED GOLD SEPARATOR AND AMALGAMATOR.—No. 751,425; H. Wismeyer, Emporia, Kans.



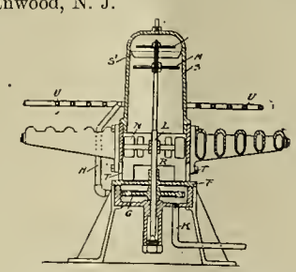
Combined gold separator and amalgamator comprising rotary separator proper consisting of series of graded perforated concentric cylinders, like series of conductors into which cylinders respectively discharge, two riffle plates arranged in lower portion of machine and receiving material from two of conductors, series of inclined amalgamating plates arranged at angle to each other and interposed between separator and riffle plates and supported in same reciprocable frame with latter, and fan located above separator.

ELECTRO-MAGNETIC ORE SEPARATOR.—No. 751,100; E. M. Oviatt and A. Dean, Denver, Colo.



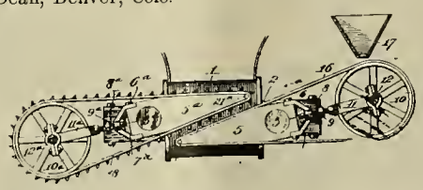
Magnetic ore separator comprising pair of electromagnets, each having north and south pole and fixed coil, each pole of each magnet being arranged adjacent to pole of opposite polarity of other magnet, producing induced current through both magnets, plurality of revoluble pole members within magnetic circuit of magnets, and means rotating members.

HYDROCARBON BURNER.—No. 750,962; W. E. Gibbs, Fanwood, N. J.



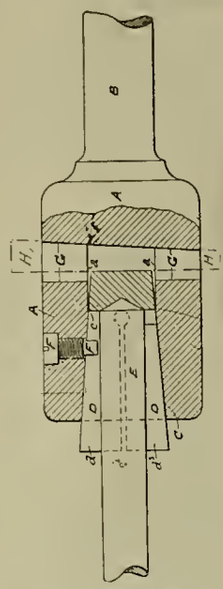
In hydrocarbon burner, combination common distributing chamber, of burner tubes surrounding and adapted to heat chamber, of means for supplying air and hydrocarbon spray or vapor to chamber, fan located in chamber, and means independent of air supply for driving fan at high velocity.

ELECTROMAGNETIC ORE SEPARATOR.—No. 751,150; A. Dean, Denver, Colo.



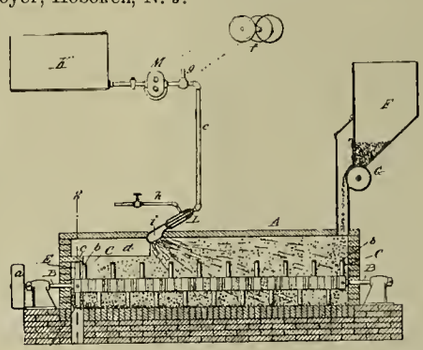
In electromagnetic ore separator, combination of magnet coil, core, cranks rotatively seated in core and having outwardly extending arms, tapering pole members mounted on crank arms, and means arranged to traverse one of pole members and adapted to receive material subject to magnetic attraction passed between pole members.

CHUCK FOR ROCK DRILLING MACHINES.—No. 751,311; L. Leigh, Jr., Luipaardsvlei, Transvaal.



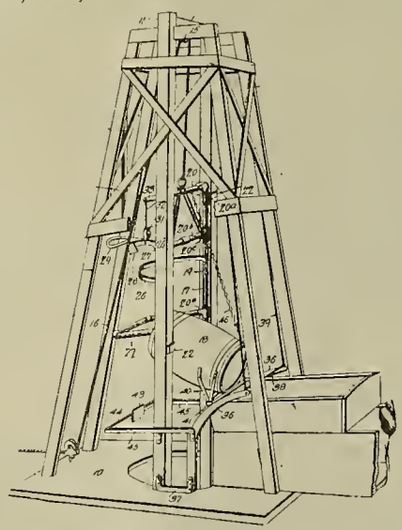
Rock drill chuck comprising head or main portion constructed with internal longitudinally tapered cavity and correspondingly tapered bush split for portion of its length to form plurality of compressible jaws constructed to embrace shank of drill between jaws, and made solid or closed at inner and smaller end to form stop or abutment.

PROCESS OF PREPARING PULVERULENT MATERIALS FOR MOLDING OR BRIQUETTING.—No. 751,134; R. A. Zwoyer, Hoboken, N. J.



Process of mixing binder with pulverulent material, consisting in adding binder in finely divided form to such material when particles of material are maintained in suspended or separated condition, and passing binder in finely divided form through chamber.

DUMPING ELEVATOR. — No. 751,225; F. B. Van Cleave, Echo, Or.



In dumping elevator, combination with supporting frame and tilting bucket, of locking mechanism for bucket, tripping mechanism for locking mechanism, guides with which bucket coacts when it is tilted, and actuator for tripping mechanism having arm secured to guides and to supporting frame.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

A. K. Beatson, part owner of the Bonanza group of claims on Latouche island, reports development work being increased, says the Valdez News. Regular ore shipments are going out. Shipment of 100 tons in December netted $1607.15. The ore runs 13% copper, with a little silver and gold, and $3 per ton freight is paid. A tunnel is being run into the ledge at greater depth than the previous tunnels.

ARIZONA.

Cochise County.

The Wolverine & Arizona, Calumet & Bisbee, Calumet & Cochise and Portage Lake & Bisbee companies, operating in Warren district, near Bisbee, have all bought diamond drill outfits for use in developing their claims. Heretofore work has been confined to sinking shafts and opening drifts.

Graham County.

B. Crawford and D. Awalt last week bonded the W. T. Kinsey and E. E. Frye group of four claims at head of Chase creek, near Clifton. Assays of samples taken across the 4-foot vein are said to show three ounces gold per ton, besides some copper and silver. It is intended to start development work this week, contract having been let for continuing the shaft and beginning a tunnel. The latter is on one end of the group and the shaft on the other. The tunnel will go in on the ore and follow it to the shaft.

Work has been started on a 4-foot vein of gold crossing the bottom of a 60-foot shaft on the Katydid group of claims, next to Lime Point, below Morenci. The group contains eight claims. It is owned by D. P. Marshall, C. Henry, Stevens & Shade, G. Depee and H. Quinn, of Clifton. There are several hundred feet of work on the claims in tunnels and shafts. The 4-foot vein is said to assay $16. The group has a millsite on Chase creek.

Mohave County.

The Security M. & Dev. Co. (the Elkhart M. Co.) at Chloride, has been reorganized under the name of the Arizona Bullion M. Co. It is the intention of the company to sink the main shaft of the mine to depth of at least 1000 feet.

The Suncloud M. Co, will have its mill in operation on the lower Sandy river, south of Kingman, next month. The mill will he of 10-stamp capacity. The mine is near the stream from which a supply of water for milling purposes can he obtained.

Yavapai County.

Superintendent J. T. McLaughlin of Jerome of the Braganza G. M. Co. says they will remodel the 20-stamp mill and put in additional machinery.——E. L. Bowman of Prescott, president of the Rainbow G. M. Co., says they will increase development work and build a mill at the mine next summer.

B. Blanchard, manager of the American C. Co. Iron King group at Blanchard, says work is progressing and the equipment is being improved. Four steel cyaniding tanks were received last week and are being set up. Each tank will have capacity of sixty tons. He says the copper sulphide ore in shaft No. 5 is holding out. It carries values in gold and silver also. The shaft is down 175 feet.

Yuma County.

O. E. Rumer says he has opened a body of ore in five different places on his Bill Bear group at the old Desert mine, near Harrisburg. Water is found at depth of 50 feet and wood can be delivered at the mine for $3.50 per cord. He expects to repair his 10-stamp mill.——Manager Lind has men working his California group, 6 miles north from the Desert mine.——H. Griffin is working his holdings adjoining the California group, and is sinking a 100-foot shaft on a ledge which crops the entire length of four locations. Griffin has eight claims in this group.

CALIFORNIA.

Amador County.

Near Volcano, Bradshaw, Santirfo & Baroni have leased a strip of ground containing four acres, on the Elephant placer. They expect to operate with one hydraulic pipe, equipped with a 6-inch nozzle. The gravel ranges in depth from 1 to 5 feet. ——Marsino Bros. are working forty-five acres of ground on edge of town of Volcano, in what is known as the "lava beds." These lava beds are areas of gravel covered with a heavy flow of lava, says the Ledger. Owing to the lava covering, it is impossible to work with the hydraulic process. The gravel is streaked with thin strata of cement. This latter contains pay, and in the open air slakes so that washing is possihle. Sometimes, however, it is stored and crushed in a stamp mill and the gold saved on plates. They have a 200-foot tunnel on their ground and are running crosscuts. Owing to the lava covering, no timbering is used in the tunnels, and little timher is used in mining the gravel.——The Christenson claim has been sold to Grillo Bros. and men are driving the 500-foot tunnel ahead. This property is equipped with Huntington mill, and has a water right. In addition to these placers the Grillos own the Columhus quartz claim, 3½ miles south of Volcano, which they will develop in the spring. A 5-stamp mill was huilt hy the former owners. However, the only development done so far is a 240-foot tunnel on the ledge, which opens it at depth of 90 feet.——Kimhall Bros. are operating the Deadwood mine, 1 mile north of Defender. They are working it hy shaft, which is down 60 feet. At this point water was struck and a boiler, pump and small hoist are heing set up, which will enahle them to sink to depth of 200 feet. It is expected sinking will resume this week. The ledge is 12 inches wide. A mill run of nineteen tons gave cleanup of $32 per ton.

Superintendent W. R. Thomas reports work progressing at the Central Eureka mine at Sutter Creek. A contract has heen let to sink the shaft another 100 feet and 5 feet is heing made per day. One skip is kept at the disposal of the men sinking the shaft all the time, hut the forty stamps of the mill are kept dropping on ore hrought up hy the other skip.

Calaveras County.

At the Royal mines at Hodson the strike was declared off. Superintendent Kemp Van Ee says he has full force at work with 100 stamps dropping, and the entire 120 stamps will be at work this week.——At the Mountain King, adjoining the Royal mine, work has been stopped temporarily. The shaft is an incline 200 feet deep.

In the Kaiser & Maguire mine, on French hill, near Mokelumne Hill, a four-ounce nugget of gold was reported found last week. This mine is contiguous to the former placer diggings.

The work of clearing out the ditch and repairing the mill at the Jones mine, south of Angels, has hegun. In conjunction with the Allison group the Jones has heen bonded to J. Cameron and T. Kerns of Spokane, Wash. The improvements on the Jones consist of a 40-stamp mill, a double compartment shaft 660 feet deep, hoisting works and hlacksmith shop, while on the Allison group there are two tunnels, 150 and 200 feet each, hesides a number of open cuts. The bond is for two years and a half. The mine is near the Stanislaus river, below Melones.

At the San Domingo mine, near Angels, a rotary gravel mill is heing placed. B. Thompson is president of the company. ——At Vallecito G. Mienecke has a 400-foot tunnel in his gravel claim and expects to tap the channel this month.——It is reported work at the Duchess mine, near Vallecito, will soon he restarted.

At the asbestos mine on west side of Bear mountain, near Copperopolis, being operated and owned by a San Francisco company, work is progressing. Ten men are at work, and asbestos is heing taken out.

Work is resumed at the Garihaldi mine near San Andreas.——The Lloyd mine at Central hill, near San Andreas, is reported ready to start up again.

Work at the Old Stiff hydraulic mine at Vallecito is going ahead. Piping is well into the main channel.——Work on the Forty-Nine placer mine at Douglas Flat is progressing under Superintendent Evans. Considerable development work has heen done.

F. J. Juchter has honded the Chris Anderson placer mine, on the Central hill blue gravel channel, near San Andreas, near the Marshall, Hedrick, Johnston and Nelson placer mines. The Chris Anderson mine has given values on the rim, but the heavy inflow of water prevented sinking to bedrock in the channel. The shaft is 85 feet deep; this will he timhered, pumps put in and then sinking will he resumed.

There are 210 stamps dropping at the mines and mills in and around Angels.

A heavier pump has been placed at the Lloyd gravel mine at Central hill, near San Andreas, and other machinery will also he put in.

The Del Monte M. Co. of Jackson, operating the Del Monte mine, near Railroad Flat, after having for some time partially suspended operations, has resumed full operations, says Superintendent G. I. Wright. A 1000-foot crosscut tunnel was started to reach the ore shoot, and 850 feet of this driven. The remaining 150 feet will he driven.

The Gertrude M. Co. of Angels, J. R. Dorroh president and W. Morehead vice-president and manager, with A. G. Madson, M. H. Manuel, O. Dolling, W. N. Garland and W. H. Thomas as directors, has heen organized for working the Demarest mine, on Cherokee creek, near Fourth Crossing. The improvements consist of a 5-stamp mill, a shaft 650 feet deep with crosscuts and drifts at the various levels, hlacksmith shop, hoisting engine and cahle sufficient to reach 1000 feet depth, skip and other machinery. Free water is to he had the year round; the land comprises 340 acres.

Inyo County.

Development of the Sacramento mine, near Bishop, is under way, J. W. & C. Brown, I. E. Dewitt and T. W. Key working it under lease. They have a 3-foot face of ore. J. W. Brown proposes to work the ore in his mill.

Kern County.

(Special Correspondence).—Conditions at Randsburg are improving and the camp is recovering from the fire and the strike of June last. For several months the mills were closed. The town has heen largely rehuilt.

The Yellow Aster M. Co. is taking out more ore than ever hefore and its two mills of 100 and 30 stamps, respectively, are crushing 500 tons of ore daily. There is a total of 15 miles of underground workings in the mine and quarries show on the surface of the mountain up to its summit. The company recently acquired property on their western extension for $60,000.

There are other mills in the district, a 2-stamp custom mill operated hy C. H. Snow; a 10-stamp mill owned hy the Butte Co., of which P. H. McMahon is superintendent. Neither of these is operating at present, nor is the Black Hawk, a 10-stamp mill, owned hy T. W. Atkinson, who owns the Sunshine mine, a producer of Stringer district.

At Johanneshurg there are three 10-stamp mills—the Red Dog, owned hy the Stanford M. & R. Works, with F. A. Mann in charge; the Phœnix, with E. Hammond in charge, and the Pinmore.

In the Stringer district, 2 miles south of and paralleling the Randsburg district proper, is the Baltic Co.'s mill, operated by C. H. Wynn, manager and part owner. This district has been and still is a good producer at shallow depths. This section has always paid its way, unassisted by outside capital, and there has heen as yet no deep development. Even the Yellow Aster, which has operated on a high hill, has not really attained depth. The development of the Randsburg district is as yet in its incipiency, and it offers opportunities for capital to show that there are deep mines to he made here.

Randshurg, Feb. 9.

L. D. Daves and J. Peterson have leased the Red Dirt mine, near Randsburg, and have begun work.——Nebeker & Buck are leasing on the Bully Boy claim, east of the G. B. and adjoining the Sisters claim.——Bouchard & Thompson have a lease on the Banner.

The Standard Oil Co. pipe line from Kern river to Point Richmond is again pumping oil from the Kern River field.

Nevada County.

Superintendent W. Graham of the Shady Creek dredge claim at the Phelan ranch, near Nevada City, says operations are being resumed after a shut-down of two months hecause of lack of water. This property is mainly owned by P. C. Drescher of Sacramento. Present arrangements for ohtaining a water supply are not satisfactory. Survey has been made for a new 7-mile ditch from Columbia hill to the mine, and they will build it in the spring. It will insure abundance of water the year round. The elevator process is used at this mine. —— Superintendent C. L. Miller of the Brophy claim, where work was recently suspended before bedrock was reached, says he expects to start up again this month. F. Hall of San Francisco is manager. The mine is equipped with a centrifugal gravel pump.

A. H. Tickell of Nevada City has bonded the Crumhecker mine in Washington district, for Eastern men. The company has hegun operations.

The Quartz Quarry M. Co., having a hond on the Junction mine, near North San Juan, has operations temporarily suspended. When work is resumed attention will first be given to sinking the main shaft to bring it down to water level.

The Round Mountain Champion mine, on the lower Bloomfield road, near Nevada City, has heen bonded for two years hy H. Huckins and A. Scribbens. Work will be started this month.

It is reported the Bonnie B. mine, near Grass Valley, will be equipped with a 20-stamp mill.

The Round Mountain mine and extension, 4 miles above Nevada City, has been honded hy R., H. and S. Huckins and A. Scrivens for $8000. The mine is on the Rock Creek road and has a shaft 500 feet from the Rock Creek hridge. It is 60 feet deep and shows a 2-foot ledge of milling rock assaying $10 per ton in free gold. They will huild a small hoisting works.

Superintendent W. Graham has resumed operations at the Shady Creek claim, near Nevada City, and the elevator is raising gold-hearing gravel. Water is heing hrought in through the Milton ditch of the California Water & Power Co. Work on the new 7-mile ditch from Columhia Hill, which Drescher & Canfield propose to huild, will he started this month.

Riverside County.

The Oro Opia M. Co. is developing a group of gold mines at Salton. The company is preparing to set up a 75 H. P. gasoline engine and three roller mills and expects to increase the number of men at work.

Shasta County.

The Gladstone mine at French Gulch is in steady operation with sixty men and electric power and a new mill.——The American placer mine is reported to have fifty men operating on Klein's creek.

D. Cone of Red Bluff has 5 miles of land along the hanks of the North Fork of Cottonwood creek, near Redding, under hond to prospect for dredging for gold. The land is 7 miles west of Igo. Keystone drillers for prospecting the ground, and men, teams and supplies are going in.

Sierra County.

(Special Correspondence). — The reported transfer of the Sierra Buttes mine, near Sierra City, is premature. Negotiations are pending.

Sierra City, Feh. 17.

Siskiyou County.

The Mount Vernon group of mines on Cherry Hill divide, near Yreka, has heen sold, and H. D. Lane of Spokane, Wash., is manager.

Arrangements have heen made hy E. T. Wallace with C. Winters to start the dredger at Hawkinsville. They will work the ground of Yreka creek from Shasta river to Yreka. The dredger is to he fitted up for working by electric power.

Trinity County.

The Beale & Temple mine on Quimby creek, a trihutary of the lower Trinity river, near Weaverville, is being developed. The ledge has heen traced on the surface for 1200 feet, says the Trinity Journal. A tunnel has been run on the ledge and a shaft sunk from the tunnel, giving a depth of 125 feet. At the hottom of the shaft the ledge is 25 feet wide. The ore is free milling on the surface, hut carries sulphurets with depth, running in value $12 a ton.

At the Dorleska mine, in Coffee Creek mining section, near Dedrick, the ledge is said to average 15 feet in width. The 10-stamp and Huntington mills are running steadily on ore and forty-two men are at work. The numher will he increased in the spring. M. MacIlwaine is superintendent. There are 4½ feet of snow at the mine.

Tuolumne County.

J. C. Charters has hought the Old Peck quartz mine on north fork of Tuolumne river, near Carters.

Work has heen resumed at the Crystalline mine, near Jamestown.

The Cherokee Gravel & Gold M. Co. of Soulshyville will increase work on its holdings at Cherokee. The main drift is in 500 feet, and when work was stopped last year the face was in pay gravel. Since then the drift has heen retimhered.

Mesgheno, Maddox, Roleri & Gianelli, operating the Duffield mine at Arrastraville, near Soulshyville, under a lease, report opening up high-grade ore and fifty tons are on the dump, which will be run through the Dreisam mill.

G. & W. Connally are taking out gold-hearing quartz from the Side Wiper claim, near Carters. A winze is being sunk and a milling test of the ore will be made. The claim is east of and adjoining the Dead Horse mine.

J. A. Rydberg has sold to the Don Pedro G. M. Co., near Chinese, the right to follow under his lands all veins which have their apexes in the Stokes quartz claim, together with the right to sink shafts, etc. A royalty of 15% will he paid.——Work is under way at the Arhona mine near Tuttletown. It has been closed for three years. —— The Golden West M. & M. Co. has deeded to P. Marsicano for $2500 all its interest in the Golden West mine, on the Comstock ranch, 10 miles east of Sonora.

J. F. and F. H. Baker of Carters have hought the Sunnyside quartz mine, 1¼ mile northwest of the junction of the North Fork and main Tuolumne rivers; also the Hill Top quartz mine, 4½ miles south of Carters, and the Never Sweat quartz mine and mill. —— H. Holmes of San Francisco has bonded the Last Chance, Free Gold, Haley & Wilhur quartz mines, 2 miles east of Jacksonville.

During the shut down at the Black Oak mine, near Soulsbyville, several changes and improvements have heen made. The gallows-frame has been raised and new

ore bins built. Sorting tables have been put in to simplify and facilitate sorting the rock and save handling the ore too often.

COLORADO.

Boulder County.

The Ottumwa M. Co. has been organized to operate the Lord Byron group of mines at Sugar Loaf.

Clear Creek County.

L. S. Kenworthy of St. Louis, Mo., has a bond and lease on the Pacific and other lodes in Jackson and Cascade districts for $50,000, says the Georgetown Gazette. He will start operations this week. The property will be equipped with machinery.

The property of the Two Sisters M. Co. has been sold to J. J. White of Georgetown. It consists of nine patented and four unpatented claims on Silver creek. Operations will be started this month.

C. I. Burt, manager of the Vulcan mine, near Silver Plume, says several additional leases have been granted and all the men are at work opening up their ground. A good tonnage is being taken out. Three raises are being put in within a block of ground 150 feet in length. These raises were started from the 900-foot station of the tunnel, and the vein varies from 2 to 6 feet in width. During the last year the tunnel has been driven several hundred feet. Machine drills were used until a short time ago, when they were discontinued on account of lack of water power.

The J. D. Williamson I. Co. of Idaho Springs has bought the Golden Leaf and Golden Fleece lodes, on Seaton mountain, for $5000. Development work will be started this week.

The Pelican, Dives, Seven-Thirty and Bismarck groups on Brown mountain, near Georgetown, and consisting of 100 patented claims, has been taken over by the Pelican, Dives & Seven-Thirty M. Co., which has been organized by New York and Kentucky men, and the one-half price (said to be $500,000 total) paid down. O. O. McReynolds, of Denver, will be superintendent. All leases now existing will be allowed to operate under previous arrangements. Ore reserves are said to be blocked out in the different veins. The new management has arranged for complete exploration of the group, and all levels are to be driven west. Connection will be made from the Burleigh tunnel level with the bottom of the Seven-Thirty shaft for ventilating, when the level will be driven west.

Custer County.

The Little Jim G. M. Co., working the Bryan mine, has a body of high-grade ore opened in the shaft, but is running a tunnel to connect with the upper workings. It is on Robinson hill, near Silver Cliff.— The Elematah, adjoining the Bryan, will be pumped out and work resumed.——The American Flag is being worked at depth of 180 feet and drifting on three veins is in progress. This claim is owned and operated by Pueblo men. The water that is raised from this mine is used in the Bassick mill, also near Silver Cliff.——The Rappahannock mine, leased to Sandow & Kennedy, has been entered by a 100-foot tunnel under the old workings. Ore is being saved and the mine has again entered the shipping list. The ore runs $70 a ton and carries some copper.

Gilpin County.

F. Augustus of Centerville, Iowa, says operations will be started at the Colorado-Maurer group, near Central City, this week. The Mountain Monarch M. Co. has a lease and bond on the group, which will be operated in connection with the Mountain Monarch group. The Colorado-Maurer has been idle for several years. It is intended to carry on developments through tunnel workings.——Work is under way on the Fort Logan tunnel property, west of Rollinsville, by the lessees, Fairchild & Galligan of Denver.

The Onoko G. M. Co., operating in Leavenworth gulch, near Central City, has resumed sinking operations. The shaft is down 220 feet and the company will sink at least 100 feet deeper. Developments are being carried on in the 120 and 220-foot west levels. In the 220-foot level there are six inches of solid copper ore, says Manager Shull. He will also raise from this level to make connections with the winze being sunk from the 120-foot level, which shows ore.

The Robert Emmett G. M. Co. has sold to the Stephens I. & T. Co. the Robert Emmett and Virginia Extension lode claims, on Maryland mountain in Chase gulch in Gregory district, near Central City, for $50,000. The property has been idle for several months. It is equipped with machinery, top buildings and has a shaft down 400 feet.

Uranium ore is reported being taken out of the Wood mine, in Leavenworth gulch south of Central City. The uranium shoot varies from 3 to 5 inches in width, alongside of which are copper and iron deposits carrying gold values. The ore is being taken from the bottom of the shaft at depth of 250 feet. The mine is owned by Eastern men and is under bond to local parties.

Gunnison County.

The north and south Hall's gulch tunnels, near Pitkin, are being driven with air drills and each is in 500 feet. The north tunnel is being run to cut the mineral-bearing contacts of the Mineral Farm basin, and the south tunnel to open up veins of the Silent Friend group at depth.

Hinsdale County.

T. Watson and W. Lynd are working the Cora and Sulphurets group under lease. The group is 1½ mile southeast of Lake City.——Gannon & Kranichfeld have a body of ore opened in the Pride of America.——It is said the Colorado & Connecticut G. M. Co., owners of the Dolly Varden group, will develop the two veins of the property during the coming spring.

Jefferson County.

The Morrison mine on Bear creek is being worked again. The ores carry copper values. The shaft is down 124 feet and it is intended to sink to depth of 200 feet and extend the levels, says Superintendent M. W. Dillon. A plant of machinery has been placed on the mine and fourteen men are at work. The mine is on Bear creek, 7 miles above Morrison.

Lake County.

The Yak tunnel at Leadville is driving on the Silver Cord property, a spur of the tunnel cutting into the claim. At the 100-foot mark levels have been started and one runs to the end of the Moyer, a distance of 540 feet, all in ore. At the bottom of the winze a level has been run south 380 feet and has tapped the Eagle raise and gone under the main tunnel. The ore body being worked is said to be an extension of the Moyer ore shoot.—— The Cord ore shoot in the tunnel has been opened by 1500 feet of drifts, 300 feet of raises and a winze 160 feet in depth. From other parts of the property a good grade of sulphides and iron is being shipped, the daily tonnage amounting to 150 tons.

C. H. Stead et al., operating the Dunkin mine, under lease from the Fryer Hill M. Co. at Leadville, are shipping two cars of high-grade iron a day and are driving development work.

The Dennis claim in St. Kevin, near Leadville, has made a find off from the 150-foot shaft. A drift was run at the 100-foot level and when in 43 feet it struck silver ore which averages 200 ounces silver per ton. J. Partridge, J. Parker et al. of Leadville are interested.

La Plata County.

(Special Correspondence). — A gold strike was made early in January on the Bulldozer claim, Lewis gulch. Some rich ore had been taken from this mine years ago, but the vein had been lost and the property lay idle for several years. Recently Durango leasers opened 18 inches of ore which assayed twelve ounces gold per ton, with some silver. Further work developed a vein 3 feet in width, which averages above $100 per ton, as shown by a shipment to the Durango smelter.

In the Little Rock claim, Oro Fino district, at a depth of 20 feet samples gave gold values of 8.41 ounces. It is claimed that the vein is 20 feet wide and all of it will pay to mill.

The mill of the Neglected mine is treating seventy tons of ore per day with satisfactory results.

The Chief M. Co. is pushing the work of building. The working force will be increased.

At the May Day a large crew has been added, which is facing up for the proposed tunnel and grading for the compressor plant on the flat near the river.

Mancos, Feb. 1.

Ouray County.

The mill of the Barstow M. & M. Co. in Commodoro gulch, 1 mile west of the Guston mine, near Ironton, began crushing ore this week. Electric power to run the five electric motors is brought over the range from the Ames power plant on the Telluride side. The Bobtail mine is the main vein worked by the Barstow Co. A tunnel, 2800 feet, is driven, exposing the vein for a distance of 2000 feet. The lode, which has northwest strike and dips southwest at 45°, is 40 feet in width. The concentrates for the present will be shipped via Ouray, but in the spring it is expected the Silverton & Red Mountain Railroad will be extended to that point, which will take the ore via Silverton to the smelter at Durango. It is the intention of the company to double the capacity of the mill in the summer, which, when completed, will give it eighty stamps dropping.

San Juan County.

The Alta claim, 1 mile from Chattanooga, near the Ophir road, near Silverton, is being worked this winter under bond and lease by F. Schurman et al. The tunnel run in on the vein shows a lead, with a pay streak 6 to 8 inches wide, with values in gold, silver, lead and copper. A new crosscut tunnel has been started 160 feet lower down than the present workings.

The Sunshine mine, above Eureka, at mouth of Picayune gulch, owned by the Wigwam M. Co., is being worked this winter by contractors driving a tunnel. The company has a group of eight claims. Last season a power plant was built which is run by water power. The fall of the water is 500 feet. It is proposed to put up a concentrating mill near the power plant.

San Miguel County

Work at the Tomboy mine and mill, near Telluride, is being steadily increased. Fifty stamps are dropping. This number will be increased as conditions warrant. At present the operations are being concentrated in the Argentine workings, where five levels are being worked in addition to the stopes. There are 250 men employed in the mine.

In March operations for the year will be begun at the Keystone placer, on the San Miguel river, 5 miles below Telluride. The two dams that were washed away last August by freshets caused by a waterspout at the source of the San Miguel river have been rebuilt. Two reservoirs that were destroyed at the same time have been replaced and enlarged. Over 1000 feet of additional sluice boxes have been built and new iron riffles have been put in for a total distance of 300 feet below the gravel pit, says the San Miguel Examiner. A 12x14-foot flume extending 600 feet has been built. E. L. Davis, a director in the company, says twenty-five men will be kept at the Keystone during the open season.

Summit County.

In the Wellington mine, near Breckenridge, operated by R. W. Foote et al., shipments are continuous from the lead-zinc vein, and the iron vein has been opened by crosscuts.

Teller County.

The Gold Nugget M. & L. Co. has been incorporated at Cripple Creek by L. E. Kimball, A. T. Pierce, G. L. Weaver, T. Ramsay and F. Richter.——The Gold Ore Leasing Co. has been incorporated in Denver by N. E. Kimball, G. L. Weaver, A. T. Pierce, E. P. Brown and M. T. Gunderson.

The Free Coinage M. Co., owning acreage on Bull hill, Cripple Creek, has given option of a five-year lease on the company's entire holdings. The lessees are to sink a shaft from surface, as a three-compartment working shaft, and to be sunk 200 feet per year during the period of the lease. The royalties are 25%. During the past few years the property has been worked exclusively by lessees. There are five sets of lesseeS operating at present, but these leases expire this month. Controlling interest in the Free Coinage is held by the S. Strong estate.

Engineer A. C. Jaquith of the El Paso drainage tunnel reports that last week the measurement showed 6500 gallons per minute flowing out. The men who are extending the east lateral are breaking down 30 inches of rock per day. They have not yet cut through the dike. As it is, the Elkton and Mary McKinney mines are being unwatered rapidly, and it is expected they will be able to get into their lower workings next week.

Governor Peahody last week terminated the exercise of martial law in Cripple Creek district, and the troops have delivered all military prisoners to the civil authorities.

The report of the Anaconda M. Co. of Cripple Creek for year 1903 shows there are thirty-five sets of lessees working the 100 acres of patented Gold Hill property, including the ore-house waste lessee. The production of all the lessees aggregated 2895 tons; gross value, $69,210.95; net mill returns, $45,528.95. The company's royalties amounted to $10,881.59, which, with rents, transfer and air accommodations, charged to lessees, brought total receipts for year to $16,671.66. The expenditures, including $4000 assessment to the drainage tunnel, $1200 manager's salary and $2747.65 taxes, aggregated $10,-933.33. In addition, mining expenses, of which lahor, fuel and water and bookkeeper's salary were chief, totalled $8169.42. F. J. Campbell, secretary and manager, says the drainage tunnel is lowering the water level of the mine at rate of 6 inches a day.

IDAHO.

Blaine County.

Superintendent Smith of the Carbonate Hill M. Co., operating mines on Cherry creek near Galena, near Ketchum, is preparing to put in a steam plant for his mines, as the water power cannot be depended on the year around. Taking water from near the head of the creek, it froze in the ditch last month. This compelled him to shut down the air compressor and resort to hand drilling.

Boise County.

The Mary Jane shaft, on Willow creek, near Idaho City, is down 192 feet. It has cut into the ledge 10 feet, showing ore which is expected to mill $3 per ton. The ledge has a 6-inch shoot of high-grade rock also, says G. A. Williams, superintendent.

Idaho County.

A strike has been made on the Silent Friend group of claims at the head of Big crook, near Roosevelt, in Thunder Mountain district. In running one tunnel a streak of sylvanite ore was cut at distance of 120 feet and about the same depth. The company is running two tunnels. The other tunnel is in 75 feet. A stringer of ore 12 inches thick has been struck, assaying $40. The company is owned by F. L. Thompson, G. B. Rogers, J. Howson and E. A. Johnson of Boise City. M. Jacobs is manager.

The Dewey mill at Roosevelt continues in steady operation, with ten stamps dropping, and twenty-five tons of ore per day are being run through. The company is employing thirty-five men.——The Sunnyside M. Co. is working thirty men. —— The East Dewey, owned by the Van Riper Co. of New York, is working eight men, and the H. Y. group, owned by the Perkins Co., is working ten men. — On the Mysterious Slide mine, owned by B. Caswell and M. Cowan, men have been kept constantly at work, and a 300-foot tunnel has been run into the claim, passing through 100 feet of sulphide ore.

Shoshone County.

The Bunker Hill & Sullivan M. Co. at Wardner is preparing an underground station ½ mile in the Reid tunnel, to move the blacksmith shop from the outside of the tunnel to a more convenient place on the inside and save hauling the steel to be sharpened that distance. The head blacksmith has six men to sharpen the steel, which will all be done on the inside, says the Review.

MICHIGAN.

The producing copper mines of Lake Superior are stamping over 1000 tons of rock per hour. The Calumet & Hecla at Calumet leads with tonnage of 5700 daily, the Osceola at Opechee has 3600 tons, the Quincy at Hancock 3500 tons, and the Tamarack near Calumet 2500 tons. The Winona at Winona has daily output of 200 tons; the Baltic, Champion, Trimountain, Wolverine, Mohawk, Franklin and Atlantic are each stamping between 1000 and 2000 tons daily. To furnish the power required to mine and crush this rock requires 100 tons of coal per hour, and 15,000 men are on the payrolls, besides giving indirect employment to thousands of other workmen in forests, on the railroads and sailing on the Great Lakes.

Houghton County.

Deed conveying the Arcadian mill to the Centennial M. Co., near Calumet, has been filed. It is said the price was $325,-000. The mill is said to have cost the Arcadian $480,000. The millsite includes 1¼ mile of shore front and contains 400 acres. President H. F. Fay reports to the company that on reaching the twentieth level the quality of the rock made it seem advisable to sink further, and the shaft has been sunk down to the twenty-fifth level and drifts started north and south of the shaft. These drifts—now 1250 feet long—which can be extended half a mile before reaching the boundaries, have opened ground of value. Since the twenty-fifth level was reached one drill has been used for sinking and the shaft is well below the twenty-seventh level, and several hundred feet in the twenty-sixth and twenty-seventh levels have been drifted, which show similar run of ground as exposed in the twenty-fifth level. The mine will be developed to furnish 1000 tons of rock per day to the mill. No. 2 shaft will be sunk from the surface to the ledge and from the twelfth level to the depth of No. 1 shaft. The rock house at No. 1 shaft, capable of holding 3000 tons of rock, will he finished, and shaft house on No. 2 will he built. Trostle from No. 1 to No. 2 will be erected and the shops will he removed to the Kearsarge location.

The Isle Royale management at Houghton has let contract for construction of stone and cement dam in the fourteenth level, connecting Nos. 1 and 2 shafts, as it is intended to abandon the burned out No. 1 shaft and allow it to fill with water, says the News.

Houghton reports say the management of the Quincy mine and the strikers are further apart than ever, and the young men among the strikers are leaving for other mines. The company has withdrawn the offer of $57 as a compromise and the miners have voted to stand by the trammers. At the smelter the management is putting in improved methods of casting copper, using the trolley system for handling ladles. Two furnaces are running on mineral from the Mass, Michigan, Adventure and Winona mines.

All the machinery for the hoist at No.

5 Tamarack shaft, near Calumet, is on the ground and being set up. It is expected the hoist will be ready for operation by March 1.

The Calumet & Hecla, near Calumet, has opened into the Kearsarge lode in No. 19 shaft, nearest the Centennial, at depth of 95 feet, the vein showing shot copper. This shaft is a vertical one and on hanging side of the lode. The striking of this lode by the Calumet & Hecla gives the mine three working lodes.

The January product of the Quincy mine, at Hancock, amounted to 601 tons 1635 pounds of copper; and the Franklin produced 359½ tons.

The Quincy mine strike at Hancock was declared off last week, the men voting to accept the company's compromise offer of $58.50 per month. Fifteen hundred men were idle sixteen days, but there was no violence.

The aggregate rock shipments being handled by the Copper Range railroad of the Copper Range Con. C. Co. amount to 5300 tons daily. The first increase over these figures will occur this month, when the four Baltic stamps are to be run to full capacity.

The Wolverine mine, near Calumet, during January yielded 505½ tons of copper.

Sinking in No. 19 shaft of the Calumet & Hecla, near Calumet, which struck the Kearsarge amygdaloid lode recently, has cut the hanging wall of the lode. The Kearsarge is mineralized for its entire width. It is expected work will be started on a permanent shaft, which will go down on the dip of the lode. In No. 20, the second Kearsarge exploratory shaft, sinking is under way at depth of 80 feet. A 3-inch air pipe has been laid from No. 17 engine house to No. 20 shaft to furnish air for the drills. A headsheave and larger hoisting engine are being set up. The Calumet & Hecla has resumed hoisting with the Hancock and Pewabic hoist, having replaced the cracked shaft with a new one. The hoist has been idle since August 24th last.

A rock crusher, said to be the largest in the copper country, weighing 24½ tons, has been completed for the Michigan Smelter Co., near Houghton. It will be used for crushing slag and have capacity of 1000 tons per day.

The January production of the Baltic mine of the Copper Range Con. C. Co., near Painesdale, amounted to 698 tons of copper, as compared with 701 tons in December. The Trimountain production was 595 tons, compared with 547 tons in December.——The Champion, also near Painesdale, produced 731 tons of copper in January.

Keweenaw County.

During January the Phœnix mine, at Phœnix, produced seventy-one tons of copper, including eighty-two barrels of mineral, from one head stamping. The rock averaged 1⅞%.

The Mohawk No. 4 steel shaft house near Allouez has been completed.

MISSOURI.

The year 1903 brought to the Missouri-Kansas mining district the largest returns for ore sales of any year except the "boom" year 1899, says the Joplin News-Herald. Last year's total zinc and lead sales in the district aggregated $9,452,840, or $21,690 more than the sales of 1902. The output, however, was less than that of 1902 by 27,813 tons of zinc ore and 3177 tons of lead ore. The improved methods adopted by many of the mines have added largely to the profits. Only a few mills were built in the district during the year, but considerable prospecting was done, which will result in building of mills as soon as the natural course of development will warrant. "The district is profiting by the lesson learned in the boom days of 1899, where costly concentrating mills were built over holes in the ground that could claim no pretensions to being mines." One difficulty the district had to contend with last year was the scarcity of coal, the railroads at times being unable to supply the district's demands for coal. ——The present year promises a larger output of both zinc and lead ore. Discoveries have been made by drill prospecting, which are expected to develop into producing mines in time to add to the output of 1904.

The total output for 1903 was 234,733 tons of zinc ore and 28,438 tons of lead ore, of a total value of $9,452,840. The average price paid for 60% zinc ore for the year 1903 was $54.55 per ton.

Jasper County.

At Webb City the Southwestern P. & Dev. Co. has been incorporated to prospect leases by drill and sublease to miners. The officers are: G. W. Moore, O. E. Duenweg, E. C. Walden, C. N. Chrisman and G. W. Strain, the last named being manager. The first year's work will be done in the proven territory of the Webb City–Carterville district. They propose putting at least three drills to work. They will keep an accurate record of each drill hole.

The Independent M. Co. has completed a mill on its lease on the Guinn land, at Webb City. Automatic feeding devices are a feature of the construction, and Superintendent Conkey expects to handle 250 tons per shift with only three men. ——The Congress M. Co. (one of the Morton properties) on the Guinn land is overhauling its mill, raising the tailing elevator, and getting ready to start mining. This prospect was formerly the Narragansett.——The Yale mill of the Old Colony Z. & L. Co. on the Missouri Zinc Fields land, is being arranged so it can run custom dirt as well as from their own lots. Additional milling capacity is needed on this ground to accommodate the large number of small lessees who have as yet no mills of their own.

The Cunningham fee of 129 acres, west of Joplin, is becoming a producer, says the News-Herald. J. Aldrich has a lease of twenty acres of the Cunningham land, and on this lease there are ten drill holes, nine of which show ore. The shaft is 129 feet deep. Drill holes on the west and south of this twenty-acre tract have struck the same ore formation. On the northeast adjoining is the May Bell lease, on which they have struck a body of ore at the 140-foot level, and are in 8 feet of ore. The Bunker Hill adjoins the twenty-acre tract, the Quaker on the west, the Jack Rose on the north. Aldrich expects to strike ore at 162 feet.

The Ground Floor M. Co., composed of Cleveland men, who have a lease of ten acres of the Randolph M. Co.'s lease of the Guinn land, north of Webb City, and south of the Golden Rod, have started operations. They are sinking a shaft 6x8 feet in the clear, using steam drills, says Manager Bendelari.

Joplin reports say the highest price paid for zinc ore during the past week was $38 per ton, and for lead $57.50 per ton. The shipments were larger than the preceding week by 1,175,280 pounds of zinc, but was 486,810 pounds of lead less.

The Jewel C. mill, near Carterville, operated by Carmean & Canada, has begun regular operations. The mill and hoisters are operated by electric motor, power being furnished by the Missouri Zinc Fields Co. They are hoisting dirt from the level which has been under water for the past year.

J. O. & D. Flynn, F. Ozburn, G. A. Case, M. S. Montague, C. T. Hanshaw, R. D. & W. C. Martin, J. W. Duncan and S. Etter have organized the Velvet M. Co. of Missouri in Joplin.

Lichliter & Varner have their mill at Alba in operation.——S. D. Mitchell has added forty-two acres to his holdings by buying the S. B. Holden tract, northeast of Zincite, for $10,500.——Stevenson & Bourne, W. Roberron et al. have struck a favorable prospect on the Wiley Webb forty at Duenweg. In sinking the shaft they have been getting some lead and jack from 45 feet down to 80 feet, and at 80 feet they broke into a body of jack.

Lawrence County.

J. B. Davis has his concentrating plant on the Shipman land, near Stott City, complete. He has two drills running on adjoining land.

MONTANA.

Beaverhead County.

The Hecla Con. M. Co., with headquarters at Melrose, Silverbow county, has put in a heavier pump in the Cleve mine at Hecla, and is working fifty men. As soon as the pump clears the mine of water more men will be put on. Ore is being shipped.——The Montana G. Dredging Co. has decided not to start their boat the coming season. This company owns holdings on Grasshopper creek from the Bon Accord mine to mouth of creek at Beaverhead river, about 9 miles.

C. M. Stolle and G. Eighorn are working the Trapper mine, one of the Hecla group at Hecla. The ore value is principally silver, but the quartz carries some copper and lead.

Deer Lodge County.

Development work is being increased on the Southern Cross mine, near Anaconda. It is intended to sink the shaft 200 feet. The company is shipping ore. The presence of iron in the ore lessens cost of smelting, and, in some shipments, pays the whole cost, says the Inter-Mountain.

Fergus County.

Smelting ore is being shipped from the Black Horse group of claims in the South Moccasin mountains, near Lewistown, by R. E. Hamilton, owner. The ores of the Black Horse have their principal values in lead, with some silver, gold and copper. Hamilton has five claims along the lead and expects to ship three cars of ore weekly. The width of the vein is 3 feet.

Jefferson County.

The New York & Montana C. M. Co. has been incorporated under Dolaware laws to work the McCabe group of mines in the copper district of Corbin, by M. Hyman, A. L. Curtis, A. B. Camphell and D. Sage of New York; G. Sumner and D. W. Morrow of Englewood, N. J., and J. Virdin of Dover. Three shafts are being sunk on the group, one of which has reached depth of 134 feet, another 60 feet and the third 50 feet. Development work has been encouraging.

The Eva May mill, 6 miles from Basin in the Cataract copper mining district, will be enlarged. It is owned by the Montana Mineral Land Dev. Co. The mine has bodies of copper ore blocked out and has been opened up by a vertical shaft to depth of 650 feet and levels run at the fourth, fifth and sixth to distances of respectively 1200, 1500 and 1400 feet. From the 600-foot level a winze has been sunk to depth of 80 feet, opening up a body of chalcopyrites. This mine is equipped with a hoisting plant. The mill capacity will be doubled to 150 tons a day. New tables will be added. At the mine the plans include sinking the main shaft to additional depth of 200 feet.

Powell County.

A boiler and machinery are on the ground for the Montana United M. Co., near Emery.

Silver Bow County.

The indications are that this year will be the most prosperous in the history of copper mining in Butte, says the News. The capacity of the Butte, Anacouda & Pacific and the Great Northern railroad companies is being taxed to handle the ore sent to Anaconda and Great Falls. The Washoe copper smelters at Anaconda are working full blast and concentrate, melt and turn into ingots 6000 tons of ore daily.

NEVADA.

Humboldt County.

At Rebel Creek Superintendent J. J. O'Connell reports they are making progress in driving the 500-foot tunnel on the Sunburst mine. Bad air causes some trouble, but they are putting in pipe for ventilation. They are driving the tunnel on the vein. The ledge is 150 feet wide. After they run 400 feet they will drive crosscuts both east and west.

Lander County.

W. Licking has bought half interest in a group of copper claims 6 miles west of Battle Mountain. Licking has men at work taking out ore for shipment.

Lincoln County.

West of the mill the Quartette M. Co. at Searchlight will build an electric plant. The site has been graded. Two gasoline engines will drive the generators. The power will be used to operate the pumps and for lighting purposes. Later an electric line will be installed to tram the ore from the Copper King mine to the mill. To prevent seepage of water from tailings ponds back into the mine, it is proposed to use a series of settling tanks.

T. O'Connor has bought the Yellowstone mine, near Searchlight. —— The Empire mine has men at work and has struck water in the Mountain Jewell shaft at depth of 140 feet, says Superintendent Ross.

Nye County.

The Dolores Turquoise M. Co. has begun operations on its property at Ray, near Tonopah, under management of J. C. Conklin.

Washoe County.

On the 260-foot level in the Wedekind mines, near Reno, it is reported, they have again cut the shoot of high-grade ore. J. Sparks, owner, says he makes no distinction in the class of ore, however, and the rich with the lean finds its way into the mill, which will again be put in operation this month.

A slime pond is being made at the Olinghouse mill, at Olinghouse, to impound the tailings which it is expected to cyanide.

The Slip mine in Olingbouse canyon, near Wadsworth, has been sold to the Springfield–Nevada M. Co. for $10,000 cash.

NEW MEXICO.

Colfax County.

Over 300 men are at work in the coal mines being opened up at Willow Arroyo, says the New Mexican. The mines at Blossburg may also be reopened in the spring.

Grant County.

The North American, Aberdeen and American Con. companies, operating in Shakespeare district, south of Lordsburg, are all preparing to resume operations, says the New Mexican. The Dakotah Pearl is a copper proposition, owned and operated by the Michigan–New Mexico C. Co. The mine is down 300 feet and showing ore running 4% in copper and carrying gold and silver values. The management will put in heavier machinery.

Wilson & Co. have two leases, one on the Romero and one on the Chino ground at Santa Rita, says the Silver City Independent. On their lease on the Romero are two shafts, one 70 and one 90 feet in depth, from which drifting and cross cutting has been done, opening up several veins. The ores are sulphides, carbonates and glance. The Tin Can shaft on the Chino lease has depth of 110 feet and is in ore carrying a 12-inch shoot of black sulphides averaging 17% copper.——Riney & Co. are leasing on the Romero and making monthly shipments of 150 tons, averaging 20%. —— H. W. Dawson is leasing on the Chino and employs fifteen men, who are working on contract; depth of workings, 150 feet; production, forty tons of 20% copper ore per month.—— Dawson & Co.'s lease on the Aztec has opened up a body of ore showing red copper oxide and native copper. Twelve men are working and thirty tons of ore are shipped each month.——Selleck & Co. are operating the Crawford & Fritter lease, shipping 100 tons of ore monthly averaging 15% copper.——Ernest & Islas are on the old workings of the Romero. The depth of the shaft is 100 feet. The ore body has been crosscut 40 feet and stoped up 40 feet, showing red oxide and native copper, averaging 25%. Production of 100 tons per month is being made. These lessees are sinking another shaft 160 feet north of the present one.——Crawford & Co. have a lease on the Chino and employ twenty-five men; output, 100 tons per month. This lease is equipped with steam hoist, three whims and a windlass. Most of the ore mined comes from the 125-foot level. The ore is red oxide, copper glance and carbonates.——The McGregor Co. is operating through the old Romero shaft, which is equipped with steam hoist. The shaft has depth of 400 feet, but the ore at present mined comes from the 150, 200 and 300-foot levels; production, 100 tons per month, averaging 20% copper. The above shipments in most cases represent sorted or concentrated ore.

Rebuilding the mill of the Aberdeen M. Co., near Lordsburg, has been completed and concentration of ore resumed. Regular shipments of concentrates will be made to the smelter.

Luna County.

The Sierra Florida M. Co. will put up a smelter at or near Deming to treat its ores.

San Miguel County.

A tunnel has been driven on the Apex mine, 30 miles northwest of Las Vegas, near head of north fork of Gallinas river. The tunnel is in 60 feet on the vein. Ore is showing at the face, 4 feet in thickness carrying pyrite with silver and gold values. A stationary engine and diamond drill are being set up at the coal mine being opened near Trout Springs, near Las Vegas. J. Leonard, superintendent, says he is testing a 5-foot vein of coal.

Sierra County.

The hoisting machinery at the Empire mine, near Hillsboro, is in position and two shifts are at work on the mine.—— The Kanawha G. M. & M. Co. has an option on the Good Hope Bonanza mines, near Hillsboro. —— El Oro mines at Andrews will resume operations this month.

Taos County.

The Jayhawk G. M. Co., at Red River—L. Rogers, of Waco, Texas, president—will resume work on its mine and mill in the spring. Ore bins are being built, and machinery set up at the mill to concentrate the ore. Work on the tunnel and shaft will be increased. R. P. and J. Kelley are developing the Silver Bow mine, on Placer creek. The ore assays ninety ounces of silver with gold values. G. D. Jordan is developing a wolframite property also near Red River.

OREGON.

Baker County.

A. B. Ernst, manager of the Virginia mine, near Sumpter, says the rotary mill now on the property will be replaced by ten stamps. Lumber to make the necessary changes in the buildings is on the ground, and it is expected to be again in operation in March.

E. S. and C. E. Platts of Baker City, owners of the Platts group in Rock Creek district, are preparing with A. G. Wintz of Ellensburg, Wash., to develop other Rock creek properties in which they are also interested.

The controversy over the ownership of certain mining grounds claimed by the Baby McKee M. Co. and the Eagle M. Co. has been compromised by a division of the disputed territory. The former owns the Baby McKee and the Last Chance groups and the latter the Imperial group, and between are the Annex lode of the Imperial and the Infidel lode of the Baby McKee group. By the settlement the development of these will go ahead.

Curry County.

Portland reports say a strike has been made in the mountains of the Sixes region, on Sixes river, Curry county. A gravel bed or channel has been uncovered by the Sixes M. Co. that is giving returns of $1 a pan. The bank has a depth of 20 feet to bedrock. In the early days the

Sixes river channels were worked to some extent with shovel, recker and sluice, but the banks were too deep and closely cemented to be worked by hand. During the past season the Sixes M. Co. has put in hydraulic equipment.

Jackson County.

Mining Superintendent Orme, for the Condor Water & Power Co., will next month begin work of installing a 20-stamp mill at the Braden mine, near Ashland, to be operated by electric power from the Gold Ray station. The power line will be 4 miles in length. Electric power will be used to operate the drills, hoisting and other machinery about the mine. Bodies of ore are blocked out.——Work is going on at Whitman & Heard's Ore Grande M. Co.'s placers on Carbury fork of the Applegate. The plant is being increased to three giants. The Misseuri M. Co., in which Smith & Warner are interested, is also operating a placer on Carbury with a No. 2 giant.

The dredger of Champlin & Co., on Foots creek, near Gold Hill, has been launched and is receiving its machinery. A boiler, weighing nine tons and of 120 H. P., is being set up. All of the other machinery for the dredger is on the ground. Champlin & Co. have two dredgers at work near Bannock, Mont.——The work of overhauling and placing new machinery has been completed at the Sturgis hydraulic mines on Forest creek. Among the improvements are a derrick for handling the boulders, and a complete electric lighting plant.

Josephine County.

Spokane, Wash., men have bought the Lucky Queen mine, Jump-Off-Joe district, near Grants Pass. C. D. Grane is superintendent and has restarted development. For several years the Lucky Queen, which at one time was equipped with a mill and plant, has been idle. The workings are being cleared and retimbered and new tracks will be laid, etc.

Development work is progressing on the copper mines of southern Josephine county, aside from that under direction of the Walde S. & M. Co. at Waldo. Among these is the Queen Bronze on the Illinois river. It is owned by Colorado men. A shaft was sunk 110 feet and a drift is being run on the ledge from this level. C. J. Murphy is superintendent. ——Farther south, on Shelley creek, is the Monumental mine, being developed under bond by T. W. Draper and California men. Fifteen men are at work. Values are carried in copper, gold and silver. The ore is said to be a concentrating and cyaniding proposition. ——Little work is being done at the mines of the Waldo S. & M. Co. They are well developed and ready to begin output as soon as the smelter is built.

A hydraulic mine is being developed in Humbug district, on Applegate river, south of Grant's Pass, by White, Christian & Benson. A reservoir has been built and a No. 2 giant set. It will be operated under 150-foot head. Piping began last week.

The Williamsburg M. Co., of Portland, has resumed development work at its Williamshurg mines on Williams creek, says the Ashland Tidings. The mines are equipped with an 8-stamp mill.

The tubular elevator for the Deep Gravel hydraulic mines at Waldo has been set and is at work, says Manager W. J. Wimer.

SOUTH DAKOTA.

Lawrence County.

The Golden Empire M. Co. has opened up a body of quartz ore in a shaft started on the Eureka claim, in Bear gulch, near Welcome City, west of Spearfish. The ledge is 300 feet in width and pans $3 per ton in free gold. The ore is said to also carry tin. It is intention of the Golden Empire Co. to put the 20-stamp mill in operation on ore from this ledge this month.

The Big Four M. Co. has cleared away the ruins from the fire at the shaft along upper Deadwood gulch, near Deadwood, preparatory to rebuilding the shaft house. A new hoist, boilers, air compressor, pump and other machinery will be put in. It is expected to be ready to resume by May 1st, when work of sinking the shaft, now down 170 feet, will be continued to the 500-foot level.

The Buxton mine, at Terry, in Bald mountain district, consists of one claim and a fraction, ten acres being the size of a claim in the days of its location. J. Lundberg, with Dorr and Wilson, have built a cyanide mill on the property and the mine is again being worked.

UTAH.

Beaver County.

The Monarch M. & S. Co. has been incorporated under Maine laws. A. B. Lewis of Salt Lake City is manager. The Monarch combination will include the Comet group, adjoining the Cactus mine, of the Newhouse M. & S. Co. at Frisco: the Imperial mines in the San Francisco range of mountains; the properties of the Royal G. & C. Co. in Beaver and Iron counties; the Manhattan and Pioche Con. mines at Pioche, Nev., and the Last Chance .. ine at Bingham.

Juab County.

S. McIntyre of Salt Lake City, president of the Mammoth M. Co. at Eureka, says his company prepeses building a smelter. The old mill belonging to the company may be utilized. The Mammoth is well supplied with water and sufficient pumping capacity.

Salt Lake County.

The Eureka-Ophir is the only property being worked at Dry Canyon, near Bingham. The Pittsburg-Utah has suspended operations.

Steel for the addition to the Highland Boy smelter at Bingham is arriving. The order calls for delivery of over 500 tons of structural material. The management expects to have the plant ready to go into operation June 1st.

Summit County.

The Pinyon Ridge M. Co. has been incorporated, under Maine laws, by J. M. and F. J. Goodwin of Biddeford, Me.; J. A. Snow and J. Berry of same State, J. McGregor, F. and S. C. McKeen, B. V. Marshall, H. and L. McDenald. J. McGregor of Salt Lake City is president. The holdings of the company are at Park City and consist of a portion of the Pinyon and Pinyon Extension and portions of the Walker and Buckley, on Crescent hill, the Nettie and an interest in the Roaring Lion. These claims are surrounded by the claims of the Kearns-Keith M. Co. on three sides and adjoin the property of the Silver King on the other. In addition to these, the company owns holdings which adjoin the property of the Silver King M. Co. on the north, west and southwest—in all thirty-one patented claims, besides others unpatented, the whole covering 400 acres. The company also owns easements in and on the Kentucky No. 4 and Kentucky No. 5 mining claims, also rights of way through the mining claims of the Silver King M. Co. for tunnels.

The Daly-West mine at Park City is shipping from 1300 to 2000 tons a week of ore and concentrates. Shipments from the Silver King run from 800 to 1200 tons, and the Keith-Hearns mill is turning out weekly seventy tons of concentrates.

The machinery at the Ontario concentrator at Park City was put in operation last week, says Superintendent Moffatt. The number of men at the mine will be increased to fifty.

Washington County.

J. S. Ferris says the coal measures recently found in Washington county are 5 miles south of the line between Iron and Washington counties, on Peter Leap creek, and 7 miles from the Harmony coal mine, near Cedar City, Iron county. The vein was found by H. S. Marshall of Tropic near the site of the church diggings which were worked in 1874. The footwall is sandstone, with limestone and then conglomerate on the hanging. H. S. Marshall of Tropic, W. Harris of Leeds, A. F. Gregerson and J. S. Ferris of Bellevue and J. V. Ferris of Colorado City, Colo., have each located a quarter-section of the land and they have formed a company to develop the ground. The vein is 4 feet wide.

WASHINGTON.

The report of State Coal Inspector C. F. Owen shews the past year has been a favorable one to the coal mining industry of the State, the total output having increased 18.57% over output for 1902, while fatalities in the mines show a decrease of 26.60%. During the year 1903 there was a total of 948,909 tons of coal exported to points outside the State. Improvements have been made in all the principal mines of the Northwest Improvement Co., the Pacific Improvement Co., the Issaquah Co., Carbon Hill Co. and several others. The resumption of tariff on foreign coals will increase Washington's export shipments. The producers were as follows:

	Short Tons Mined.
N. W. I. Co., Roslyn (Kittitas county)	1,032,530
N. W. I. Co., Cle Elum (Kittitas)	331,400
Summit C. M. Co., Cle Elum (Kittitas)	2,000
D. A. Brown Co., Roslyn (Kittitas)	3,000
Roslyn Coal Co., Roslyn (Kittitas)	7,087
Pacific Coast Co., Franklin No. 1 (King)	90,159
Pacific Coast Co., Newcastle (King)	145,374
Pacific Coast Co., Lawson mine (King)	86,987
Pacific Coast Co., Franklin No. 7 (King)	82,480
Pacific Coast Co., Franklin Gem mine (King)	65,646
Black Diamond Coal Co., Black Diamond (King)	278,922
Seattle Electric Co., Renton (King)	134,743
Issaquah Coal Co., Issaquah (King)	105,643
Denny Clay Co., Kummer (King)	10,705
Occidental, Palmer (King)	16,024
Fred Nolte Co., Cumberland (King)	6,700
Snoqualmie C. & C. Co., Snoqualmie (King)	5,000
N. W. I. Co., Ravensdale (King)	187,900
Carbon Coal Co., Cumberland (King)	235
Carbon Hill Coal Co., Carbonado (Pierce)	280,123
South Prairie Coal Co., Burnett (Pierce)	69,912
Wilkeson Coal & Coke Co., Wilkeson (Pierce)	55,399
N. W. I. Co., Melmont (Pierce)	83,100
W. A. Co., Fairfax (Pierce	33,600
Gale Creek Coal Co., Wilkeson (Pierce)	37,182
Black Carbon, Pittsburg (Pierce)	4,000
Montezuma, Fairfax (Pierce)	11,970
Skagit Coal & Coke Co., Cokedale (Skagit)	19,256
Blue Canyon Coal Co., Blue Canyon (Whatcom)	600
Marion Howell, Centralia (Lewis)	1,300
Crescent Coal Co., Chehalis (Lewis)	500
Great Western Coal M. Co., Tenino (Thurston)	1,000
Total	3,190,477

The output by counties was:

	Tons.
Kittitas	1,376,017
King	1,216,518
Pierce	575,286
Skagit	19,256
Whatcom	600
Lewis	1,800
Thurston	1,000

The total value of the coal mined in 1903 was $6,380,954, based on $2 per ton at the mine; and the average wage charge per ton of coal mined is $1.25. In addition there were 47,916 tons of coke manufactured at a value of $239,580 at the ovens. The coal mining industry gave employment during the year to 4876 men, whose total earnings were $3,982,184, based on an average daily wage of $2.67. There were twenty-five fatal and eighty-three non-fatal accidents in the mines in 1903.

Cowlitz County.

J. P. McInerney, of The Dalles, Or., secretary of the Coal Creek Coal Co., says the company is taking out coal from its mines in Cowlitz county and will ship it to the Columbia river. The coal shows good grade of semi-bituminous quality, and development consists of 200 feet of work. They have a railroad from the mines to river transportation. It is expected shipments will begin this week.

Ferry County.

Work has resumed on construction of the mill for the Bedie M. Co. at Bedie camp, near Republic, and men are also being put to work in the mine, says C. M. Fassett of Spokane, president. Work at the mine was suspended several weeks ago. All the material for a 10-stamp mill is on the ground.

Snohomish County.

Manager Braden of the American S. & R. Co. smelter at Helena, Mont., has twenty men at work at its smelter at Everett, but will increase the number to 200 and put the plant in full operation. Later the plant will be enlarged.

Stevens County.

The Syndicate M. & M. Co. has been incorporated by Spokane men to develop property in Meteor camp, on south half of Colville reservation, 12 miles southwest of Daisy. The company owns twelve claims between the Stray Dog and the Nonpareil, as well as the McDonald group, which was bought last year and which has been worked since by a co-partnership. The work has shown gold, silver and lead values. The officers are W. W. King, T. J. Coffman, D. S. Prescott and E. F. Waggoner.

WYOMING.

Laramie County.

The Colorado F. & I. Co., Pueblo, Colo., has made preparations to make large shipments of iron ore from its leased mines in Sunrise district. The bridges on the railroad between Hartville Junction and Sunrise have been rebuilt and the track put in condition. Since the shutdown at the mines six weeks ago a few men have been engaged putting the properties in shape for increased output. It is expected two trainloads of ore will be shipped to Pueblo daily.

FOREIGN.

AFRICA.

Rhodesia.

The total gold output of companies making returns to the Rhedesian Chamber of Mines at Bulawayo for month of December amounts to 18,750 ozs. (Matabeleland, 15,244 ozs.; Mashonaland, 3506 ozs.). The monthly returns for the year, compared with 1902, have been as follows:

	1903. Ozs.	1902. Ozs.
January	16,245	15,955
February	17,090	13,304
March	19,626	16,891
April	20,727	17,559
May	22,137	19,698
June	22,166	15,842
July	23,571	15,226
August	19,187	15,747
September	18,741*	15,164
October	17,918*	16,849
November	15,714*	15,923
December	18,750*	16,210
Totals	231,872	194,268

* Silver produced:—September, 4160 ozs.; October, 4231 ozs.; November, 4757 ozs.; December, 2573 ozs.

West Africa.

The Ashanti Goldfields Auxiliary, Ltd., has its two dredgers on the ground at Sekendi and they are being set up. They will conduct operations on the River Ofin.

BRITISH COLUMBIA.

Boundary District.

Boundary shipments for the month of January were:

	Tons.
Granby	44,520
Mother Lode	12,114
Emma	4,014
Oro Denoro	3,736
Athelstan	957
Senator	318
Total	65,659

Rossland District.

At Ressland operations were resumed this week at No. 1 mine of Le Rei Twe group. The product of the No. 1 will be shipped to the smelter at Grand Forks. The mine was closed down four months ago. The mine is said to be well developed, but its body of smelting ore was comparatively small. Production will be governed in a measure by capacity of the smelter to take the output. The No. 1 mine possesses bodies of iron ore, though these iron ores do not carry high enough values to permit of their being utilized in same manner as the higher grade pyrrhotite gold-copper ores, but the excess of iron over silica is such as to command favorable smelting rates from smelters to which this excess of iron is valuable for flux. The product of Le Rei Two concentrator is not as yet being shipped to any smelter under contract.

Slocan District.

A. Bigney, of Sanden, who has a lease and bond on the Majestic and Unexpected crown-granted claims on Payne mountain, reports cutting a vein of ore, varying from 6 to 12 inches wide. The length of the tunnel is 75 feet.

West Kootenay District.

Development work has been started on the Buffale group, near Peplar, under superintendence of H. White. It is intended to first run a 60-feet tunnel to tap the lead at 50 feet depth.

O. Sandberg, of Albert Canyon, W. E. Newcome, of Ferguson, and V. M. Westfall & Co., of Trout Lake, have bought the Lanark group of claims at Laurie. This group consists of fifteen crown-granted claims and fractions.

CANADA.

Alberta.

President A. C. Flummerfelt of the International Coal & Coke Co., operating at Coleman, says they shipped 100 tons of coal daily during December, which has been increased to 180 tons. Within eighteen months the company expects to increase its output to 2000 tons a day. In development work they have opened drifts to depth of 350 feet, 252 feet and 400 feet, respectively, the vein in the last named or main drift being 17 feet thick. The company has sixty-eight men in the mines, but is building houses, etc., and has 200 men on the payroll. Coleman is 6 miles east of Crow's Nest station, on the boundary between Alberta and British Columbia.

Nova Scotia.

Premier Murray reports that the revenue of the province for the year 1903 amounted to $1,243,581, of which royalties from mines yielded considerably more than half.

Yukon Territory.

Winter mining on the Klondike is in successful operation on No. 10 below, on Bonanza creek, near Dawson. A steam pipe heated by means of crude oil runs full length of a sluice box, by which the water is kept warm and the pay dirt shovelled into the sluices as in summer operations. At other points on the creek sluice boxes have been set up in drifts underground, protected from the cold air, warm water being used and re-used in washing gravel. The weather on the upper creeks has been comparatively mild, ranging from zero to 10 and 40 below.——There is talk in Dawson of an all-Canadian railroad from Dawson to points on the outside. The matter is mainly in the hands of the Governor of the Territory. Preparatory work is under way on the Klondike tributaries. It is said the mines are in better shape for production than ever before at this time. Supplies are abundant.——Favorable reports are received at White Horse from the new diggings on Beulder and Ruby creeks, 170 miles from White Horse. At depth of 6 feet, on Boulder, from 20 to 30 cents to the pan is obtained. In six days two men took out forty ounces on Ruby, while Boulder has paid three ounces a day to the man. Stations have been built and provisioned along the route from White Horse.

The Copper King mine, near White Horse, has made shipment of 150 tons of copper ore that also carries values in gold and silver. This mine will make regular shipments.

MEXICO.

Aguas Calientes.

The Aguas Calientes Metal Co., of Asientos, operating La Merced y Anexas group, in Ocampo district, 8 kilometers west from Cobre station on the Mexican Union railroad, in putting in a 110 H. P. steam turbine, an electric hoist, triplex electric pump, hoilers and other equipment. The group is being developed through two vertical shafts, one of which is two-compartment and down 260 feet. The other is single compartment and down 315 feet. The ore is said to run 5% copper, 8 ounces silver and 0.2 ounce gold per ton. The same company is also operating the San Simon y Anexas group, in same district, 1 kilometer south from Cobre station. Development on this group consists of one single-compartment vertical shaft, down 200 feet, and two tunnels, respectively 200 and 150 foot in length. The shaft is equipped with horse whim. Ore from the San Simon y Anexas group runs 5% copper with silver values. The two groups cover total of 44 pertenencias, says Albert Doerr, manager.

Chihuahua.

The Palmarejo & Mexican G. F. Co., at Palmarejo, reports December returns at: "Zapote" works, crushed 3100 tons and treated 2400 tons, producing $17,300 gold, $36,700 silver. The exponses were $42,650. The mill ran twenty-five days only.

W. D. Pearce of Chihuahua, manager of La Luz G. M. Co., operating at Maguarichic, reports the mill is completed and will be in operation next week. Ditch and pipe line to furnish water power is also being built.

The Corralitos M. Co. has closed down its mines at San Pedro on the Sierra Madre railroad from Juarez to Nuevas Casas Grandes. The concentrating plant at Juarez is also temporarily closed down.

A one-kilometer gravity double-track tram is being built for La Compania Ignacio, Rodriguez Ramos, S. A., at that company's Cigarrero mine, in Sierra Almaloya district. The capacity of the tram will be 250 tons from each of the two stations every ten hours.

Durango.

(Special Correspondence).—The International railway is extending its line north of Santiago de Papasquairo toward Guanacevi. This will open up several old camps in the country tapped by the railroad.——Three days on the trail, southwest from Santiago de Papasquairo, are the mines of the Bacis G. & S. M. Co., Ltd., an English company. Its holdings consist of 18 pertenencias. The values are found in sulphide of silver carrying gold. Ore is worked down to twenty-five ounces in silver per ton. The ore is carried from the mine to the mill by aerial tram. The mill of twenty stamps, crushing twenty-five tons of ore daily, is operated by water power piped from the Bacis river. The pipe line is 6000 feet long, decreasing from 30 inches in diameter at the river to 20 inches at the mill. Ten more stamps have been added and will be in operation next month. The company is also working a Bryan mill crushing twelve to fifteen tons daily. East of the mill excavating is in progress for machine shops. Some stringers of ore have been struck in this work which assayed twenty-one ounces in silver. Near the mill on a dike of porphyry and quartz bordering the river is the stone and cement shaft from which the Spaniards extracted their richest silver ores. W. S. Pearless is manager and A. J. Griffin assistant manager and chemist.——There are 200 men at work in development of the Cobre mines, 3 miles below Bacis. The company is owned largely by Hildebraudt & Co. of Durango, also Cushing & Walkup, owners of La Trinidad mine. The ore is a low grade sulphide of copper, with azurite. The vein runs 2½ to 5 feet in width. A concentrating plant of daily capacity of twenty-five tons has been completed for experimental treatment of the ores. L. Walkup is manager and T. Broidenbach is superintendent of the concentration plant.

Much development work is in progress near Huahuapa, which is on a branch of the Bacis river, toward San Dimas. The camp is comparatively a new one, but is shipping considerable high-grade silver and copper ore.

The silver mines at San Lucas, near Canatlan, on the International railway, north of Durango, are being operated by an American company.

Durango, Jan. 28.

Guerrero.

The Negociacion Minora Rosario y Anexas of Taxco is operating the Xhocotitlan and other claims in Alarcon district, 24 kilometers northwest from Naranjo station, on the Mexican Central Railroad. They cover an area of 120 pertenencias. Development consists of a double-compartment vertical shaft down 250 feet, one drainage tunnel driven 2000 feet, and crosscuts, drifts, etc., says the Mexican Investor. It is equipped with two Huntington 8-foot mills, five Frue vanners, one 15 H. P. single steam hoist, two steam pumps, four other pumps, one 8 H. P. engine, one 25 H. P. engine and two boilers with total of 38 H. P. The ore carries gold and silver and is said to run $40 Mexican per ton. B. Gorow is superintendent.

The Santa Cruz, Azianena and mines in the district of Santiago Papasquiaro, 95 kilometers from Parral, Chihuahua, owned and operated by the Restauradora M. Co., are developed by a three-compartment incline shaft, down 200 feet, four tunnels driven several hundred feet, and crosscuts, drifts, etc. They have a 50-stamp mill (950 pounds per stamp), two steam hoists, engine, hoilers, etc. A 100-ton cyanide plant is being built and the company is planning to put in Bryan mills also. The ore carries gold and silver values, says Manager H. H. Hughes.

Jalisco.

Douglas, Lacy & Co. of New York and Mexico City are sinking shafts on the Buena Ventura, San Salvador and Veta Grande mines. The Veta Grande is said to be producing ore which assays 16% copper, with $20 per ton in gold and silver. The vein is 5 feet wide. They have started work at another place on the vein, which they expect to connect by tunnel with the first one. The group is 6 miles south from Ezatlan and consists of twenty-four claims.

A company has been formed at Mexico City for development of the Esmoralda mines, in the municipality of Pihuano. The ores of this mine are said to carry 8% cobalt, 7% nickel also bismuth.

Mexico.

The Con. Gold Fields of South Africa Co. has taken over the Libertad group of mines between Tlalpujahua and El Oro. The Libertad adjoins the Dos Estrellas and the Union.

El Oro M.& R.Co., at El Oro, reports for month ending Dec. 31, the mill ran twenty-seven days, crushing 8567 tons, producing from 100-stamp mill, $106,913, producing from cyanide plant, $3698. Working expenses and development amounted to $63,075. The profit from the railway for the month was $9000. There has been expended on permanent improvements $35,279, including $26,009 on new mill.

Nuevo Leon.

The Bajan district, near Monterey, is reported shipping 2000 tons of ore monthly to the Monterey smelter. The Norias de Bajan, the Bonanza, the Mealy mines and the smaller mines of the district show an increase in tonnage, and generally a higher grade of ore with less zinc.

Oaxaca.

The Royal Crown M. Co. has taken over and is operating the Royal Crown group of claims, 3 miles southeast from Ocotlan, in Taviche district. The group consists of the Royal Crown, El Rey, La Reina and Prince claims, covering a total of 34 pertenencias. The Royal Crown was formerly worked by the Spaniards, but the workings (principally open cuts) are caved in. Recent development work consists of two shafts, besides crosscuts and drifts. At a depth of 115 feet in shaft No. 1 a crosscut driven northeast has cut the Veta Principal or main vein of the Royal Crown group, in 18 feet. In shaft No. 2 crosscuts northeast and southwest were run on the 82-foot level. At a depth of 115 feet ore running $40 per ton is said to have been opened up. Drifting north and south on this vein is in progress.

El Rosario M. Co., operating at Penoles, has denounced water rights which will be developed for power to run its mining and milling machinery.

F. Pimentel y Fagoaga of Mexico City, president of the Mexican Coal Co., operating near Puerto Angel, says additional machinery will be put in.

Sonora.

V. A. Lucier of La Colorada is developing a copper property 20 miles from Minas Prietas, and is preparing to put in machinery for a smelting plant.

The production of the Greene Con. C. Co., at Cananea, for month of January was 5,246,000 pounds of copper. The company has been increasing its production and this is the largest in its history. The first ingot of copper produced by the company was on May 27, 1902.

The Lucky Tiger Combination M. Co. of Bisbee, Ariz., operating near Cananea, is preparing to build a 25-ton smelting plant at its mine. A stamp mill and air compressor are also proposed.

Zacatecas.

The San Rafael Grande M. Co., allied with the Stilwell railroads, is working the San Rafael mines at Zacatecas and is shipping thirty cars of ore per week. The ore is shipped to Mapimi and Torreon smelters. December shipments amounted to value of $90,000. I. Ragaz is manager.

SPAIN.

The Finanz Chronik states that the revival of Spanish industries is especially noticeable in the mining and metallurgical branches. The production of silver ores, manganese, load and sulphur is increasing; that of copper has increased but little during the past few years; that of silver-bearing lead ore has decreased. The Somorrostro mine is producing 350,000 tons of silver ore per year.——The copper mines of Cordoba, Huelva and Sovilla, as well as those of Tharris and Rio Tinto, are well known. The last named has a production of $2,700,000 per annum. —— The load mines of Jaen, Murcia, Almeria and Linares yield an annual output of nearly 100,000 tons.—— Santander and Murcia produce 86,000 tons of zinc per year; Oviedo, Huelva and Sevilla, 30,000 tons of manganese; and Caceres, 19,000 tons of phosphorite.—— The principal quicksilver mines are in the Province of Ciudad Real. Among those, the most important one, operated by the Government, is the Almaden. The total production of quicksilver from this mine amounts to about 630,600 pounds per year.

Most of the metallurgical works are in the Basque provinces, especially in Bilbao. Among these are the Sociedad Altos Hornos de Vizcaya (which is a consolidation of the two smeltors, La Vizcaya and La Iberica), and that of J. M. Martinez de las Rivas, in Sestao.——The iron furnaces of Santa Ana de Bolueta, operated by transmitted hydraulic power, produce 3500 tons of pig iron and 4100 tons of manufactured iron per annum.—— The iron works of Aspete, 12 miles from Bilbao, have a yearly production of 3000 tons.

Huelva.

The Pona C. Co. at Nerva reports its December output at 9686 tons of copper ore, and shipments at 5742 tons. Precipitate, containing 100 tons of fine copper, was produced.

Personal.

W. M. KEENAN of Denver, Colo., is in California on business.

J. POUNDSTONE of Grimes, Cal., is in San Francisco, Cal., on mining business.

C. C. CLARK is superintendent of the Debentuary Co.'s mines at Gold Hill, Or.

J. F. BRANDES will leave Denver, Colo., next week on an extended European tour.

F. W. WILLIAMS of Seattle, Wash., is in San Francisco, Cal, on mining business.

R. F. BULLER of Hailey, Idaho, interested in Idaho mines, is in San Francisco, Cal.

L. O. RAY of Tonopah, Nev., interested in Nye county mines, is in San Francisco, Cal.

C. B. NEEL, superintendent of the Sumptor smelter, is in the East on business.

J. BALLARD is in San Francisco, Cal., from Camp Meeker, Cal., on mining business.

F. J. MCNAIR returned to Leadville, Colo., from a trip to Denver, Colo., last week.

H. B. GILLIS of Yreka, Cal., interested in Siskiyou county mines, is in San Francisco, Cal.

D. ROBERTS is manager of the Kelly tunnel at Georgetown, Colo., vice B. F. Kelly, resigned.

T. DERBY, superintendent of the quicksilver mines at New Almaden, Cal., is in San Francisco, Cal.

W. J. RULE of Sonora, Cal., superintendent of El Rico M. Co. at Tuttletown, is in San Francisco, Cal.

J. W. PIPER of Washington, D. C., is visiting his mining properties west from Dolores, Chihuahua, Mexico.

DR. JOS. HYDE PRATT of the Engineering Co. of America is in San Francisco, Cal., en route to Pyramid, Nev.

J. A. BUNTING of Bakersfield, Cal., owning oil properties in Kern and Fresno counties, is in San Francisco, Cal.

D. CLARK of Spokane, Wash., is manager of the American Eagle M. Co., operating the Eagle mine at Elk City, Idaho.

B. BLANCHARD, manager of the American C. Co. at Blanchard, Yavapai county, Ariz., is in the East on company business.

O. O. MCREYNOLDS of Denver, Colo., is superintendent of the Pelican, Dives & Seven-Thirty M. Co. at Georgetown, Colo.

W. TECHOW, former mill superintendent for North Pole M. Co., is manager of the Mountain View mine, near Sumpter, Or.

A. H. WILLETT of Portland, Or., is visiting the southeastern States on business connected with the Copperopolis M. Co.

W. H. BRAY is superintendent of the Federal Loan, Potosi-Orleans, Erie-Ontario and Gold Tunnel mines, near Nevada City, Cal.

H. WILSON of San Francisco, Cal., is in New York City in the interests of the Wildman-Mahoney mines of Sutter Creek, Cal.

J. N. ESSELSTYN has resigned as manager of the Mountain View mine, near Sumpter, Or., to take up general engineering work.

SUPERINTENDENT C. A. HOLLAND of the John Royal and Altadena mines returned to Columbia, Cal., last week from a short trip to the East.

T. E. SCHWARZ has returned to Denver, Colo., from Alma, Park county, Colo., after visiting the London mine for which he is consulting engineer.

I. MILLER, president of the Springfield-Nevada M. Co., returned to Olinghouse, near Wadsworth, Nev., last week from a business trip to Springfield, Mass.

M. BOEHMER will have charge of the Stratton's Independence mine, Victor, Colo., during absence of Superintendent Cornish, who is taking a vacation.

JOHN ROSS, JR., superintendent of the Wildman-Mahoney mine, has returned to Sutter Creek, Amador county, Cal., from a business trip to San Francisco, Cal.

B. F. KELLY, for the past three years manager of the Kelly tunnel at Georgetown, Colo., has resigned and has gone to New York. Later he will go to Mexico.

I. DAVIDOV, whose name has been connected with placer mining in Siberia, South America and Mexico, has established an office at 52 Broadway, New York City, as consulting engineer.

Obituary.

S. JONES, a mining man of Sumpter, Or., died at Portland, Or., on the 27th ult., of typhoid fever. Deceased was 49 years old and was largely interested in mining properties in Sumpter, being part owner of the Midway, the Lucky Boy, the Lula and other mines.

T. F. DELANEY, a mining man of San Francisco, Cal., was shot to death at Mojave, Cal., on Jan. 29th, by a party who, it is alleged, lay in wait for Delaney and fired at him from behind. No motive for the crime is known. Deceased was a native of San Francisco, and 27 years of ago.

THOMAS RILEY, a Colorado mining man, died at Idaho Springs on the 8th inst., of miners' consumption, with which he had been a sufferer for several years. He was 49 years of age and a brother of G. Riley, mayor of Idaho Springs, with whom he discovered and developed the Franklin group of mines, which are being operated by the Gem consolidation.

Commercial Paragraphs.

W. W. ELLIOTT AND F. M. DRESCHER, consulting engineers, have formed a partnership at Prescott, Ariz.

THE Deitz Electric Drill Co., 1614 Blake street, Denver, Colo., recently shipped one of their drills to Jamestown, Boulder county, Colo.

THE Nichols Steam Generator Co. has opened offices and shops at 151 New Montgomery St., San Francisco, Cal., where they will handle the instantaneous steam generator for house heating and power purposes.

THE Union Gas Engine Co. of San Francisco, Cal., brought suit on the 1st inst. in the United States Circuit Court against the Standard Gas Engine Co., charging the latter with infringement of the gas engine patents belonging to the former. Because of the alleged infringement, the Union Gas Engine Co. asks for an injunction and damages against the Standard Co.

MARTIN HARDSOCG has returned to Ottumwa, Iowa, from a three months' trip of personal investigation of his drills in Western and Southwestern mines, and has decided to make extensive arrangements to put the "Little Wonder" air hammer and rock drill on the market,

deeming the field favorable for the introduction of such a tool.

THE Gardner Electric Drill & Machinery Co., through their Denver, Colo., branch, E. C. Means, manager, has recently installed two of their No. 15 drills in the McAlpine G. M. & M. Co. property, Chinese Camp, Tuolumne county, Cal., which are giving satisfaction from reports received from there. Mr. Means reports a fairly good business in their particular line.

JOHN A. ROEBLING'S SONS CO., continually extending their sphere of influence, have lately established a store at 313 First Ave. South, Seattle, Wash., where they carry a full line of wire rope, bare and insulated copper and iron wires, wire cloth and netting, telegraph wire, etc. The parent house at Tronton, N. J., where the works are established, has efficient representation by numerous branch establishments, prominent among which are those at 117 Liberty street, New York City; 173 Lake street, Chicago, Ill.; Denver, Colo.; 25-27 Fremont street, San Francisco, Cal.; Ravena and Alameda streets, Los Angeles, Cal.; First and Stark streets, Portland, Or., and now the new Seattle establishment.

Books Received.

"Mineral Tables, for the Determination of Minerals by Their Physical Properties," is the title of a work by Arthur S. Eakle, Ph. D., assistant professor of mineralogy at the University of California. This useful little book is intended as an aid to those studying mineralogy and to assist students in more quickly determining a mineral by its appearance and general physical characteristics, in the field or in the laboratory, in the simplest manner. Practice of this sort tends to develop the habit of close observation, and enables the student to become familiar with minerals more quickly than in any other manner. The tables include all of the common minerals and a few of the more rare ones; 73 + 111 pages. Cloth, $1.25. John Wiley & Sons, New York, and Chapman & Hall, Ltd., London.

Trade Treatises.

The Buff precise transit is described in detail in a copyrighted catalogue issued by the Buff & Buff Mfg. Co., Jamaica Plain, Boston, Mass., and worth reading by any engineer.

A 24-page catalogue from S. H. Harmon Lumber Co., 534 First or 42 Market street, San Francisco, Cal., givos illustrated description of the oil, water, wine, mining, stock, silo and rectangular tanks that they manufacture and supply.

Elegantly arranged and of manifest value is the latest pamphlet, "Giant Air Compressors and Rock Drills," issued by the Compressed Air Machinery Co., 24-26 First St., San Francisco, Cal. In its 80 pages are illustrated description of the air compressors, drills, pumps, engines, pneumatic tools and efficient labor-saving mining devices manufactured and sold by that company, several of them being new and all descrving notice. A copy of this fine publication will be sent to any address on request.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Ageney, the following are worthy of special mention:

AUTOMATIC FLUSHING TANKS. — No. 750,955. Feb. 2, 1904. Joh E. Erlcson, San Francisco, Cal. This invention reintes to a tank or receiver such as may he employed for flushing and like purposes. The object of the invention is to provide a receptacle for holding a given quantity of water to approximately fill the receptacle with water from a source of supply under pressure which will be sufficient to force the water into the receptacle and compress a body of air in the upper part thereof, which afterwards serves to force out the limited body of water under pressure of the compressed air within the tank.

MALT MAKING MACHINE.—No. 751,026. Feb. 2, 1904. H. J. Sulzen, Sacramento, Cal. The object of this invention is to provide a machine which may be propelled and guided over the floor as desired and which is adapted to agitate, lift, aerate and collect the malt or redistribute it upon the floor. It consists generally of plows and means for propelling them along the floor so that they will take up and turn the malt, and elevators or earriers hy which the malt is raised and subjected to a hlast of air and afterward again discharged and distributed upon the floor.

DEVICE FOR TREATING TEGUMENTARY TISSUES. —No. 751,194. Feh. 2, 1904. A. S. McCutchan, Oakland, Cal. One-half assigned to John Yule, of same place. This invention consists of a container, with means for applying it to the tissues to he treated, so as to form a close joint against leakage without undue constriction or pressure on the parts to he treated, a means for supplying said container with oxygen gas, and means for regulating its size. In conjunction with this I have shown means for admitting light and means for directing light into the container and also a device by which static electricity may he used in conjunction with the oxygen and light and means for producing what is knowa as the "static breeze."

CENTRIFUGAL WASHER FOR FISH DRESSING MACHINE.—No. 751,388. Feb. 2, 1904. A. J. Farmer, San Francisco, Cal. Assigned to the Canners' Machine Co., of San Francisco, Cal., a corporation. This invention relates to improvements in fish-cleaning machines and particularly to an improved washer for cleansing the cavity of the fish after the fish have been split open and the entrails and soft portions removed. It consists in substituting for the usual stationnry jet pipes a rotary washer, operating within the cavity similarly as the cleaning brushes. The particular class of fish-cleaning machines for which it has been designed comprises those machines which handle and dress the larger fish, such as salmon.

SIDEHILL HARVESTER.—No. 751,111. Feb. 2, 1904. A. W. Severance, Walla Walla, Wash. Assigned to Holt Mfg. Co., of Stockton, Cal., a corporation. This invention relates to an apparatus for harvesting grain and the like which is especially designed for use upon sidehills and in such a manner that the thrashing and cleaning mechanism of the apparatus may be maintained substantially horizontal transversely of the machine, so that the grain delivered into that portion of the machine will not he bunched up at one side or the other.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Mnrket St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING FEBRUARY 2, 1904.

750,705.—PIPE WRENCH—E. J. Bates, Bakersfield, Cal.
751,251.—KNIFE—J. C. & G. E. Bollinger, Olympia, Wash.
750,941.—TOOL DRESSER—J. S. Brown, Los Angeles, Cal.
751,062.—DRILL—C. Erickson, Bremerton, Wash.
750,955.—FLUSHING TANK—J. E. Ericson, S. F.
751,388.—CENTRIFUGAL WASHER—A. J. Farmer, S. F.
751,064.—GARMENT SUPPORTER—F. Ferguson, Santa Rosa, Cal.
751,360.—JOINTER—C. F. Frazee, Portland, Or.
750,846.—PUMP—T. R. Goth, S. F.
751,365.—OIL BURNER—Hess & Williams, San Jose, Cal.
750,978.—GARMENT SUPPORTER—J. E. & I. O. Josephi, S. F.
751,309.—LIFTING JACK—L. O. Lander, Lisabuela, Wash.
751,085.—GAS APPARATUS—L. P. Lowe, S. F.
751,194.—TREATING TISSUES—A. S. McCutchan, Oakland, Cal.
751,322.—LOGGING DEVICE—G. Moore, Monroe, Wash.
751,092.—OIL BURNER—D. H. Mosteller, S. F.
751,334.—SEWING AWL—T. O'Shaughnessy, San Jose, Cal.
751,405.—INDICATOR—G. D. Palmer, Powell Valley, Or.
751,001.—CAN OPENER—A. M. Parker, Los Angeles, Cal.
751,410.—JAR COVER—H. A. Porteous, Hemet, Cal.
751,106.—LAND SCRAPER—C. E. Reed, Sunnyside, Wash.
751,111.—HARVESTER—A. W. Severance, Walla Wnlla, Wash.
751,026.—MALT MACHINE—H. J. Sulzen, Saeramento, Cal.
751,225.—ELEVATOR—F. B. Van Cleave, Echo, Or.
750,923.—DRAWING TOOL—F. H. Wheelan, S. F.
751,364.—VALVE—G. R. Wilehart, The Dalles, Or.
751,426.—HAIR PIN—W. F. Zwick, Seattle, Wash.
36,765.—DESIGN TOY BANK—S. W. Knighton, Portland, Or.

Latest Market Reports.

SAN FRANCISCO, February 12, 1904.

METALS.

SILVER.—Per oz., Troy: London, 26⅛d (standard ounce, 925 fine); New York, bar silver, 56⅜c, refined (1000 fine); San Francisco, 56⅜c; Mexican dollars, 43@44½c San Francisco, 43½c New York.

COPPER. — New York: Standard, $12.50; Lake, 1 to 3 casks, $12.50; Electrolytic, 1 to 3 casks, $12.25; Casting, 1 to 3 casks, $12.12½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £55 12s 6d spot per ton.

Copper remains dull and quiet. Europe reports heavy buying, but in the United States the demand is as yet nominal; consequently the price is slightly lower and shows no signs of immediate change in either direction.

LEAD. — New York, $4.45; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4⅜c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £11 13s 9d ₱ long ton.

SPELTER.—New York, $5.00; St. Louis, $5.00; London, £21 15s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.50 @ 28.00; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32½c; bar tin, ₱ lb., 35@37½c. London, £124 7s 6d spot.

PLATINUM. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ₱ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—Now York, No. 1, 99% puro ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickots, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This wook the basic prices aro: Wire, $2.77; Cut, $3.25. Moanwhilo the nominul quotations por keg (list prices) are: No. 20d to 60d, Wiro, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wiro, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wiro, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.15@2.40 ₱ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ₱ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemor pig, $13.60 @14.25; gray forge, $12.60; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bossemer billets, Pittsburg, $23.00@23.00; open hearth billots, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemor	$16 00@16 50
Foundry Northorn 1	14 25@14 75
Northern 2	13 75@14 25
Northern 3	13 25@13 75
Southorn 1	14 10@14 60
Southern 2	13 60@14 10
Southorn 3	13 10@13 60
Forgo	12 35@12 85
Charcoal	16 50@17 00
Billets, Bessemor	24 00@24 00
Bars, iron	1 35@ 1 40
Bars, steel	1 46@ 1 46
Rails, standard	28 00@30 00
Rails, light	26 00@30 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channols	1 76@——
Dealers forge	9 00@ 9 50
No. 1 railroad wrought	12 00@13 00
No. 1 cast, net ton	11 00@12 00
Iron rails	15 00@16 00
Car wheels	13 50@14 50
Cast borings	4 00@ 5 00
Turnings	8 00@ 9 00

GENERAL SUPPLIES.

ANTIMONY. — Now York, Cookson's, 7c; Hallett's, 6¼c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8¼c; 100-lb. lots, 10¼c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than ono ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than ono ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; douhle tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11¼c ₱ set; 14 oz., 40s., 10c.

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OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 15c; Mineral Seal, iron bbls., 19c; woodon bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, hulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

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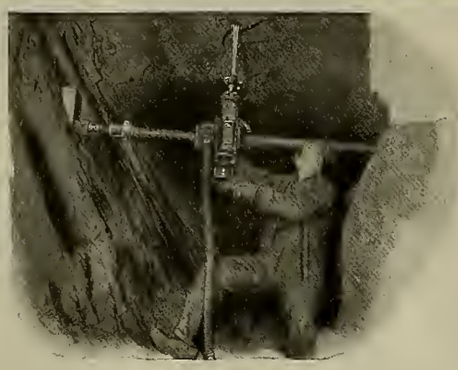

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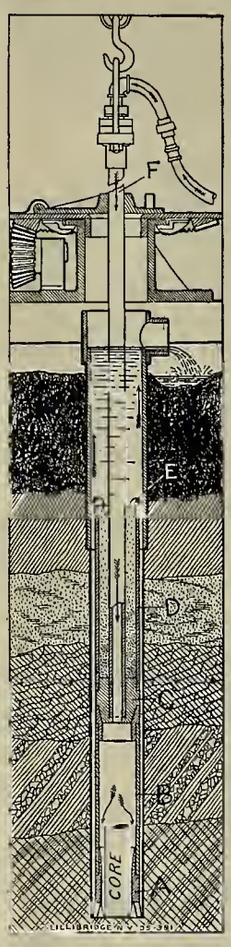

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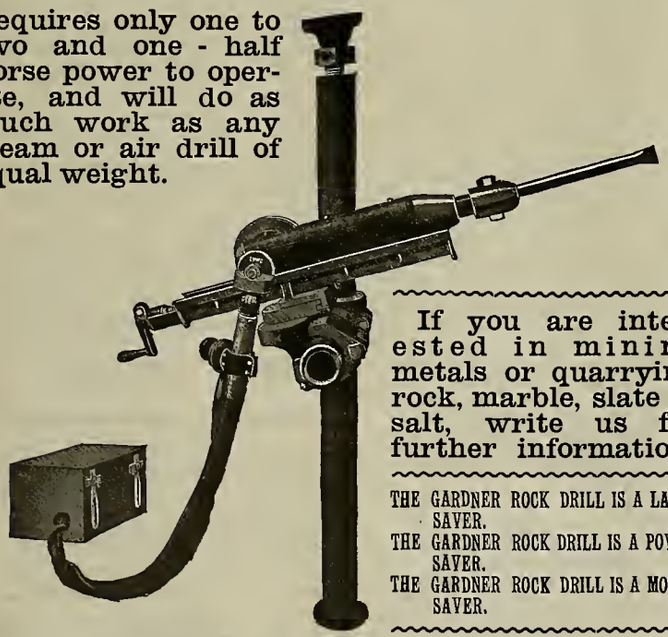

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Whole No. 2274.—VOLUME LXXXVIII. Number 8. SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 20, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Mines of Searchlight, Lincoln County, Nev., and Vicinity.

Searchlight is 25 miles in a northeasterly direction from Manvel, Cal. Searchlight, as well as the camps of El Dorado canyon, Cottonwood Springs and Good Springs in Lincoln county, north of Searchlight, is tributary at present to Manvel. The proposed line of the San Pedro, Los Angeles & Salt Lake Railroad, now building from Salt Lake City, Utah, will be the means of increased activity in opening up the entire section north of Searchlight. In the McCullough mountains, north of Searchlight, are the turquoise mines of the Simmons group. The turquoise occurs as veinlets and nodules in dikes which cut through the main mass of porphyry of the mountains.

The fame of Searchlight rests largely upon the record of one mine—the Quartette—owned by the Quartette M. Co., a close corporation, principally of Eastern men. They have opened up the mine down to the sixth and seventh levels. About forty tons a day are being taken out, and the output of the 10-stamp mill is stated to be $50,000 per month. This mill is operated on the property, with water supplied from the mine. The company has a 20-stamp mill near the Colorado river, 18 miles east, and a narrow-gauge railroad transported the ore for its operation, but at present it is shut down. Superintendent T. J. Harrington states that it will be started again in the spring. Considerable ore is blocked out, but there is no cessation of development work. The strike of the miners a few months ago temporarily stopped all work in the district, and it has not yet resumed its former output.

Searchlight, Nevada, Looking East.

The Southern Nevada Co., of which F. Perew is manager, is progressing with satisfactory results. Its mine, the Rosebud, is a flat ledge, covering a low hill and cropping near the summit. This slopes off gradually in all directions and has been quarried as far as possible. It is now being worked by inclined shafts. Considerable development work is being carried on besides the regular production of thirty-five tons of ore a day. The mine is about a mile from the company's 10-stamp mill. The ore is hauled in wagons, and by an automatic dumping arrangement, dropped into cars and run into the mill by gravity. The mill was so placed on account of an abundance of water found in a shaft sunk there in prospecting. It is in such quantity that no attempt is made to save it for reusing and it flows across the stage road, a mile distant. There are 18,000 to 20,000 tons of tailings on the dump and a cyanide plant will soon be installed to rework them.

Head Frame, Quartette Mine, Searchlight Nevada.

The Duplex Co., owning the original discovery near the town of Searchlight, is not uow operating, though it is said they will resume this spring. They also have a 10-stamp mill.

The Good Hope mine, owned by P. D. Carper of Los Angeles, Cal., is between the Duplex and the Quartette and is carrying on development work steadily with encouraging results, as is also the Cyrus Noble mine, owned by G. E. Otis of Redlands, Cal. The latter is west of Searchlight, and near the level of the desert. It has no mill as yet, but is yielding ore which is hauled to Manvel and shipped thence by rail to El Paso, Tex. Many other smaller prospects are being developed in the district, which covers a chain of low hills about 3 miles in extent, rising abruptly from the floor of the desert.

Mill of Southern Nevada Co., Searchlight, Nevada.

Eighteen miles southeast of Searchlight, and 7 to 10 miles from the Colorado river, is Newberry Mountaiu district, which, while as yet in the prospect stage, promises well. The principal development is being done by the Empire M. Co., headed by W. H. Fuller of Los Angeles, Cal., and owned mainly by Easteru men. Superintendent A. A. Ross is sinking a shaft on the Mountain Jewel claim, in which water was found at 65 feet, and while it is being put down in high-grade ore, the water is interfering with operatious. This water will be used to ruu a 10-stamp mill which they propose to erect in the summer. There are seventeen claims in this group. On three, the Tar Heel, Empire and Badger, for a distance of 4500 feet crops a ledge of high-grade quartz which is being opened up in several places by shaft and tunnel. It is so situated that the ore can be mined and milled at a low cost.

Northerly from Searchlight, in the Spring Mountain section, are the lead-silver mines of the A. J. Campbell estate, covering a total of thirty patented claims. The principal producers of the group were the May Belle, Ruth, and May Kirby mines. Little work is being done there at present. A few miles west of Spring Mountain district are Cottonwood Springs and Good Springs. Near Good Springs, a fiud of cinnabar has been made by J. C. Armstrong, and it is being opened up as the Red Cloud claim. The cinnabar is said to be associated with free gold, and occurs on the hanging wall of a 50-foot porphyry dike which cuts through the limestone.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:
NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, FEBRUARY 20, 1904.

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A SOMEWHAT anomalous condition prevails in the Transvaal, South Africa, where recently a petition signed by over 45,000 white men, representing over 70% of the entire white male populatiou—about 15,000 men in Government service not voting—praying the Government to admit Asiatic unskilled laborers to the Transvaal to work in the miues. The Australian and New Zealand officials have doue all in their power to prevent the mine owners aud the Transvaal government from importing Chinese or other Asiatics, having had experience with this class of labor themselves; but the resident Australians of the Transvaal have remonstrated with their home government, telegraphing that representative Australian business men and professional men resident in the Transvaal strongly protest against the interference with the plan of Asiatic importation. At present the mines are worked chiefly by uative Africans imported from Portuguese territory. The natives from British territory refuse to work down in the mines, although they are there iu the country in great numbers. It is probable that, as it is evident that the great majority of the white residents of the Transvaal favor Chinese labor in the mines, these will soon replace the Kaffirs and other negro tribes which have heretofore done the work.

WHILE the requirement that mine hoisting eugineers shall pass an examination by a proper authority is not geuerally in force in the West, and is usually considered unpopular, if not unnecessary, still the fact that a man understands that he will have to be examined cannot fail to have a beneficial result, as he will then gain all the informatiou about hoisting engiues, and the requiremeuts of miue hoists generally that he can possibly obtain, and the result is a better engineer than would otherwise result.

Sensible Mine Rules.

The code of regulations which has recently been posted by the Federal Mining & Smelting Co. about its mines and works at Wardner, Burke and other mines in the Cœur d'Alenes of Idaho, is an instance worthy of more thau passing notice. It consists of thirty-five rules regulating the conduct of the men employed by the company, and the use by them of the company's property. The code is published elsewhere herein verbatim, as it is considered of sufficient interest and importance to miners everywhere. The first requirement is that all employes must "read" the rules before going to work for the company. This signifies that the miners employed shall be able to speak or read the English language, but this requirement is weakened somewhat by Rule 6, which requires that some other person shall read the rules to those who are unable to read them for themselves. In some instances mine managers have made a rule that every man going underground shall be able to speak Euglish intelligibly. This is calculated to reduce the likelihood of accident, but a faithful observation of the requirements of the rules of the Federal Company, whatever the nationality of the workmen, must result in decreasing the probability of accident to a minimum. Without doubt the rules were compiled after careful thought, and by a manager thoroughly acquainted with the dangers of underground mining. He calls attention to the unexpected dangers which lurk in many places, in passing raises or winzes, in the open stopes, at the face, in the bottom of the sinking shaft, in every portiou of the mine, the dangers likely to be encountered are anticipated and pointed out, thus educating the inexperienced, cautiouing the old hands, and restraining the careless. The paragraphs dealing with blastiug and missed holes are pertinent aud worthy of observance throughout the mining regions everywhere. The rules indicate a familiarity with the careless practices of miners, which not infrequently result fatally. Among these are the custom of carrying nitro powder in the boot legs, detonating caps in the pocket, smoking about the loading bench and carrying lighted candles about when preparing fuses and powder for blasting. The habit which some men have of clinching caps onto the fuse with the teeth is not mentioned, probably in the belief that no sane man will do such a thing, proper nippers being supplied for this purpose, yet not a few miners do this commonly, long escape from harm leading them to think there is no danger in the practice. The section referring to "missed holes" is also as complete as it seems possible to make it. The missed hole is an element of great danger and it cannot always be detected, for when a round is fired a uumber of reports may be counted which corresponds with the number of holes "spit," and still there may be a "cut-off" hole in which there remains sufficient powder, should it explode by drilling into it, to kill half a dozen men, but the cut-off hole is hard to locate and is usually unsuspected. There are some elements of danger in the life of a miner which cannot be altogether eliminated. The rule requiring the hoist engineer to send an empty cage or skip down the shaft and pull it back to ascertain if the shaft is free from obstruction before lowering men into the mine, is a new and unusual practice, but one which might well be adopted, as a precautionary measure. The rule indicatiug the maximum number of men that shall ride on certaiu cages is timely, as if left to themselves when coming off shift the men will often overcrowd the skips or cages, and many serious accidents have resulted from the practice. The section requiring daily inspection of the shaft, ropes and machinery is essential, but at mauy mines is neglected altogether, and these departments are considered safe if they are found in good condition on monthly or bi-monthly inspection. There are many mines where the hoisting ropes never receive an inspection of any sort until evident signs of weakuess present themselves. Then the rope is turned "end for end." This is well enough if all of the weak portions be on the reel with several additional turns for safety, but if the weak portion goes beyond the reel then the danger is greater than before. It is manifestly safer to cut off 200 or 300 feet altogether of the rope than to turu it end for end.

On the whole the regulations of the Federal Company seem to be as comprehensive and as sensible as any rules of the kind introduced elsewhere, and are superior to some others. In every paragraph the company evinces its aim and desire to protect the men from accident, though it is evident from carefully reading the regulations that the greater number of accidents anticipated are likely to be the result of carelessness on the part of the miners themselves.

Just at this time, Colorado miners are agitating a proposition to have legislation enacted in that State which shall make the reoccurrence of a disaster similar to that which recently occurred at the Independence mine, at Victor, an impossibility. There are many things in the operation of a mine which fall naturally within the province of State legislation, and a number of the rules of the Federal Company above referred to, have already been made subjects of legislative action, in several States. When State legislation is contemplated which shall influence the mining industry, and particularly the practical operation of mines, it would be the part of wisdom for the legislative committee having the matter in hand to call upon a number of the most experienced mining men in the State for advice on the subject and thus avoid unuecessary complications, encumbering the statute books with meauingless laws. Experienced mining men know what is required and what is best for the operation of a mine. These things are often unfamiliar to men composing legislative bodies, and however good their intentions, they fail sometimes to accomplish the object aimed at.

Prospectors' Opportunities in Alaska.

There are numerous reports of new discoveries of placer gold in Alaska and in the Northwest Territory, which will probably attract many adventurers the coming summer season. Preparations are being made by many to take advantage of the first steamers going north. This northern field is one of the most extensive undeveloped mineral regions known, and it holds out a promise of possible success to those having sufficient means to properly equip themselves and to open claims which require the expenditure of time and money, but unfortunately there are many going who have neither means nor experience, nor the necessary physique to endure the hardships of a pioneer's life in the Arctic regions. For these latter one is inclined to predict failure, if not disaster, but of the many who have preceded them in past years some did well, and it was not always those best equipped who succeeded. The recent discovery of a second beach at Nome, higher than the present beach, and at a distauce of half a mile or more from the shore line, indicates that after four years of active prospecting in that district there are still good chances. In the interior of Alaska there are extensive gold-bearing gravel deposits, but these for most part must be opened by men of large means.

THE success which has so frequently attended the efforts of leasers in the Cripple Creek, Colo., district has resulted in the mine owners making new rates and terms in leasing their property. It is stated that hereafter in most cases the minimum royalty will be 25%, with a higher sliding scale for ores above a stated value. They have determined also to reserve for themselves the privilege of working the blocks immediately above or below any new finds made by leasers in their explorations. Notwithstanding these new and somewhat arbitrary conditions imposed, miners are still eagerly seeking the privilege of leasing in many of the noted mines, the richness of which heretofore have made numerous leasers wealthy.

AS a result of the recent disaster at the Independence mine at Victor, Colorado, the Commissioner of the State Mining Bureau has instructed his deputies to notify mine managers throughout the State to make such changes as are necessary in their shaft equipment and miue operation as were recommended by the special committee of inquiry appointed by him to investigate the cause of the accident at the Independence mine. It is said 150 mines will be required to make material changes to conform to the new requirements. Among other changes the mines will be required to place extra "chairs" in the head frames, and devices on the cages to prevent overwinding.

CONCENTRATES.

THE sample of rock from southern Oregon labeled "kaolin" is not clay, but infusorial earth.

LANDS containing clay, kaolin, etc., on the public domain are subject to location under the placer laws. The location is made in the same manner as other locations.

IN 1901 the Legislature of Nevada passed a law providing for paying a bounty to the first person discovering and producing petroleum oil or natural gas in that State.

THE rock specimen from Temaxcaltepec, Mexico, is specular iron (a variety of hematite). It is slightly magnetic, probably due to admixture of magnetite. This ore is sometimes gold bearing.

SOME porphyries have the same chemical composition as feldspar, due to the admixture of various feldspars, such as orthoclase and albite, which is possible without changing the crystal form of the mineral.

THE rock specimen from Rye Patch, Nev., is granular quartz, containing molybdenite, the sulphide of molybdenum. The molybdenite can be concentrated. The rock also contains a small amount of iron sulphide.

IN roasting sulphide copper ores for leaching by acid solutions, it is easy to carry the roasting process too far, forming oxides instead of sulphides of copper, and the oxides leach very slowly, rendering what might otherwise be a profitable operation a failure.

WHEN driving a drift, it should be cut the full size it is intended to have it. There is no economy in driving a small drift and subsequently enlarging it. The same applies to shafts and all other mine cuttings, excepting stopes, which should be worked in blocks.

THE three samples from Tucson, Ariz., are: No. 1, marked "clay," infusorial earth; No. 2, marked "spar," calcite, colored by iron and manganese; No. 3, marked "iron ore," magnetite, with small amount of pyrite, small amount of copper sulphide present.

WHERE rock is broken in an open cut, either ore or waste for filling, if the rock is to be sent down through a mill hole located at the lowest portion of the cut, a grizzly of heavy timbers should be placed over the shaft to keep large rocks from passing down and jamming the chute below.

A CHARACTERISTIC of aluminum is that it is not attacked by nitric acid at boiling heat. The only other metals capable of thus resisting the action of nitric acid are gold and platinum. Hydrochloric acid, which alone does not affect gold or platinum, dissolves aluminum readily, converting it into aluminum chloride.

THERE are about 180 sticks of ¾-inch nitro powder in a fifty-pound box, about 135 sticks of 1-inch powder and about 100 sticks of 1¼-inch powder. The powder is net weight, the box and sawdust packing not being counted by the manufacturers, though these add materially to gross weight and cost of transportation.

IN placing the column pipe for a mine pump, flanges are superior to the ordinary couplings, as by their means the pipes can be placed or removed without turning by means of wrenches, thereby lessening the work in the shaft, and they also afford a substantial support for the pipe line by placing "yokes" at proper intervals, the flanges resting on the "yokes."

INFUSORIAL EARTH, or diatom earth, is an aggregate of the skeletons of the microscopic plants called diatoms; is white, yellowish and light brown. The material composing these beds are almost wholly silica and contain little aluminous matter (clay). It is used chiefly for polishing powder. Some manufacturers of nitro powders use this material in the manufacture of dynamite.

THE greatest pressure upon the pipe line into Virginia City, Nev., is 1720 feet, equivalent to 846.48 pounds per square inch. The pressure of a narrow, vertical sheet of water is proportional to its height. The pressure of a sheet of water but a foot wide against the wall of a vertical dam is as great as though the water extended back for miles. This is known as the hydrostatic paradox.

THE cost of excavating earth should be estimated and fixed by the cubic yard excavated, whenever the material removed is to be dumped into a fill. Various kinds of earth and rocks settle in different degrees of compactness and may make more or less than had been estimated. If the price is fixed upon the amount excavated there can be no controversy as to the amount in the embankment.

THE strength of potassium cyanide varies considerably. In practice it contains from 98% to 125% of cyanide (estimated as the potassium salt), but the higher grades generally contain a quantity of sodium of cyanide, which when refined and pure contains 53% cyanogen—potassium cyanide containing but 40%. Consequently a pure sodium cyanide would appear to contain 132.5% potassium cyanide—that is, the equivalent to that amount.

SELENITE resembles mica when in thin transparent sheets. It is sulphate of calcium (gypsum). To determine between mica and selenite, place a piece of the mineral over a fire, and if it be selenite it will quickly become white and opaque. Mica is little or not at all affected by heat. There are also minerals containing selenium referred to as "selenites," but these are ores containing usually copper, silver and lead as well as selenium and are not to be mistaken for either gypsum or mica.

TETRAHEDRITE (gray copper) is a compound of copper, antimony and sulphur, as essential constituents, but often also contains various other substances, including arsenic, mercury, lead, iron, etc., and it is often rich in gold and silver. When the luster is brilliant, it may sometimes be mistaken for some varieties of tellurido, but the latter are much softer than gray copper. Tetrahedrite is decomposed by nitric acid. The tellurides, when powdered and treated with sulphuric acid, color the solution purple.

"LEAD POISONING" in lead mines is due to the miners inhaling the dust in the mine workings, caused by drilling, shoveling, etc. Cases of this kind occur in dry lead mines, where the ores are oxidized—carbonates, sulphates, oxides, etc., and is seldom heard of in mines producing galena, unless the men drink the water in the mine, which may contain various mineral salts detrimental to health, though the water may be cold and perfectly clear and pleasant to the taste. Arsenic is often present in mine water.

IF John Doe was still in the employ of the Gold Hill Co., work done under his direction during the latter part of 1903, whether paid for or not, would inure to benefit of the company. If, however, he was a mere trespasser, any work done by him, or under his direction, would in no way benefit the company, and as they had not commenced the assessment work by January 1, John Doe could legally locate the property and claim everything on it. If John Doe were still in the employ of the company, or a co-owner with the other owners, he could not relocate to the disadvantage of his partners.

THE expansion of a steam pipe line conducting steam 100 feet to a pump in a mine shaft will be from 4 inches to 6 inches, and allowance must be made for this or the fittings will be broken, and this usually occurs at the pump, where the pipe connects with the cylinder. For this reason a slip joint is advisable. Slip joints are also advisable on the column pipe. Where the latter is put in place the smaller pipe, which "telescopes" into the larger section, must be placed uppermost, or any grit carried in the water being pumped out will soon fill the space between the two pipes and the interior pipe will become jammed.

EVERY SHAFT should have a protecting hand rail about the collar, to prevent persons from accidentally falling into the shaft. Such a rail can be arranged by setting posts at the corners and opposite the dividers. The rail need only be secured at one end, and free to move, as on a hinge. By securing the bars at the corner posts by passing an iron rod through both post and bar, the other end may be raised out of the way or lowered to its place on the adjacent post. This admits of handling timbers, changing skips, the passage of men and materials to and from the mine, and also insures comparative safety.

THERE are several kinds of mica. The micas are all scaly minerals, of which muscovite (the ordinary colorless transparent mica of commerce) and biotite (the black mica of granite and other rocks) are the most charactoristic type. In addition to these there are paragonite (sodium mica), lepidolite (lithium mica), zinwaldite (lithium-iron mica), phlogophite (magnesium mica), lepidomelane (iron mica), roscoelite (vanadium mica), alurgite (manganese mica), sericite (a fine scaly mica of silky luster), mariposite (magnesium mica colored by chromium oxide), uranium mica, and a number of others which are rare.

SPLIT lagging, if made of good timber, is superior to sawed lagging and is usually thicker. The cost of split lagging varies in different camps, being usually about $70 per 1000. This is equivalent to sawed lumber at $14 per 1000, for the space covered by the two kinds of lagging, if the sawed lagging is a little under 5 feet in length. If the lagging is being driven the sawed kind must be at least 6 feet in length, while the split lagging is usually either 5 feet or 7 feet long. If too long it is cut off and the ends used for blocking, etc. For wet shafts in soft ground where the material will run if given a chance the sawed lagging is preferred.

IT requires from 4000 to 6000 gallons of crude oil, according to the character of the material, to sprinkle a roadway 16 feet wide. The best practice is to sprinkle the roadway liberally the first time it is gone over, and during the dry season to sprinkle it two or three times lightly. If the roadway is properly treated it soon forms a firm, solid surface, with no dust, but generally, for reasons of assumed economy, too little oil is used, and the result is not as satisfactory as where it is properly applied in sufficient amount. With oil worth $1.25 per barrel, the cost of oiling a road is about $200 per mile. "Concentrates" is not informed of road sprinkling with oil for the purpose of laying the dust prior to 1894.

THE twenty rock specimens from Oregon have been determined as follows: No. 1, Quartz showing iridescent tarnish, due to iron and copper salts: 2, infusorial earth; 3, rhyolite tuff; 4, chalcopyrite with malachite, (copper carbonate) and iron oxide; 5, diorite with abundant small grains of magnetite; 6, talc veinlets in serpentine; 7, talc; 8, chromic iron; 9, decayed dike rock with cinnabar (mercury sulphide); 10, chrysoprase (color due to nickel) with millerite, (nickel arsenide) in fine needle-like crystals: 11, same as No. 10; 12, galena (lead sulphide); 13, serpentine; 14, silicified dike rock containing magnetite; 15, an intrusive rock (diabase) silicified; 16, similar to 15; 17, kaolin, iron oxide and sericite; 18, kaolin, iron oxide, talc scales, and possibly gold (all rocks of this appearance should be assayed on general principles); 19, decayed dike rock, probably diorite; quartz, chrysocolla and kaolin. (This may also contain gold.)

WHERE cutting out for a station at a shaft, sufficient head room must be made near the shaft for handling long timbers and removing same from skips to the level. It is also economy to cut the ore and waste bin under the level at the time of sinking, and not after the shaft has been continued below and timbered past the chute. The bin under the floor of the station should be divided by a strong partition, so that ore and waste may be kept separate. Where it is not expected to break much ore on a level, a temporary apron may be provided to chute rock from the car into the skip, and the ore bin below may be dispensed with. Where the vein has a flat dip—less than 20°—the ore bins should be provided in the same manner as where veins are steeper. It requires the removal of more ground, but it saves handling rock, and avoids the necessity of sending the cars to the surface which are used on the levels. This practice always necessitates more or less delay, both underground and on the surface.

IT is not uncommon to find several kinds of rock as a result of cooling of the same magma. A great difference in structure of these several varieties is particularly noticeable. This is due to the unequal periods of cooling. Those portions near the border of the molten mass cool more quickly, and are, consequently, finer in grain than the portion forming the central portion. Where injected magma is deep seated and a very long time in cooling; an exceptionally coarse crystallization usually results. This is a feature of that class of granitic dykes known as pegmatite, in which the individual minerals occur in the form of large crystals. Among these are black tourmalines, green apatites, large crystals or "books" of mica, from which the merchantable mica is obtained; large masses of feldspar and quartz, the latter sometimes of beautiful rose tint. The granitic intrusions of the Black Hills, South Dakota, are of this class, and many of them contain this stone in greater or less quantity.

THE curvature of the earth is about 8 inches per mile of horizontal distance, or accurately 0.667 foot. This increases as the square of the distance, thus the amount of curvature in 3 miles would be 9 times 8 inches, etc. This is lessened somewhat by the refractive power of the atmosphere, which is a variable factor increasing and diminishing with changing temperature, humidity and elevation above the sea. This refraction has a tendency to make distant objects appear to be higher than they really are. An average is placed at about one-seventh the curvature of the earth. At sea the summit of a mountain 5717 feet high would just be visible on the horizon at the distance of 100 miles. In running long tunnels engineers take the curvature of the earth into consideration. A horizontal line is not a level one, for a straight line cannot be level. Level means a line at right angles to a line drawn to the center of the earth (a plumb line) and this direction changes with every movement along the earth's surface.

SOME salts have a great affinity for water and absorb moisture from the atmosphere and become moist. This is known as deliquescence. It is exhibited in a marked degree by common salt. Some sulphide minerals also have this property. A sulphide of iron occurring in the Boomerang mine in San Bernardino county, Cal., where the climate is dry, upon being taken to the museum of the State Mining Bureau at San Francisco, Cal., where the air is more humid, in the course of a few months became covered with an efflorescence and gradually crumbled to powder. The water of crystallization is present to a greater or less extent in most minerals. It is usually driven off by heating the mineral to 212° F. Borax is a notable example of this. Alum is another. When minerals of this kind are heated they usually swell up and occupy more space than when in normal condition (intumescence) and then fuse down to a colorless glass. Borax is a useful flux in assaying, but only "borax glass," as the mineral is called that has had the water of crystallization expelled, can safely be employed, as the mineral while containing the water of crystallization would cause the contents of the crucible to overflow and destroy the value of the assay for commercial purposes.

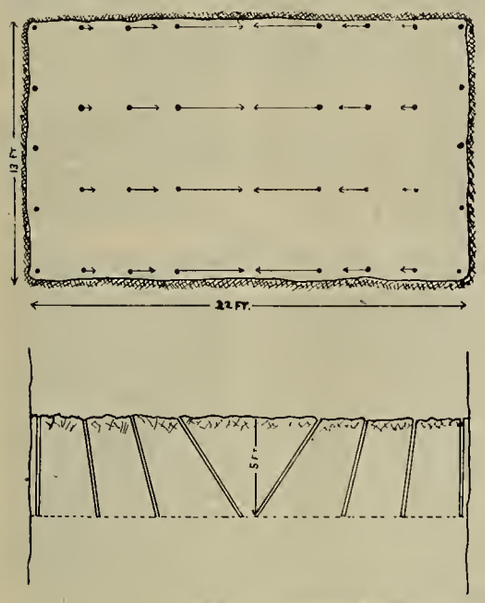
Some Features of Mining Operations in the Homestake Mine, Lead, South Dakota.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by
BRUCE C. YATES, E. M.*

The cost of a set of timbers in place for the Ellison shaft is:

Timber	$26 85
Framing timbers	10 00



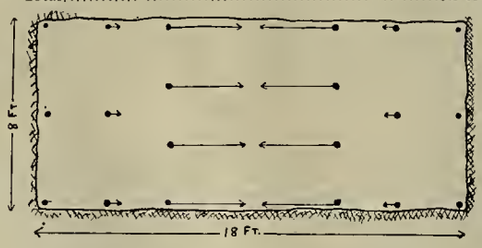


Fig. 4.—Diagram Showing Disposition of Holes for Blasting in Shaft.

including the placing of the timbers. The cost of labor per foot of shaft, assuming that the contractors made $4 per shift, which is the usual price paid to shaftmen, is as follows:

Eight miners at $4	$32 00
One timberman at $4	4 00
Two engineers at $4	8 00
Two landers at $3	6 00
One-sixth set timbers, lumber and framing	10 64
Total	$60 64

Four miners, one shift, at $4	16 00
One lander, one shift, at $3	3 00
One timberman, one shift, at $4	4 00
One engineer, one shift, at $4	4 00
Total	$63 85
Cost per foot	10 64

The average progress made is 1 foot in two shifts, or two machines are used for drilling, mounted on a horizontal bar. The bar has two decided advantages over the column, namely: the machine may be set up as soon as the blasting is finished and drilling for the next round goes on while the shovelers are removing the rock, and the sides of the drifts are carried much more evenly than with the column, which makes it

The Rand machine is used for drilling, mounted on a bar. The manner of placing is shown by Fig. 4, which gives horizontal and vertical section of a standard three-compartment shaft. Electric exploders are used to fire the blasts in all the shaft work, 40% dynamite being used, as in drifting.

The dimensions of the shafts, size and framing of the timber are illustrated by Figs. 5, 6 and 7. As all the shafts are vertical, no special features are introduced. Station sets are from 12 to 16 feet high. Two or three extra sets are put in on the stations, which serve as braces to the long sets of the shaft and support the roof of the station.

Formerly all station floors were covered with sheet iron. On all the new levels, however, the track rails are laid to the edge of the shaft and in line with the cage rails. Two tracks are laid up to the shaft, one to each hoisting compartment. A diamond crossover, located close to the shaft, permits the loaded cars to run onto either cage and the empties to be returned to the empty track. Fig. 8 shows the arrangement of the crossover, and by noting the position of the lever and spring points the manner of operation is easily understood. A third track passes around the shaft when the station is opened on both sides. The cages are made at the company's shop and are provided with the usual safety appliances. All new cages are made with the chair and operating lever on the cage, so that the cage tender always has control of the chairs. Double-decked cages are used at the Ellison shaft, which carry two cars on each deck. The Golden Prospect cage carries two cars on a single deck, and all other shafts have small, single decked cages. Skips have not been used in any shaft now belonging to the Homestake Co.

DRIFTING.—Three dimensions are used for "dead work" drifts, depending upon the use for which they are intended: prospect drifts 6x7 feet, single-track working drifts 7x8 feet, double-track working drifts 12x8 feet.

Prospect drifts are usually driven under contract, two men being employed on each shift. Each man is a party to the contract. The miners car their own rock, furnish powder, fuse, candles, shovels and picks, aud pay for the repairs on machines. The company furnishes machine and drills, lays all track and puts in air pipe as needed. The price paid is from $5 to $8 per running foot, depeuding on the character of the rock.

No timbering is required except in a few isolated cases, where a soft seam is encountered, necessitating standing a few tunnel sets.

In running the 7x8 single-track drifts, either one

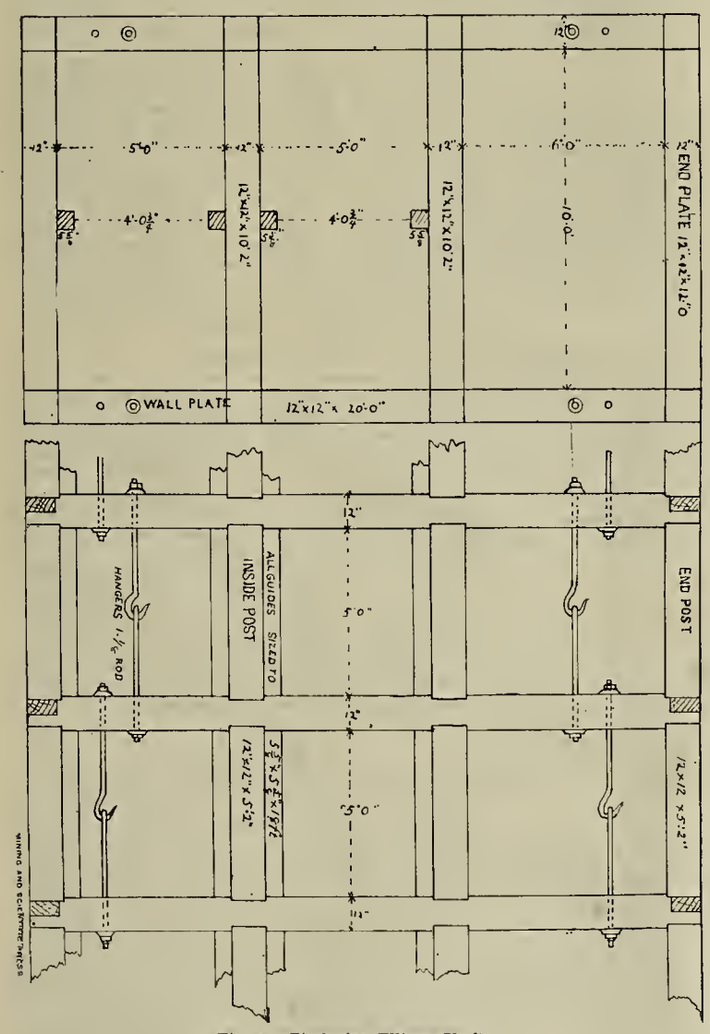


Fig. 6.—Timbering Ellison Shaft.

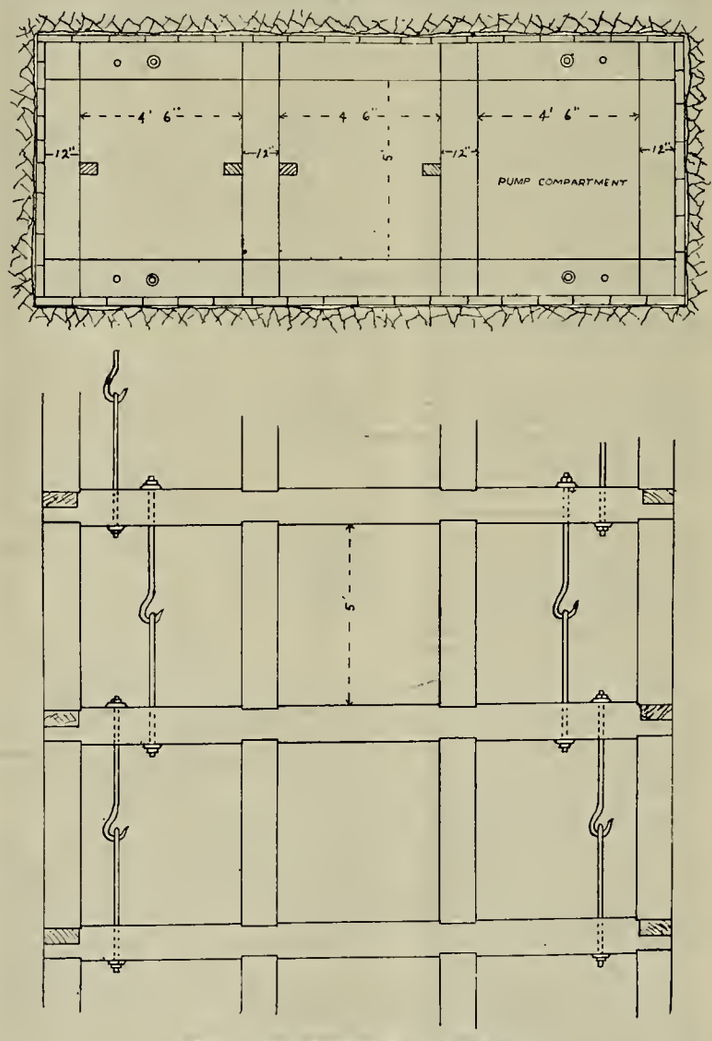


Fig. 7.—New Standard Shaft Timbering.

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easier to lay a straight track and allow ample room for a ditch on one side.

Mounting the machine on a bar instead of a column has only lately been tried in the Homestake mine, and the result has proven very satisfactory. Machine men say that it is easier to move the machine from one position to another, which fact is an advantage to the miner and will, in the end, materially advance the interest of the company.

The manner of placing the holes is illustrated by Fig. 9, which represents the face of a drift. The direction and inclination of the holes are shown by arrows, and the order of blasting the holes is indicated by numbers.

The following tabulated statement shows the cost of 5 feet of average 7x8-foot drift:

One miner, two shifts, drilling, at $3 50	$ 7 00
One helper, two shifts, drilling, at $3	6 00
One miner, one shift, blasting, at $3 50	3 50
One helper, one shift, blasting, at $3	3 00
One shoveler, two shifts, at $3	6 00
Explosives—Powder, caps and fuse	10 75
Blacksmith labor, repairs of machine, and machine shop labor	4 85
Total cost	$41 10
Cost per foot	8 23

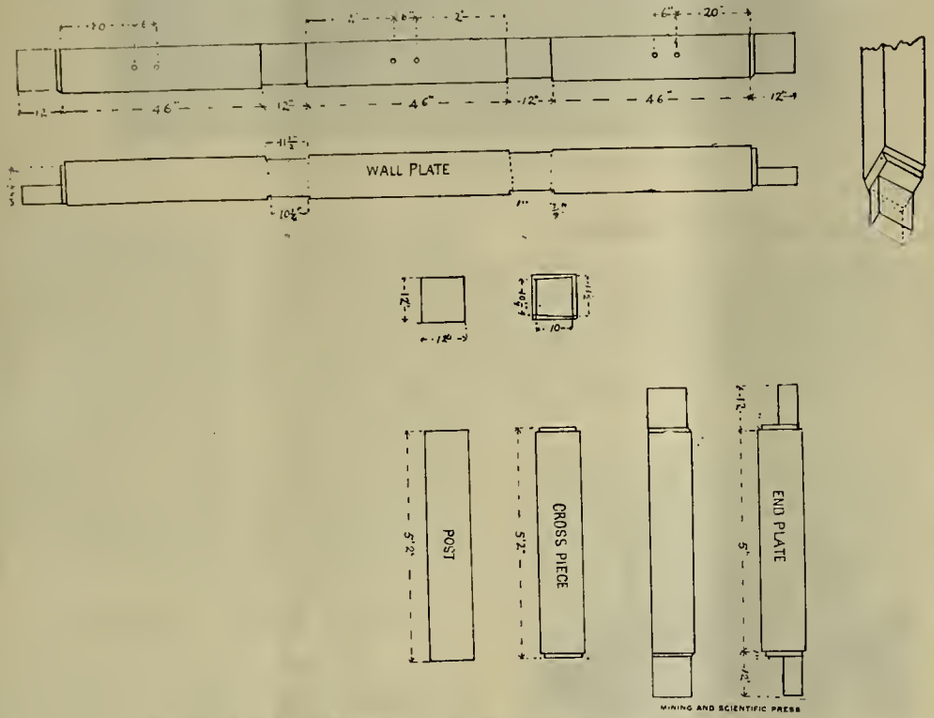


Fig. 5.—Members of Shaft Set, Three-Compartment Shaft, Homestake Mine.

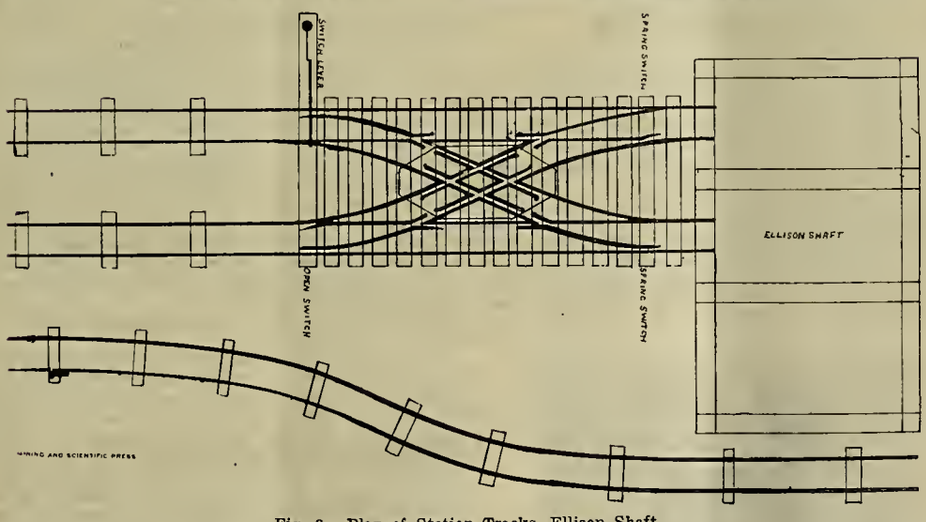


Fig. 8.—Plan of Station Tracks, Ellison Shaft.

The above cost statement does not include the cost of laying track or putting in air pipe. This was left out because track and air pipes are a part of the permanent improvements of the mine, and not all of this item should be charged against any particular drift. (TO BE CONTINUED.)

MINISTER A. M. BEAUPRE, of Bogota, Colombia, reports that Colombia has passed a new mining law, which is intended to develop the many gold, silver and platinum mines of that country. It provides that a tax of $10 be paid for each denunciation and $50 for the concession title, paper money, and a scheme of annual taxation for working the same. All mining machinery going there will be admitted free of duty. An effort was made to amend the law so that all mines, including iron, copper, zinc, sulphur, and precious stones, could likewise be denounced and acquired by individuals, but it was defeated.

A Code of Mine Regulations.

It is the desire of the management of mines everywhere to avert accident and disaster in the operation of the mines under their direction, but generally only ordinary methods are employed to promote these humane and business-like ideas, and simple rules are made for the purpose, governing the conduct of the men and the use of the company's property. The following "Notice to Employes," posted about the various mines and works of the Federal Mining and Smelting Company of Wallace, Idaho, is one of the most comprehensive codes of rules and regulations yet issued with the above-mentioned purposes in view, and it seems so complete and so suggestive that it is given space in full:

ALL EMPLOYES MUST READ THESE RULES CAREFULLY BEFORE GOING TO WORK.

1. The following rules must be strictly observed by all miners and other workmen employed by the above named company.

The object of those rules is to obtain the greatest possible safety for all employes. It is hoped that all, by using the utmost caution in the performance of their respective duties, will co-operate in securing the safety both of themselves and their fellow workmen.

GENERAL.

2. It is the duty of all employes to take sufficient time to make the examinations required by these rules, to guard against any dangers from accidents in the mine or its workings.
3. Each man must ascertain by careful examination thereof that the particular place in which he is employed is safe. If found to be in an unsafe condition from any cause whatever, measures must be taken to remove such danger at once and before proceeding to work, and if necessary the foreman or shift boss must be notified.
4. It is the duty of every employe to warn his fellow employes and boss of any danger which threatens or which may appear to threaten to cause injury to any person or the property of the company.
5. No smoking will be allowed while on duty or any time around the premises, except under ground during lunch time only.
6. All employes who cannot read must report same, or be reported to the foreman, shift boss or timekeeper, or any other employe, who will thereupon read these rules over to him, explaining the same thoroughly, and no man will be permitted to go to work without first reading and signing these rules in the office of the company at the mine in which he is to work.
7. Any machinery noticed to be defective must not be used until fully repaired by competent mechanics, and no one is permitted to assume the duties of a fellow workman in the running of any machinery not in his charge, unless authorized to do so by the foreman or master mechanic.

GENERAL MINING.

8. Throughout the mine, and especially in the stopes, there are many openings which must be carefully avoided. Some of these openings are in constant use, such as man-ways, timber-ways, chutes, etc. There are others not so constantly used which may be temporarily open. All employes are warned to observe these latter openings and to warn their fellow employes of the same and see that the same are covered, or to warn their boss to cover them when not in use. Workmen using any openings shall warn approaching employes of any existing danger.
9. Miners driving drifts, crosscuts or raises which are to connect with other workings must not blast when such drift, crosscut or raise is within 10 feet of such other working, before word has been sent to warn all employes to keep away from the vicinity where the connection is expected to be made.
10. It is the duty of all employes working in any raise, drift, crosscut or winze whenever a connection with other workings is made, to notify their shift boss, who shall write plainly on the bulletin board provided for that purpose, when such connection was made with other workings, so that the on-coming shift will be aware of any danger or dangerous place.
11. Drills, timber or other material must not be placed within 5 feet of any shaft opening or winze.
12. It is the duty of machine men to see that their machines, air drill hose and tools are removed a sufficient distance to escape injury from blasting.

EXPLOSIVES, MISSED HOLES, ETC.

13. Before blasting, employes must warn all persons within range of danger; and, after spitting fuse, guard all avenues of approach against persons coming unawares towards place being blasted. All employes while blasting must remain in a safe place within hearing distance, and count the number of shots heard, and carefully note the number of missed holes, if any. No employe shall, under any circumstances, approach a missed hole within thirty minutes after spitting the fuse. The fuse used burns not less than 1 foot in twenty-three seconds. No fuse less than 6 feet in length must be used.
14. Miners who have blasted on coming off shift must notify their shift boss and the on-coming shift if there have been any missed holes, and how many, so that they may have full knowledge of the matter. In such cases the shift boss coming off shift must write plainly on the bulletin board provided for that purpose, the place where the missed holes have been left and the number of missed holes; also fill in blanks furnished for keeping record of missed holes. It is the duty of the on-coming shift to find out if there are any missed holes or other danger where they are going to work.
15. When returning to any place after a blast or blasts have been fired, each employe upon entering such place must make a careful examination for any loose rock or other elements of danger by which he could be injured, and if any such be found he shall immediately make it safe, or, if unable to do so himself, report the same to the shift boss or foreman before proceeding to work. Employes must carefully examine the workings before setting up machines, for loose or scaling rock or any elements of danger, and all missed holes must be fired before drilling is commenced.
16. When blasting choked chutes warning must be given in both directions so that no one may come opposite or too near such chutes at time of firing.
17. All blasting of boulders in stopes must be done under the direct supervision of the shift boss and NOT otherwise.
18. All sticks or pieces of giant powder, fuse or caps, not used must be taken from drift or other place to place prepared in crosscuts, and not left around the mine. Lighted candles or torches, or any other naked light must not be taken into magazines or near capping benches or place prepared for powder in crosscuts or elsewhere, as these places are lighted by electric lights or other enclosed lights. The temperature of magazines or other place where powder is kept must not exceed 65° Fahrenheit. Thermometers are furnished to test temperatures. If any thermometer is broken the first employe discovering such breakage must immediately report it to the foreman. Smoking in or about any of the above places is strictly forbidden. Caps must not be carried to powder magazines.
19. Miners must not carry giant powder or caps in their pockets or boots. When using less than a stick of powder, the stick must be cut with a knife, and not broken without cutting. Picking giant powder out of a hole is strictly forbidden. No tamping of powder with steel or iron bars is al-

lowed. Capping benches must not be less than 50 feet from powder magazines.

RULES FOR OPERATING TUNNEL TRAINS AND TRAMMING ON LEVELS.

20. Tramming is constantly going on throughout the mines on the levels and tunnels and all persons must be constantly on the lookout for cars and trains.
21. No one shall get on or off tunnel trains while same are in motion.
22. Motormen must not run their trains at a greater speed than 6 miles per hour, and it is the duty of the motormen and all other employes on trains to see that switches are properly set and that no open switches are left in the direct route the train is taking. Switches of this company are of the general railroad pattern and must he kept closed so as to prevent accidents. If motors, cars, track, or other equipment is noticed to be defective, same must he reported to the foreman so that immediate steps can he taken to repair the same. In coupling cars the hand must not he used under any circumstances, unless the train is at a standstill.
23. Trains or cars passing a person or persons in tunnel must slow down and give such person or persons sufficient time to get off tracks.
24. Motormen must keep their motors clean and in good order. In handling passenger coaches the motor must always pull the coaches and never push the same, except when the coaches are empty.
25. Any employe riding on the electric locomotives does so at his own risk. No one is allowed to ride on the ore trains. This company does not furnish hand-cars for the use of its employes.

SHAFT AND HOISTING RULES.

26. Engineers in charge of hoisting engines at the change of shift and at meal times shall first send down the cage empty to ascertain that the shaft is clear and safe before lowering the men down in the shaft.
27. Not more than eight men at a time shall ride on each deck of the cage at the Standard mine, and not more than six men at a time on each deck at the Burke mine. Riding upon timher skip in any shaft, raise, winze or elsewhere is positively forbidden.
28. It shall he the duty of the mechanical department to daily inspect the hoisting ropes and engines to see that the same are in a safe condition and in proper repair, and if at any time the rope or any part of the machinery shall appear to be out of order, to have the same repaired before continuing with the hoisting.
29. Tools, steel, drills, timber and other material must not he lowered or hoisted except when placed inside cage or other conveyance and made safe by fastening. When men are hoisted the cage or other conveyance must commence to slow down within one hundred (100) feet of the sheaves. Men must not he lowered or hoisted at a speed greater than 6 miles per hour, and when the cage on which men are heing lowered approaches a station where chairs are in use the speed of the cage must he materially lessened.
30. No employe must leave the shaft at any station without first seeing that the har is properly placed in position, so as to prevent any one walking into the shaft opening.
31. Cage men must, immediately after the cage is hoisted, remove the chairs and see that everything is clear for the cage to pass.
32. No one shall pull the electric signals or bell rope hut the cagers, unless hy express permission of the foreman.

SPECIAL RULES FOR SHAFT SINKING.

33. Before spitting fuses the hlasting signal must he given to the engineer, and the fuse must not he spit until the engineer replies by hoisting the cage hucket a few feet and lowering it again. The engineer after answering the signal must remain ready to instantly hoist the men from danger.
34. For shaft firing the shortest fuse must be at least 9 feet in length.

SPECIAL WARNING AS TO ELECTRIC WIRES AND OTHER ELECTRICAL APPARATUS.

35. All employes are warned to carefully avoid coming in contact with any electric wires or other electrical apparatus, and are also warned not to touch them with any metal which is held in their hands, as all of the wires carry high voltages and are dangerous to touch.

By order of The Federal Mining & Smelting Co.

I, ..., having applied to the Federal Mining & Smelting Co. for work in its mines, do warrant that I have had experience in such work; that I know the duties which will be required of me and the nature of the places in which I will he required to work; that I am fully acquainted with the hazards of mining work and the nature of the places in which such work is carried on, and voluntarily assume the same; that I have received a copy of the foregoing rules, which I have read (which have heen carefully read to me), and which I thoroughly understand and agree to comply with.

Dated.....

Witness ....

A Card.

TO THE EDITOR:—There has come to my hand a circular prospectus of the Crowu King Mines Co., iu which my name is used without authority. I do not consent to the use of my name thereiu, nor do I vouch for any of the figures or statements contained in said prospectus. SAMUEL W. OSGOOD.

Chicago, Ill., Feb. 8.

Quartette Mill, Searchlight, Nevada. (See Front Page.)

Laboratory Ore Crusher.

Herewith is illustrated the Case laboratory ore crusher, regarding which the Denver Fire Clay Company of Denver, Colo., say that patents were issued W. W. Case of Denver, Colo., some months ago thereon, but before placing it on the market they wished to make a thorough test, that it is designed to supersede the Bosworth crusher, and that while it is, in all respects equal, to the Bosworth in poiuts of

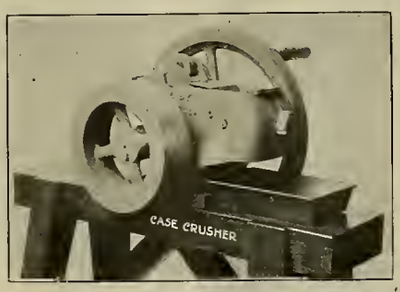


Fig. 1.—Laboratory Ore Crusher.

durability, strength of parts, capacity, adjustment and simplicity of cleauing device, it is considered superior. It is made for both hand and power. The illustrations show the power machine, which is equipped with a 9-inch belt pulley, 2¾-inch face. The manufacturers recommend 450 to 500 revolutions as best for all round laboratory work.

For several years the demand for power-driven crushers has increased. At present it is estimated that 75% to 80% of the sales are for power crushers, which, if properly constructed to stand the above speed, have a capacity ten times that of the hand crusher. Fig. 1 shows the crusher ready for use. Fig. 2 shows it opened to clean. To open is required

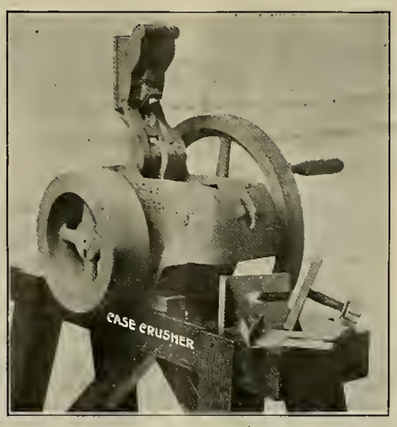


Fig. 2.—Laboratory Ore Crusher.

two or three turus of the hand wheel at the frout and of frame, which loosens the front jaw plate aud edjustment shims, the top being then lifted out. The rear jaw plate can then be raised and swung back, as shown in Fig. 2. This cleaning device is quickly operated and does uot weaken the crusher frame.

The adjustment for fine or coarse crushing is made by use of sheet steel shims, which are inserted between the front jaw plate aud the frame, the shims having a slot, as shown in Fig. 2, allowing it to drop astride the bolt connecting the jaw plate with hand wheel. This adjustment affords a variation of from one-quarter to thirty mesh, and does not alter the relative position of the front and back jaw plates. The motion of the movable jaw is such as to give it good feed and still not cake on soft material. The rear jaw plate is held by one taper head bolt in the center, so that wheu the lower end becomes worn it can be reversed. The frout plate is also reversible.

The capacity of the crusher, driven by 1 H. P., is stated to be from 100 to 200 pounds per hour. The jaw opening, 2½ inches by 3 iuches; all parts duplicated; weight, 135 pounds.

Hydraulic Mining in Cariboo, B. C.

The anuual report of operations of the Con. Cariboo Hydraulic Mining Co., submitted by Manager J. B. Hobson, E. M., to the company at a recent meeting held in Toronto, Canada, shows some interesting details of the large operations in progress in Cariboo. In his report Mr. Hobson says in part:

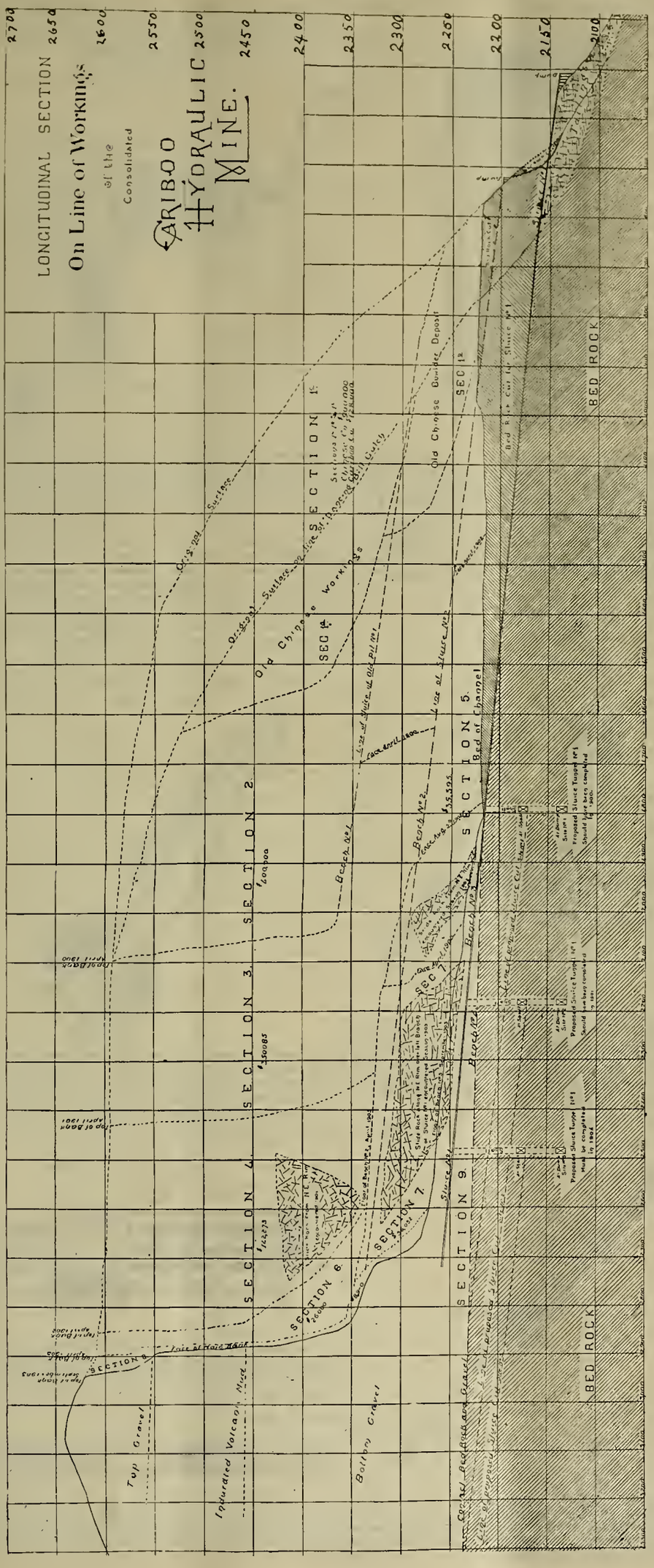
The past season turned out a disappointing one, for the reason that the 26 inches of well settled snow that laid ou the watershed at the end of March went off maiuly by evaporation under the influence of the cold frosty weather, accompauied by the northerly winds that prevailed during the months of April and May, affordiug barely sufficient water to operate the miues fifty-three days and seven hours, with a quantity of water varying from 2000 to 2500 miner's inches, being twelve days and eight hours short of the washing time reported for season 1901, and 118 days and six hours short of the washing season reported for season of 1900.

The season's mining operations were divided iuto two runs as follows:

Washing was commenced on the third bench in pit No. 1 on the 21st day of April, was continued for a period of forty-five days and seven hours, ending July 15th. During the progress of the run 111,083 miner's inches of water were used to wash out a slide of indurated volcanic mud, containing about 68,000 cubic yards, that came into the excavation from the northwest rim on the big bend of the chaunel north of Dancing Bill gulch, and 248,000 cubic yards of the rocky deposits of the the third bench, making a total of 316,000 cubic yards for the run, from which was recovered $2115\frac{85}{100}$ ounces of gold, valued at $36,032.94, an average yield of $14\frac{53}{100}$ cents per cubic yard for the 248,000 cubic yards of gravel and slide rock washed from the third bench, which was carried up to the face of the main bank.

About half the washing time was applied to the excavation of the rocky cuts required to accommodate the right and left brauches of sluice No. 1, which were advanced 740 feet on the right and 704 feet on the left side of the excavatiou.

The second run, commeuced on the 21st day of July, included a period of eight days, ending with the exhaustion of the water supply on the 21st day of August. During the progress of the run 16,000 miner's inches were used to wash out about 12,000 cubic yards of slide rock that came iuto the excavatiou from the southwest rim, and 44,000 cubic yards of gravel from the main bank, making a total of 56,000 cubic yards for the run, from which was recovered



523 24/100 ounces of gold, valued at $8910.76, an average yield of 20 24/100 cents per cubic yard for the 44,000 cubic yards of gravel washed from the main bank. The right hand branch of sluice No. 1 was advanced 45 feet, making the advancement of sluices amount to a total of 1489 feet for the season.

The grade of the deposits of the third bench increased gradually as the workings were carried up channel towards the main bank, but the immense deposits of slide rock, found lying next to the northeast rim, on line of left branch of sluice No. 1, replaced a large area of the pay strata, and caused a material reduction in the average yield of the ground worked. The removal of this immense deposit of broken, angular rock retarded the progress of the work, and added materially to the cost of mining, and the excavation of cuts required for the advancement of left branch of sluice No. 1.

The results of the second run is encouraging, and indicates a continuation of the high-grade deposits that gave satisfactory results prior to the season of 1901, where enormous deposits of slide rock from the rims were found replacing large areas of the high-grade strata composing the main body of the fill found between the rims of the ancient river.

The light gold output may be laid to the short water supply, the working time lost in removing large masses of slide rock, encountered while carrying the workings up stream, and excavating cuts for advancement of sluice branches.

SUMMARY OF THE SEASON'S MINING OPERATIONS.

Quantity of gravel, clay and rock washed—	
Gravel from third bench, cubic yards	248,000
Gravel from main bank, cubic yards	44,000
Slides from rims of old workings and indurated volcanic mud, cubic yards	68,000
Bedrock slide, cubic yards	12,000
Total quantity washed, cubic yards	372,000
Average duty of water per miner's inch, cubic yards	2 92
Gold product for season, Troy ounces	2,639 09
Value of gold	$44,943.70
Total time occupied in washing in pit No. 1, 53 days, 7 hours.	
Total quantity of water used, miner's inches	127,083

CONDITION OF THE MINE.—To better illustrate the subject, I have prepared the accompanying longitudinal section on line of workings.

By reference to the longitudinal section you will note that all the ground in the third bench, including sections Nos. 5 and 7, has been worked out up to the face of the main bank, leaving the shallow bench of ground between sluice No. 1 and bedrock as bench No. 4, extending from the point where sluice No 1 goes above bedrock at A, about 1100 feet to the face of the main bank.

Sections 1 a, 1 b and a portion of 1c were worked out by the Chinese, who reported a gold recovery of $900,000. The Cariboo hydraulic mining companies worked out the remainder of sections 1 a, 1 b and 1 c and recovered therefrom $128,000. The Cariboo Hydraulic Mining Co. worked section No. 2 and recovered therefrom gold valued at $400,000. The Cousolidated Cariboo Hydraulic Mining Co. worked section No. 3 during season of 1900 and recovered therefrom $350,085.77. Section No. 4 was worked out in 1901 and produced $142,273.41. Sections Nos. 5 and 6 were worked out during season of 1902. Section No. 5 produced $35,395.19, and section No. 6 produced $26,000, a total of $61,395.19. Sections Nos. 7 and 8 were washed during season of 1903. Section No. 7 produced $36,032.94, and section No. 8 produced $8,910.76—a total of $44,943.70—making the total gold product for the 2370 feet of channel worked amount to $2,026,698.07.

The bedrock cut B and sluice tunnel No. 1, at site No. 1, should have been completed during season of 1900, so that all the ground included in sections Nos. 4, 5, 6, 7 and 8 and the fourth bench, included in section No. 6, could have been washed through sluice, cut and tunnel at reduced cost for mining and sluice maintenance, but the delay in the delivery of the power drill plant and electric appliances until late in 1901 made it impossible to complete either cut or tunnel as expected.

The sluice tunnel must be driven from site No. 2 or No. 3 during the season of 1904, to afford outlet to the dumps for the ground worked during season of 1905.

Since the sluice cut has been lowered and the branches of sluice section No. 1 have been carried up to the main bank—and the working face includes a greater depth of high-grade gravel than has been exposed for washing since the opening of the property—the mine is in better condition for continuous and profitable operation than it was at the opening of the season of 1900, when $200,000 was netted out of a product of $350,085.77.

(TO BE CONTINUED.)

THE upward blows of a cam upon the tappet of the stamp mill have a tendency to drive the tappet upward, and this tendency is not overcome nor equalized by the momentum of the falling tappet when the mill is in motion. As a consequence, tappets if not firmly keyed have a tendency to move upward on the stamp stem. When the cam shaft is making fifty revolutions per minute (100 drops of the stamp) the cam strikes the tappet moving at a speed (at the point of contact) of about 5 feet per second. The force of the blow is proportional to the weight of the cam when moving at a stated velocity.

Mining and Metallurgical Patents.

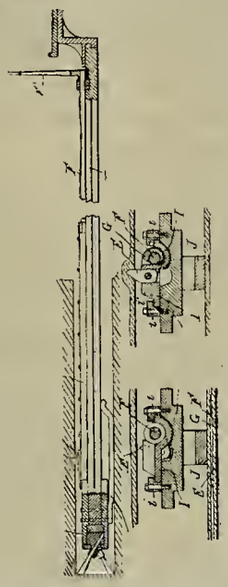
PATENTS ISSUED FEBRUARY 9, 1904.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

WELL DRILL JAR.—No. 751,199; G. B. Patton, Williamstown, W. Va.

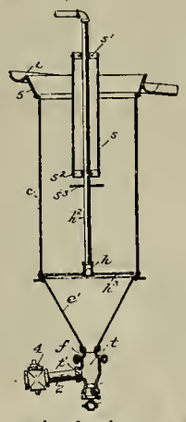
A device of kind described comprising shell, bushing secured in one end of shell, screw plug having inner tempered end fitting in opposite end of shell, plunger working in shell through bushing, and removable cap secured to inner end of plunger.

MINING MACHINE.—No. 751,478; H. B. Dierdorff, Columbus, Ohio.



In mining machine, combination, of bed, carriage, laterally acting cutters on carriage, holding device rigidly connected with carriage laterally and adapted to be moved toward and from carriage, and means for moving holder device at will into and out of engagement with coal.

PNEUMATIC HYDRAULIC SEPARATOR.—No. 751,645; F. W. Hopkins, Denver, Colo.

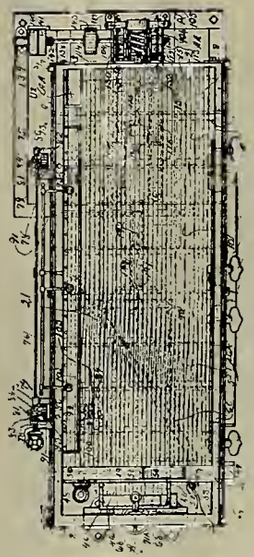


In combination casing having upper end and lower outlets, means for introducing air into casing extending throughout entire cross sectional area of casing to diffuse air gently throughout entire mass of material, casing being unobstructed for passage of material upwardly and downwardly according to weight, inlet for crushed material at point below surface of liquid in casing and deflector or spreader extending across inlet to spread material issuing therefrom and to prevent escape of air therethrough, air-introducing means being located at distance below deflector with liquid space intervening.

PROCESS OF TREATING COPPER ORES.—No. 751,648; N. V. Hybinette, Plainfield, N. J.

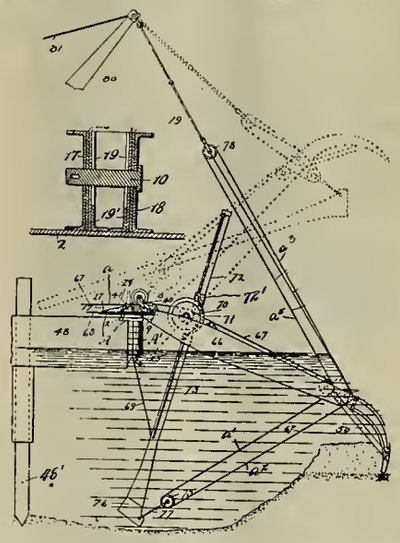
Method of treating ores of copper and similar metals by subjecting ore in state of coarse division to oxidizing roasting and converting metallic compounds thereby into more or less soluble condition, then roasting it with reducing agent, thus rendering compound insoluble, treating mixture with water and separating finely divided valuable material from coarser gangue.

ORE CONCENTRATOR.—No. 751,971; H. S. Bailey and W. E. Wild, Denver, Colo.



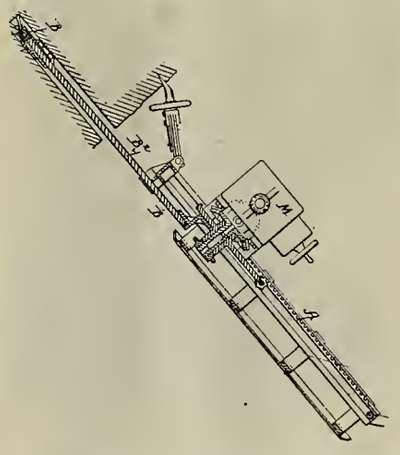
In ore concentrator, reciprocating table containing plurality of ore pulp receiving recesses of predetermined length, width and depth; plurality of ridges or dams extending across ore pulp receiving recesses, plurality of concentrates washing and classifying portions below dams, means for feeding ore pulp into and across recesses, and means for flowing supply of clear water over concentrates below ridges or dams, and means for tilting and for reciprocating table.

DREDGE.—No. 751,937; R. R. Osgood, Troy, N. Y.



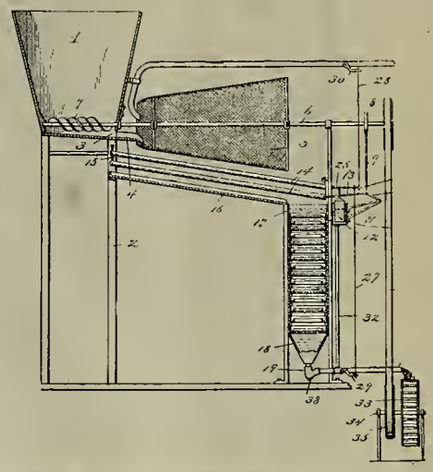
In dredge or excavator, hinged boom, dipper sustained thereon upon handle arranged to travel back and forth within bearings on boom, hoisting chain connected with dipper below boom and extending above boom, for operation, and a bank-engaging anchor upon extremity of boom.

MINING MACHINE.—No. 751,919; J. A. Jeffrey, Columbus, Ohio.



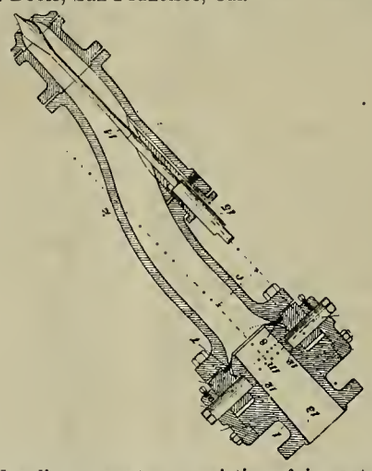
In mining machine, combination of cutter chain, carriage supporting chain, bed for supporting and guiding carriage, power devices for actuating cutter chain and moving carriage, and holding device for carriage, consisting of endless chain supported on carriage and adapted to engage with one of horizontal walls of kerf, and to have its active portion moved backward on lines parallel to path of carriage while moving bodily forward therewith.

AMALGAMATOR.—No. 751,911; R. P. Hall, Gem, Idaho.



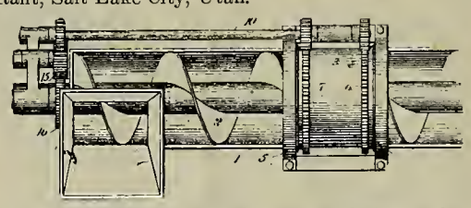
In amalgamator, combination with hopper, having shaft journaled therein and extending therefrom; of feed mechanism within hopper and upon shaft, revoluble screen upon shaft adapted to receive material from hopper, reciprocating screens thereunder, inclined board below screens, receptacle adapted to receive material from board, series of trays within receptacle and arranged one above other, trays having apertures in bottom thereof arranged out of alignment, trap communicating with bottom of receptacle, outlet pipe extending from trap, float, valve within outlet pipe, pipe for supplying water to screens and receptacle, valve therein, mechanism connecting valves and float, and means for rotating shaft.

NOZZLE FOR IMPACT WATER WHEELS.—No. 751,722; W. A. Doble, San Francisco, Cal.



Hydraulic apparatus, consisting of impact wheel with buckets, nozzle pipe of sinuous or double curved form for directing stream of water upon buckets of wheel, means for varying amount of water discharged from nozzle and supply pipe, to which nozzle pipe is pivoted on axis in plane of its sinuosity, plane and axis being parallel to axis of impact wheel.

ORE SAMPLING MACHINE.—No. 751,340; W. L. Raht, Salt Lake City, Utah.



In ore sampling machine, rotary chute member having opening between ends, and means for causiug discharge of material through opening at intervals.

WELL PUMPING APPARATUS.—No. 751,049; B. L. Brinton, Bradford, Pa.

In well pumping apparatus, the combination of well tubing, fixed workiug barrel at bottom thercof, removable working barrel having same internal diameter as fixed working barrel and external diameter less than iuternal diameter of tubing.

The Geology and Copper Deposits of Bisbee, Arizona.*

NUMBER III.

Written by F. L. RANSOME.

MINERALOGICAL CHARACTER OF THE ORES. — The ores worked by the Copper Queen Cousolidated Mining Co. up to 1893 were oxidized ores, consisting chiefly of malachite, azurite, cuprite and native copper. In the upper levels the malachite and azurite occurred as beautiful incrustations and stalactites lining caves in the limestones. These "cave ores" have been exhausted, and although oxidized ore is still abundant, it occurs generally as soft earthy masses, often containing cuprite and native copper, and usually associated with large amouuts of limonite and kaolin. Native copper and crystalline cuprite are still abundant in the recently opened workings of the Calumet & Arizona mine.

The original sulphide ores, from which the oxidized ores have been derived, consist of pyrite containing variable amounts of chalcopyrite and sometimes a little sphalerite. These pyritic ores are sometimes directly in contact with oxidized ores, but it is not uncommon to find masses of chalcocite between the two. The mineral, familiarly knowu as "copper glance," or "glance," is the most important sulphide occurring in the Bisbee quadraugle, since nearly all of the bodies of workable sulphide ore owe their value to its presence. So far as observed, it occurs only in massive form, distinct crystals being nowhere seen. It is sometimes firm and compact in texture, but is often rather soft and occasionally has almost a sooty character.

The chalcocite occurs at various depths, but uowhere far from ore showing at least partial oxidation. Its most characteristic place of occurreuce is in the irregular zones of rich sulphide ore that usually intervene between masses of lean pyrite and oxidized ores containing cuprite, native copper and carbonates. The ore of these zones often consists of soft crumbling pyrite, which is intimately associated with dull, crypto-crystalline chalcocite in the form of a thin envelope about the pyrite grains. The greatest depth at which chalcocite has been observed is 1050 feet, in the Calumet & Arizona mine. Bornite has been reported from some of the ore bodies, but arsenical or antimonial compounds of copper are absent, so far as known. The copper bearing minerals of the oxidized ores include malachite, azurite, chrysocolla, melanochalcite, aurichalcite, brochantite cuprite, tenorite and footeite.

Of the various gangue minerals associated with ores, calcite, in its role of principal constituent of the limestouc in which the important ore bodies occur, is the most abundant. It is seldom, however, that the mineral forms so large a part of the altered limestone in the immediate vicinity of the ore as it does of the unchanged rock in which mineralization has not been active. It has largely been replaced in the process of mineralization by pyrite, amphibole, pyroxene, garnet, chlorite, quartz, vesuvianite and other minerals. The resulting rock is usually of more compact texture than the unaltered limestone and is slightly g eenish in tint. The metamorphic silicates are, as a rule, recognizable only uuder the microscope, and the contact metamorphism is therefore very inconspicuous as compared with the altered limestones of the Cananea district to the south.

GENESIS OF THE ORE DEPOSITS. — Two general processes have operated to form the ores now exploited. These are (1) metasomatic alteration, including pyritic mineralization, and (2) oxidation and its atteudant phenomena of transportation and enrichment. Concerning the precise boundary betweeu these two general activities some difference of opinion is possible; but as regards the essential share of each in the genesis of the ores there can be uo question. There are few known ore bodies in the Bisbee quadrangle which do not demonstrably owe their value to the co-operation of both processes. This was also the conclusion reached by Emmons from the descriptions of Douglas and from a brief visit to the Copper Queen mine. The existence of workable masses of ore that have resulted wholly from the primary metasomatic mineralization, while not denied, is still as far from proof as when Dr. Douglas published his account of the Copper Queen mine four years ago.

As shown in thosc underground workings which are below the intermediate zone penetrated by oxidizing reagents, the sulphide minerals ascribable to the early period of metasomatic alteration are common pyrite, and perhaps also a little chalcopyrite and sphalerite. The occurrence of some cerussite in the limestones suggests that galena may also occur, although this mineral has not been seen. Associated with these sulphides are amphibole (tremolite), pyroxene (diopside), garuet (grossularite), vesuvianite, quartz and chlorite, in the limestones; quartz, sericite, chlorite, perhaps kaolin, and a little epidote in the granite porphyry; and quartz and sericite in the Pinal schist.

The metamorphic minerals are not distributed uniformly through the limestone, but are arranged iu zones about the porphyry stock of Sacramento Hill. Nearest the porphyry the former limestone is now a fine grained aggregate consisting chiefly of quartz and calcite. The width of this siliceous zone may be roughly estimated at about 200 feet. It is probably very irregular and is not sharply defined at its outer border. Although heavily impregnated with pyrite, it has not proved such favorable ground for ore as the next zone to be described.

Eucircling the siliceous zone are the palc green altered limestones in which pyrite, tremolite, diopside, grossularite and probably vesuvianite are the characteristic minerals. In this zone quartz is comparatively rare. Calcite, however, is abundant, and may make up half or more of the altered limestone. At its inner edge, this zone grades somewhat indefinitely into the siliceous zone. About its circumference it passes by obscure gradations into the unmetamorphosed limestones of the regiou. The rock of this zoue of metamorphic silicates is softer thau that of the inner siliceous zone. It is frequently traversed by little irregular surfaces of shearing, so that the rock tends to break along many curved surfaces into many small fragments. Thc width of this zonc cannot be stated with precisiou, on account of the indefiuite character of its boundaries, but it may be very roughly estimated at about 1000 feet. The zone is not, however, limited in plan to a simple concentric band about the porphyry, but exteuds for a considerable distance to the uorthwest, alongside the Dividend fault.

The town of Bisbee lies on the fault line. Thc hills northeast of the town are composed of pre-Cambrian schists. Those just south of it are upper Carboniferous limestone, with lower Carboniferous, Devonian and Cambrian beds coming successively to the surface along the fault to the northwest.

A little less than half a mile southeast of the center of town, the fault encounters a mass of altered granite-porphyry and as a simple fracture disappears. This porphyry, which forms Sacramento Hill, a local landmark, is a very irregular stock about a mile in diameter. It has invaded the pre-Cambrian schists on the northeast, and the upper Carboniferous (probably also the deeper-lying older Paleozoic beds) on the southwest. The available evidence indicates that the intrusion of this porphyry took place after the dislocation of the invaded rocks by the great fault. The latter probably continues to the southeast of the porphyry mass, but it is concealed in this direction by the younger Cretaceous beds. The Paleozoic beds forming the faulted syncline are not merely flexed, but are cut by many faults, some of them of considerable throw. These faults are, as far as seen, of the normal type.

The ore occurs very irregularly as large masses within the limestone. The horizontal extent of these bodies is usually much greater than the vertical. They are rudely tabular in form and lie generally parallel to the bedding planes of the limestone. As a rule, the important ore bodies have been found within a distance of 1000 feet of the main porphyry mass or of the great fault fissure just northwest of the porphyry. In the Czar workings of the Copper Queen mine, partly under the town of Bisbee, ore bodies have been worked from the surface down to a depth of about 400 feet, but toward the southeast the bulk of the ore occurs at increasing depths. In the Calumet & Arizona mine, about 3500 feet to the south of the Czar, no large ore bodies were encountered until the shaft had penetrated about 800 feet below the level at which the first ore body was discovered on the Copper Queen claim. The ore thus occurs at increasing depths toward the center of the local synclinal basin.

With thc exceptiou of the extreme western part of the Copper Queen mine, all of the productive and important workings in the vicinity of Bisbee are in the Carboniferous limestones. It is probable that the greater part of the ore bodies occur in the granular limestones of the lower Carboniferous, but the distinction between upper and lower Carboniferous beds can rarely be satisfactorily made underground. Some important ore bodies certainly occur in the lower part of the upper Carboniferous. On the other hand, no ore bodies of consequence have yet been found in the deeper-lying Devonian and Cambrian limestones. In the Copper Queen mine local usage has distinguished an "upper lime" and a "lower lime." As far as could be seen, however, this distinction is largely imaginary and is based on no constant lithological or structural features. Thc "lower lime" appears to be any limestone lying underneath the known ore bodies. It is in the main lower Carboniferous, and the ore-bearing possibility of the underlying and Devonian and Cambrian beds are yet to be ascertained by deeper prospecting.

Although the ore masses in general are what are usually termed "flat" ore bodies, dipping gently with the enclosing beds, they are related to other structures as well as to bedding planes. Ore is usually found in large masses along the contact of the limestones with the main porphyry mass. This contact, however, has not been thoroughly explored, and much of the ore aloug it consists largely of low-grade, partly oxidized pyrite. Dikes and sills of porphyry occur in the limestones at various distances from the main intrusive mass, and these are almost invariably associated with ore in the adjacent limestone. 'In some cases large ore bodies followed for a long distance in the general plane of the bedding have been known to turn dowu almost vertically alongside a porphyry dike. Fissures in the limestone have also uudoubtedly influenced the distribution of the ore.

While the main porphyry mass of Sacramento Hill is often heavily impregnated with pyrite, it has not been shown to contain workable ore bodies. It is certain, moreover, that many of the porphyry dikes encountered in the workings of the Copper Queen mines show little mineralizatiou even when in contact with ore.

(TO BE CONTINUED.)

* Abstract Trans. Amer. Inst. Min. Eng.

The Simplon Tunnel.

One of the greatest engineering projects of the day is the Simplou Tunnel, now approaching completion.

The total length of the tunnel will be 12.25 miles, of which distauce 6.25 miles have been penetrated on the north or Brigue side, 4.25 miles on the south or Italian side, leaving 1.75 mile still to be executed. Owing to the great height of the mountain above the tunnel—some 6000 feet—the pressure is great, and the temperature of the rocks and springs of water correspondingly high. The greatest heat encountered is 133° F., but it is now falling as the tunnel progresses southward, and at the present time is 126° F. Were this water to be allowed to fall on the workmen, injury would result. But thc simple expedieut is adopted of diluting it with cold water from the hydraulic mains, thus reducing its temperature to 70° F.

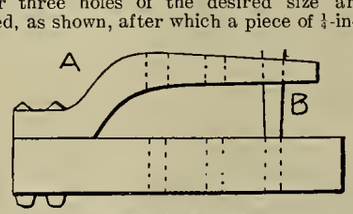
To cool the air in which the men are working, a large volume of fresh air, cooled by high-pressure water spray to 25° F. below the tunnel temperature, is sent right up to the working face. This point in other tunnels is generally foul and oppressive, but in the case of the Simplou is cool and fresh; and it is largely due to these precautions that no sickness exists among the men. The use of the drill suppresses all dust, and there has not been a single case of miners' phthisis, although some 3000 men have been at work for five years.

The advance galleries from Brigue have now passed both the summit of the tunnel and the frontier line between Switzerland and Italy; they are now on the descending gradient to meet the workmen coming up the corresponding ascending gradient from the south end of the tunnel. The aggregate monthly progress of the northerly and southerly ends of the advance galleries approximates a quarter of a mile. It is anticipated that, if no further or greater difficulties present themselves, a junction will be effected this year.

The volume of water flowing out of the south end of the tunnel is over 15,000 gallous per minute, and furnishes motive power to work the refrigerating apparatus and to compress the air by which the drills are operated. The tunnel when completed will be the longest in the world—14 miles. The cost will be $13,510,000.

A Guide for Punching.

The accompanying sketch shows an article of probable value in cases where nothing better can be procured. To make this punch guide, take a bar of steel 5 inches long, ⅝ to ¾ inch thick, and 1 inch wide. Two or three holes of the desired size are then punched, as shown, after which a piece of ¼-inch steel



A Guide for Punching.

is punched with the same number of holes in the same position, but somewhat larger, so as to hold the punch. The sccond piece is then fastened to the first by means of two rivets, and the tool is completed. A represents the spring, B the punch. The use to which this tool may be applied is punching holes in ⅜-inch boiler steel. If the end of the punch is carefully tempered one can thus punch several thousand holes. One can have several different sizes of holes and punches. If the points of the punches are kept in order, punching will not damage or split the plate. This device would ofteu save considerable time in drilling holes.

Rare Minerals in Oklahoma.

Although out of seventy-one specimens sent from the Wichita mountains of Oklahoma, only two contained a trace of silver and none of them a trace of gold, still there have been discovered other minerals which may prove of great value. In one of the samples which were sent to the United States Geological Survey laboratory the discovery was made of the mineral called columbite. It is not knowu that columbite has auy specific value of its own, but its presence is always significant, for it is known to

have a fondness for the society of certain minerals that contain rare and valuable earths. Among these is samarskite, the source of thorium, which is in demand for use in the manufacture of mantles for Welsbach lights. Pitchblende, another of these minerals, is the principal source of radium.

H. F. Bain of the United States Geological Survey made a reconnoissance of the Wichita mountains last fall, with the purpose of studying the reported occurrence of ores of copper, lead and precious metals. The samples collected were assayed by E. T. Allen, chemical geologist of the Survey. Among other minerals Mr. Bain found molybdenite.

Methods of Mining in the Vermilion Iron District of Minnesota.

Written for the MINING AND SCIENTIFIC PRESS by KIRBY THOMAS.

For more than a generation the copper and iron mines of the Lake Superior district have been considered models for operation on an extensive scale by mining men from all parts of the world. The great depth of these ore deposits and the comparatively wide and regular ore bodies have permitted developments to be carried on in accordance with carefully

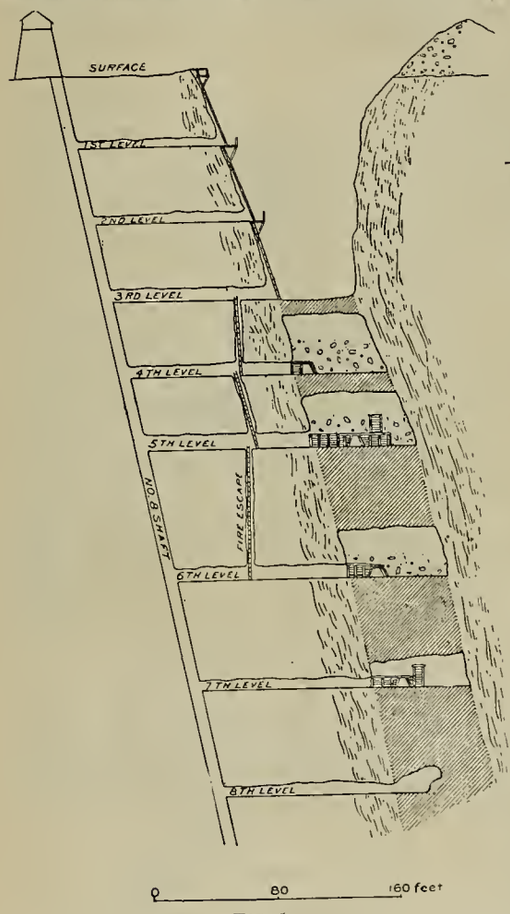


FIG. 1.

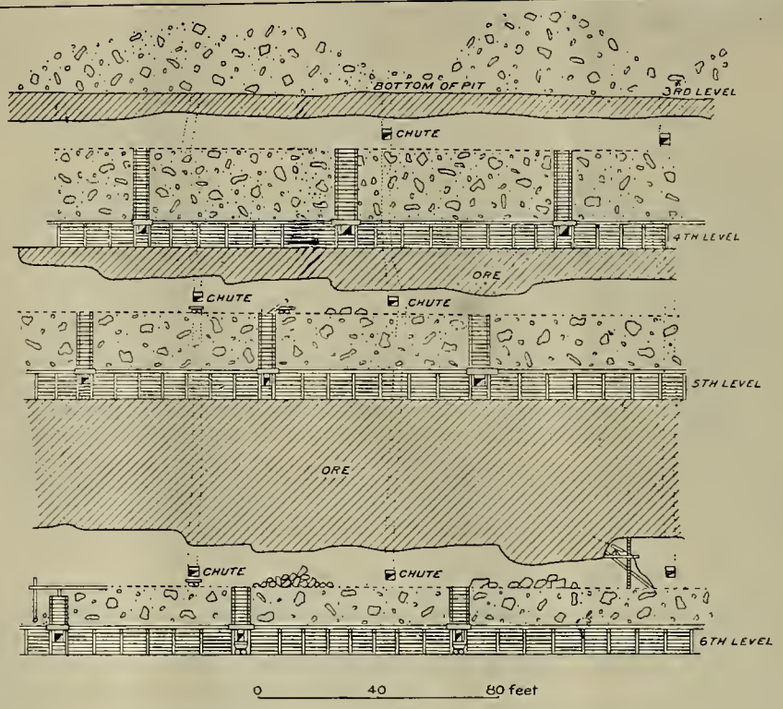


FIG. 2.

planned systems, and the extensive scale on which the mines have been operated has justified the best technical skill and the most effective of mechanical appliances. The iron mines at Tower and Ely, in the Vermilion district, in northeastern Minnesota, although only opened in 1884, are excellent examples of the best art in mining, and have long been looked upon as models by mining engineers and practical miners.

These mines have all been developed by the Minnesota Iron Co., now a part of the United States Steel Corporation, and from the start have had ample funds for carrying on the work in regard to the ultimate best results. The ore mined is hematite of bessemer grade. The output for 1903 was 1,676,744 tons for the mines at Tower and those at Ely. The total output to date exceeds 21,000,000 tons.

The ore is shipped by rail to Two Harbors, on Lake Superior, a distance of 72 miles from Tower and from Ely of 90 miles. Here it is automatically dumped into bins, from which it is loaded by gravity into large lake steamers for Lake Erie points.

A very excellent description of the methods of mining in the miues at Tower and in the Chandler mine of the Ely group is given in the recently issued monograph of the United States Geological Survey on the Vermilion district (Monograph XLV), prepared by J. M. Clements, under the direction of C. R. Van Hise, chief of the Lake Superior division of the Survey. From this publication, chiefly, and and from the writer's personal observations, the following general description of the methods used in these typical mines is prepared. The cuts are from the monograph mentioned.

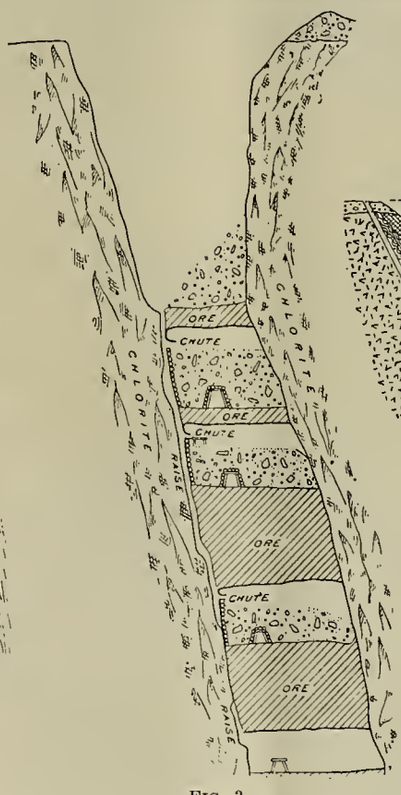


FIG. 3.

shows best the development of the "overhand stoping" system and may be taken as a type of this kind of mining.

The ore deposit of the Tower mines occurs in a synclinal and is separated by intercalated igneous sheets into a number of irregular ore bodies, one above the other. These ore bodies are more or less lenticular in shape and dip steeply to the north at angles of from 65° to 80°. The country rock is greenstone, but the igneous dikes, altered to chlorite,

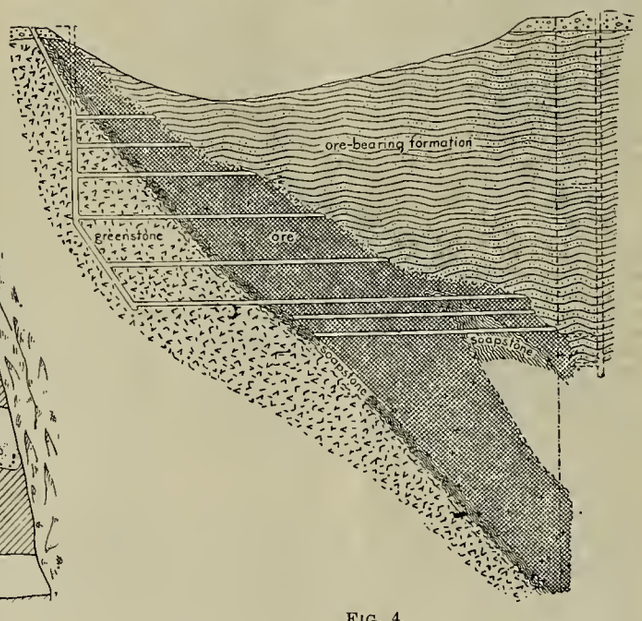


FIG. 4.

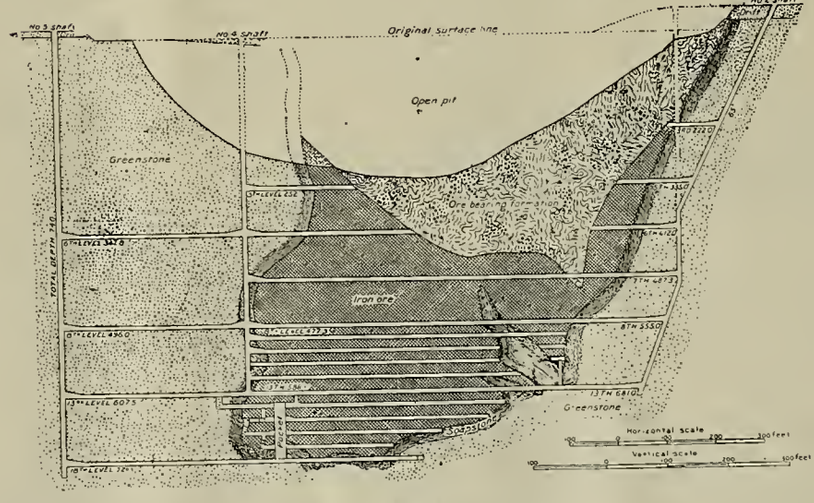


FIG. 5.

The Minnesota mine, near Tower, is really several mines operated as one. The No. 8 shaft of this mine

usually form the immediate contact. Sometimes the ore bodies are surrounded by the material of the iron formation proper—that is, cherts, jasper and interbanded hematite. The ore is hard, blue hematite.

The deposit outcropped on the hill and was first exploited by means of open pits. These were carried to a depth of 150 feet, when it was found advisable to resort to underground mining.

The No. 8 shaft, here described, is the deepest of these workings, being 926 feet in depth. This is a slightly inclined shaft and is sunk in the foot wall rock, sufficiently removed from the ore deposit to insure stability. Crosscuts are run from the shaft into the ore at intervals of 75 feet. The crosscuts, or levels, are extended to the hanging wall. A gallery 15 to 20 feet wide is stoped out in the ore body and across it. Drift sets, consisting of legs 9 feet long and 15 to 20 inches in diameter, with 11-foot caps, 16 inches or more in thickness, and heavy lagging, are erected in the gallery, extending from the foot wall to the hanging wall. After the timbering is completed filling is begun. In a like manner drifts are run along the strike of the ore deposit, connecting with the crosscut where it enters the ore body. Timbered ladderways and chutes are built up from the main drifts to a few feet above the drift sets. The space from which the ore is removed is then filled with waste rock, covering the drift sets with several feet of filling. The rock for the filling is obtained from cribbed raises, which are cut in the foot or hanging wall in the country rock along the contact with the ore. These raises extend to the surface and between each level. The rock from these raises is dumped from chutes direct into the space to be filled, or into tram cars for transportation to more remote places. By filling the raise with rock to the desired level, or by raising a temporary floor of timbers, the rock from the raise is diverted at any desired level. The rock obtained from the excavation of these raises and from the contact walls of the deposit is usually soft and easily broken down. Rock for the filling of the topmost level is obtained from the sides of the open pit. When an upper level is worked out the filling may be run into the level below.

The miners stand on the filling, or on platforms sufficiently near the roof to reach the ore and to break it down with tools or blasting. A slice of about 10 feet of the ore is blasted down from the roof. This is broken up and thrown into ore chutes or mill holes, by which it reaches the main levels, where it is loaded by gravity into bucket cars for transportation to the surface. The mill holes are placed about 25 feet apart and the men can throw the ore into them without tramming or second handling. At present the cars are hauled to the shaft by mules, but electric haulage is contemplated.

By this general plan the ore is worked out of the upper levels and the work is carried on in the lower levels simultaneously and independently.

Diamond drills are used at this mine for boring holes for blasting. This is the only mine in the Vermilion district using diamond drills for this purpose, but it is claimed that the hardness of the ore and the long holes drilled justify their use.

The several drawings herewith illustrate the general methods. Fig. 1 shows a cross section of shaft No. 8 to the eighth level. The various stages of the timbering are shown in the different levels. Fig. 2 represents a longitudinal section along the vein, the cribbing, ore chutes and filling being shown, also the methods of attacking the ore. The dotted lines indicate the raises in the walls through which the filling is introduced from above. Fig. 3 is a cross section showing the raise and levels in different stages of the work. The raises serve as a connection between the levels, and with the surface, as an escape in case of accident to the main shaft. Independent safety shafts are also provided, as shown in Fig. 1.

The Chandler mine of the Ely group is an example of the "caving" system, which is also used in the Pioneer and some of the other mines on the same deposit. The formation and the ore are similar to that at the Minnesota mine, except that the ore is naturally brecciated, which fact has been taken advantage of by the operators, and a system of mining developed which merely continues this natural process of brecciation and thereby reduces the cost of mining the ore. The ore at Ely lies in a trough of greenstone, pitching to the east at about 45°. A layer of sheared and altered greenstone about 25 feet thick lies between the ore and the massive greenstone. A cap of fractured iron formation, consisting of jasper, chert and ore bands, fills the trough above the ore body.

There are two general adaptations of the caving system in use in the Chandler mine. Above the eighth level the main levels are 75 feet apart and four series of sub-drifts are run between each main drift. Below the eighth level intermediate drifts at intervals of 20 feet are run, with no sub-drifts, and with stations at the shaft for each intermediate level. In the upper part of the mine two main drifts are driven from each level approximately parallel and on opposite sides of the ore block. From these main drifts, at 50-foot intervals, raises are put up, from which the four sub-drifts are run. The main drift is timbered with sets of 9-foot caps and 7-foot legs, and the sub-drifts with sets of 6-foot caps and 7-foot legs. This leaves about 8 feet of ore vertically between the sub-drifts. These sub-drifts are begun at the top and the ore is extracted successively until all above the main level is removed. The last step in any sub-drift is to slice the pillars and cave the backs of ore. The overlying rock and sand are then permitted to cave and the process is repeated for the next lower block of ore. The ore descends by gravity through chutes to the main drift, or level, where it is automatically loaded into tram cars and hauled to the shaft.

In the lower part of the mine the general procedure is the same, except that no sub-drifts are run, and a vertical thickness of about 10 feet of ore is broken down between the top of the sets of each intermediate level and the floor of the one above. This modification avoids the necessity of putting up raises and the ore can be loaded into cars more easily.

The naturally broken ore of the Chandler is further brecciated by the pressure of the load, and for this reason the caving system here has peculiar adaptation. Where necessary, machine drills are used in driving the headings.

An idea of the general plan of the Chandler mine can be obtained from the two cross sections shown in Fig. 4 and Fig. 5. The first is an east and west section, and the second a north and south section.

Both of these mines are considered models for the opening up of a large body of ore where the obtaining of a maximum amount of ore at minimum expense is desired.

The several cuts also illustrate the relations of the Vermilion ore bodies to the underlying greenstone rocks and the iron formation proper.

UNTIL 1900 the miner's inch was indefinite, varying in different districts. California and Montana have adopted 1.5 cubic foot per minute as the legal inch.

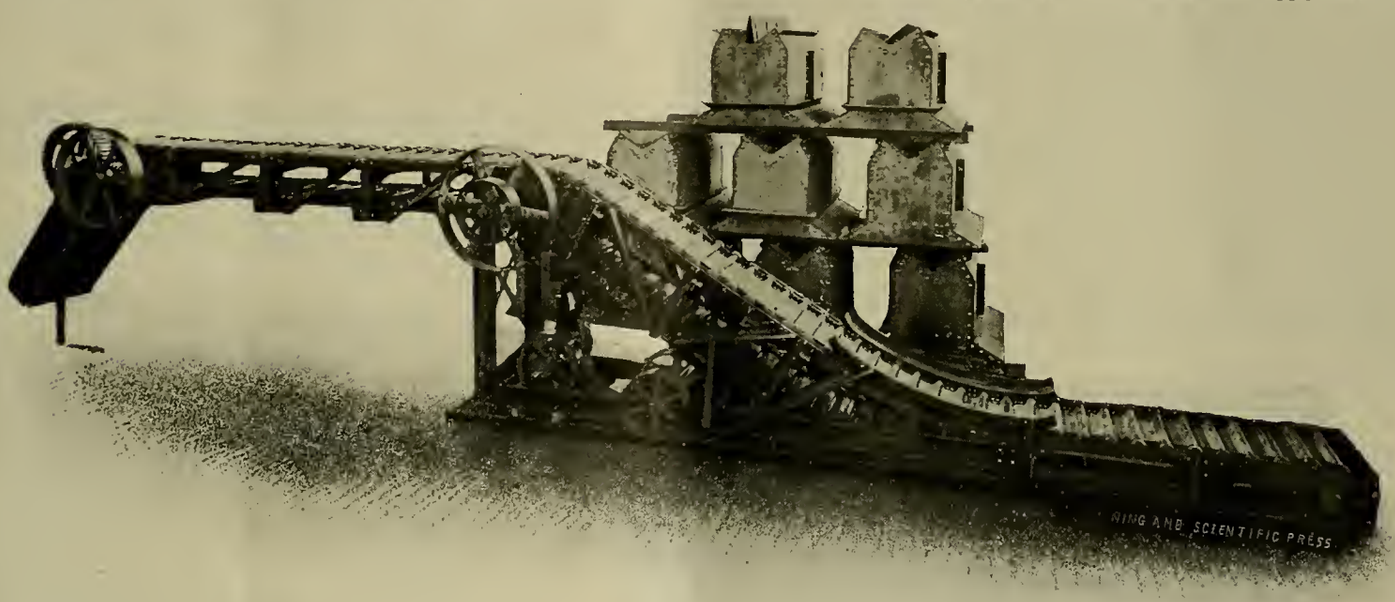
A Unique Loading Machine.

At the Empire Tunnel Co.'s property, Georgetown, Colo., is an unusual device in the shape of a loading machine. The vignette herewith is engraved from a photo furnished by the Link-Belt Machinery Co., of Chicago, and the accompanying description is from the Georgetown, Colo., Courier:

"A loading machine, the only one of its kind in the world, arrived at Empire on Tuesday of this week, and was at once transported to the buildings of the Empire Tunnel Co., at that place. This machine was built from specially designed plans, and it is claimed will do the work of eight men with one operator. It was built by the Link-Belt Machinery Co., of Chicago, under a guarantee that it would work successfully, and was secured at great cost.

"It is claimed that there is not another mine in the entire West to-day that has a loading machine, and it is doubtful if there is one in the world. It was in a peculiar manner that the Empire Tunnel people secured this labor-saving device. Some time ago a mining man made the remark in Georgetown that a machine could be so constructed as to load the rock from the blow-out in the breast of a tunnel. He outlined his plans so clearly that the Empire Tunnel Co., through its secretary, Clarence Jarbeau, at once communicated with the Link-Belt Machinery Co., asking if such a device was to be had on the market. An answer was received stating that nothing of the kind was known so far as that supply house was concerned, but at the same time they asked to be furnished rough plans in regard to its construction. The same were forwarded, drawn on the lines suggested by the party above referred, and in the course of a couple of weeks word was received from the house that the machine could be successfully built. An order was at once placed and the result was looked forward to with eagerness. On Tuesday the machine arrived, and mining men who have examined it state that it will be a pronounced success.

"Few people outside of the mining world have any conception of what a loading machine will mean in driving a tunnel through the mountain. That it will stimulate work wherever placed cannot be doubted, principally on account of the great saving to be made. The machine will be set up in front of the cars, and by working a lever will lower itself, gather up all loose rock and dump it in the cars. Thus it will be seen that no muckers will be necessary, save that of the man who is in charge."



Loading Device for Ores, Etc.

Electric Firing in Shaft Sinking.

A recently published account of shot firing by electricity in shaft sinking at the Sherwood colliery, Nottingham, England, describes the various operations there as follows:

The whole of the shot firing required during the sinking operations at this colliery was done by electricity. A shaft-sinking frame was employed, suspended from the surface, on which the compressed air rock drills that were employed were carried. Twenty-two holes were drilled at the same time in the bottom of the shaft, vertically downward, six in a circle of 4 feet radius, and sixteen outside of these, in a circle of 9 feet radius, all the holes being 6 feet deep and 2 inches in diameter. All the twenty-two shots were fired together, and twenty-four horizontal holes in the side of the shaft were then drilled,

in a circle of 11 feet radius. These were all fired together, and it is stated that the blasting left the shaft quite clean, no dressing having to be done afterwards by the pick. The total sinking to 1400 feet only occupied fifty-four weeks—a very creditable performance, indeed, and a great advance upon the previous records, due evidently to the intelligent use of the electric shot firing. The shaft bottom was lighted during the sinking by six incandescent lamps of 32 C. P. each, held in a special fitting, and suspended in the shaft by an insulated and protected cable.

Coated Gold.

In milling gold ores and cemented gold-bearing gravel the millman is often greatly troubled by the occurrence of gold which does not yield readily to amalgamation, although the gold can be readily detected in a ground sample washed in a pan, and this gold will usually amalgamate, too, which makes the problem still more perplexing. The reason can be found in a careful examination of the flakes or particles of gold which have been freed from the matrix by pounding, but uot rubbing or grinding. The gold is seen covered with a film of iron rust, manganese or some other substance. Often the gold is bright, but will not amalgamate. In such case the coating is probably silica. If such gold be treated in hydrofluoric acid the silica will be dissolved and the gold will readily amalgamate. Placer miners are familiar with the black and rusty gold of the gravel beds. Coarse gold of this description is easily saved, but the smaller particles sometimes escape, being carried along by the swift current of water in the boxes, and as the quicksilver fails to hold the gold it is often lost. What is thus commonly seen in modern gulch mining also occurs in the cemented deposits of the ancient river channels. In some of them much of the gold is covered with a coating of manganese and iron, and this gold acts in the same manner as that of the recent placers. Where the gravels of the ancient channels are too firmly cemented to be readily disintegrated in a revolving mill, the stamp mill is resorted to, and the gravel goes through the same process as quartz from a vein. It is crushed in a rock breaker, passes through automatic feeders to the mortar where it is stamped in the ordinary way, being crushed to pass a screen having ¼ to

Rubber in Gravel Mill.

½ inch apertures, which gives the mill large capacity, but while the stamping removes some of the iron or manganese oxide it seldom removes all, and there is much of the gold still difficult to amalgamate. To facilitate this a mechanical device is sometimes employed called a "rubber." This is illustrated in the accompanying engraving. It consists of a frame of timbers placed in front of each battery. The rubber is suspended from iron cross rods, and is actuated by an eccentric on a shaft driven by a belt as shown in the lower part of the picture. This gives the rubber a reciprocating motion, the shoes scouring the crushed pulp as it passes underneath, and brightening any rusty gold that may be present to facilitate its subsequent amalgamation.

In quartz mills a device of this kind is not in use so far as known, but it has been demonstrated that coated or rusty gold is not brightened sufficiently by stamping alone to remove any coating preventing amalgamation. For such ores grinding pans, rotary grinding mills or even an arrastra after stampiug will usually brighten the gold sufficiently for the purpose. Rusty gold is as difficult to save by amalgamation as though it were in some rebellious chemical combination.

The Metallurgy of the Homestake Ore.*

In discussion of the paper of C. W. Merrill, under the above caption, Mark R. Lamb of Torres, Sonora, Mexico, says: I have read Mr. Merrill's paper† with much interest, and can not but accept his challenge as regards the cost of the clean-up at the Homestake mill.

If I understand him correctly, the two men take the precipitates from the presses and do nothing towards refining them. If that is so, it would correspond to the work four men do here in about eight hours—that is, to cleau the box and to place the precipitates in the driers.

In order to make a fair comparison, the bullion in each case should be stated in ounces, siuce it is as difficult to precipitate silver as gold, and our bullion is mostly silver. Bullion to the value of $50,000 is equivalent to a weight of about 2500 ounces. At our last clean-up eight standard bars, each 1100 ouuces in weight, were made, which equals a total weight of 8800 ounces. Four men had the precipitates drying by 3 P. M.

This plant, the Minas Prietas works of Charles Butters & Co., at Torres, has square-bottomed electrolytic vats, an arraugement which necessitates the handling of all the precipitates in buckets. The Butters plant at Virginia City, Nev., is equipped with conical vats, and probably could make a still better showing under similar conditions.

Another poiut is that common labor only is required. (Ordinary laborer's wages at Torres are 70 ccnts gold). I may say also that, except for the couvenieuce of the refinery, the box could be cleaned mouthly instead of bi-mouthly at only a slight additioual expense.

The comparison, if made a few months ago, would have been much more iu favor of the electrolytic process, as the tailings handled at that time contained a large quantity of copper, and the amount of zinc dust required would have been enormous.

To resume: 2500 ounces of bullion are handled by two men at Homestake and 8800 ounces by four men at Torres.

Mr. Merrill, rcplying to the above discussion, says: Mr. Lamb's coutribution to the data of clean-up costs under various mcthods of precipitation from cyanide solutions is interesting aud welcome, and, I trust, will be followed by some onc who is handling large quantities of bullion by the zinc-shavings method. At one of the largest plants in New Zealand, handling 25,000 tons per month, I am informed that seven men are kept busy constantly cleaning up the zinc boxes.

Our last clean-up at the Homestake Plant No. 1 consisted of approximately 3233 ounces of precious metals, which was removed from the presses by two men in five hours, a duty of 323 ounces per man-hour. Mr. Lamb's men, in removing electrolytic slimes, handled 275 ounces per man-hour.

I do uot know how the preseuce of silver affects the percentage of precious metal in electrolytic slimes; but in zinc dust precipitation it greatly increases the proportion of precious metal. In the case of the Montana Co.'s plant at Marysville, Mont., I recollect that, in one iustance, when we were running on comparatively high-grade silver tailings, our zinc dust precipitate from the strong solution contained nearly 40% of precious metal.

* Trans. Am. Inst. Min. Eng.
† MINING AND SCIENTIFIC PRESS, Oct. 3, 1903.

Tensioning a Circular Saw.

Some of our readers in remote places may want to straighten a circular saw. Here is one good way: Place the saw ou an anvil. Have a board fastened to the anvil and a support at the other end about an inch lower than the height of the anvil. In testing the saw let the edge marked A rest on the board and lift up edge B so that the saw will rest only at A and B. If the saw showed straight while in a perpendicular position on the floor, and shows round under straightedge when testing on auvil, like in Fig. 1, the saw needs tensiouing or dropping, and will require a lot of hammering between the lines C and D (Fig. 1).

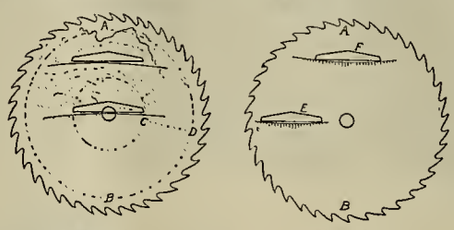


FIG. 1.

FIG. 2.

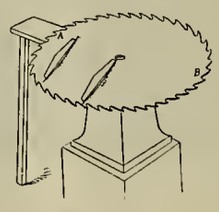


FIG. 3.

In case of a small saw, say about 16 inches, test it as in Fig. 3. A saw of this size does not have to show any tension under the straightedge, no matter where applied, if lifted as iu Fig. 3; it must show straight. Use a straightedge not longer than half the diameter of the saw, square across, and where a lump shows hammer it down, going clear around the saw, then turn it over, leveling down lumps wherever you see one. Always make your tests in the dotted portion of saw, as shown in Fig. 1. Keep this up until all high places have disappeared.

After you have the saw level, after thoroughly trying both sides, it will be nearly ready to run. If by placing straightedge, as at E (Fig. 2), it shows straight, and by pressing down a little with your thumb it opens up, as in F, all around the saw on both sides, and about half as much if the same straightedge is applied across the eye, you will find that the saw will do good work after being properly set and filed.

Large circular saws are treated just the same, but the amount of tension required can only be determined when size, speed and power are known.

Value of Molybdenum Ores.

The rapidly increasing use of the metal molybdenum in the manufacture of tool steels, armor plate, etc., says the Imperial Iustitute Bulletiu, has necessitated the discovery of some method by which poor molybdenum ores may be concentrated to contain at least 50% of the metal, since ores less rich than this can not be profitably smelted. Molybdenite, the principal source of molybdenum, is found widely distributed in various localities in New Brunswick, Ontario, Quebec, and British Columbia and elsewhere. It occurs in association with quartz and also in granites, gneiss and pegmatites, associated with pyrites, mica and other minerals.

So far the mineral has generally been concentrated by hand picking. Several methods have been devised for the mechanical concentration of the ore and some recent experiments in this direction made by J. W. Wells of the Kingston School of Mines appear to have met with success. The method is simple and depends upon the fact that molybdenite which passed through rolls does not become pulverized, but separates into flakes, while the accompanying minerals are crushed to powder. As an illustration of the application of the process, it may be stated that a sample of ore containing 50% of pyrrhotite, 10% of pyrites and 6.5% of molybdenite, in addition to calcite, mica, quartz, pyroxene, etc., after passing through rolls and being screened through a 0 2-inch sieve, furnished 1.4% of flakes, consisting principally of mica and molybdeuite. After a second screening through a 0.10-inch mesh, a further 1.54% of material of similar composition was obtained. The two concentrates in each case contained about 55% of molybdenite and 45% of mica.

To separate these minerals several methods were tried; but the best results were obtained with the Wetherill magnetic separator, which removed practically all the mica and gave an ore containing 90% to 91% of molybdenite.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

The following table of receipts and expenditures on the Ready Bullion and Mexican mines, on Douglas Island, are from an official source:

ALASKA MEXICAN G. M. CO.

Statement of receipts and disbursements for year ending Dec. 15, 1903:

RECEIPTS.

18,776.04 ounces bullion from 239,453 tons ore, @ $1.407 per ton	$337,106.73
4,981.88 tons concentrates from 239,453 tons ore, @ $1.562	373,973 09
Sulphurets saved, 2.08%.	
Value of sulphurets per ton, $75 08.	
Total of all receipts	$711,079.82
Total @ $2.969 per ton	$711,079.82

DISBURSEMENTS.

Mining:	Per Ton.	Total.
Development, 8153.3 feet	$0 647	$154,912 70
Stoping, 239,453 tons	0 658	157,533.25
Milling 239,453 tons	0.276	66,183.17
Sulphurets, expense at Douglas Island	0.014	3,301 77
General expense at Douglas Island	0.029	6,984.36
Total operating expense at Douglas Island	$1.624	$388,915.25
Estimated freight and treatment charges	$0.161	$38,708.07
Expended on construction accounts	0.069	16,603.38
Estimated London, Paris, San Francisco offices, and con. engineers' expense	0.020	4,800.00
Total of all expenditures	$1.874	$449,026.70

READY BULLION MINE.

Statement of receipts and disbursements for year ending Dec. 15, 1903:

RECEIPTS.

11,353 ounces bullion from 202,881 tons ore, @ $1.01 per ton	$204,914.03
1,084 tons concentrates from 202,881 tons ore, @ $0.6552	132,940.26
Sulphurets saved, 2.01%.	
Value of sulphurets per ton, $32.55.	
Total of all receipts @ $1.6652 per ton	$337,854.29

DISBURSEMENTS.

Mining:	Per Ton.	Total.
Developing 1,879 feet	$0.1849	$37,580.00
Stoping	0 8702	176,515.38
Milling 202,881 tons	0 3803	77,170.46
Sulphurets expense at Douglas Island	0 0178	3,505.13
General expense at Douglas Island	0.0242	4,913.97
Total operating expense at Douglas Island	$1.4769	$299,684.94
Estimated freight and treatment charges	$0.1528	$31,010.58
Expended on construction accounts	0.0350	7,095.90
London, Paris, San Francisco offices and consulting engineers' expenses	0.0231	4,800.00
Total of all expenditures	$1.6878	$342,591.42

E. B. McFarland et al. of Porland, Or., with Idaho mining men, have taken over the Petty group of mines, 70 miles from Skagway, composed of five claims, for $100,000. The company will start operations this month, with H. T. Gager as manager. The mines are located on the White Pass and Yukon rivers in Tagish Lake district, and readily accessible. The ore is gold and silver, with traces of copper and lead. The silver is in the form of black sulphide and green and yellow chlorides, with occasionally ruby silver. The veins are from 3 to 10 feet in width. The mines are above timberline, at an elevation of 4000 feet.

The smelter at Hadley, Prince of Wales island, being built hy the Alaska S. & R. Co., will be completed by March 1st and is expected to he hlown in next month. The blast furnace will handle from 400 to 500 tons of ore a day. At first they will ship matte, but expect to put in converter works later. There are hodies of copper and gold-bearing quartz ore in southeastern Alaska which will supply the smelter. At one place a vein 150 feet wide runs 2% to 6% in copper and carries $4 in gold and 2 ounces in silver, says P. Johnson, of the company. They will have barges and steamers to carry the ore from the mainland to the smelter. They expect to turn out forty tons of copper a day.

ARIZONA.

Cochise County.

The Higgins mine, near Bisbee, has partly discontinued work on development. Work has stopped on the shaft and hoth tunnels. In the crosscut where a strike has been made the work will he carried ahead. In the meantime two diamond drills, each of a capacity of 2000 feet, will he put in. The presence of water renders the use of the drill for prospecting more economical than driving or sinking. The find made is 220 feet from the surface.

Gila County.

F. Beston, of the San Carlos C. Co., on the Gila river near San Carlos, near Dudleyville, says work continues hy the Saddle Mountain M. Co., which has a bond on the group. N. H. Mellor, superintendent of the Saddle Mountain M. Co., is doing considerahle development work on the San Carlos and adjoining property. Sinking is in progress on the Apachia claim, the shaft being 120 feet deep and a winze is being sunk from the 100-foot level. On the Cannon Ball of the O'Brien group, a tunnel is being driven. All the openings are in sulphide ore of medium grade. The coal claims in the Deer Creek field, bonded to the Saddle Mountain Co., are distant 7 miles from the copper mines, and a road is now being built to connect them. It is intended to prospect the coal lands with a diamond drill.

Graham County.

H. Westlake, superintendent of the Colorado M. Co., near Clifton, reports the work of driving the Garnet tunnel progressing. Two shifts are being run, and 2½ feet of ground broken per day.

The Veiled Prophet C. Co., Ltd., has been incorporated at Clifton to develop the Veiled Prophet group of five patented claims in Greenlee district. Development work, under the management of B. M. Crawford, will be started next month. The officers of the company are M. A. Smith, W. M. Griffith, E. F. Everhardy, D. M. Potter and B. M. Crawford of Clifton.

Another 200-foot contract was let last week hy L. F. Sweeting, manager of the Polaris M. Co., near Clifton, making a total of 1500 feet under contract.

Superintendent Bennie says the Shannon C. Co. smelter's converter plant, near Clifton, will be ready for operation hy June 1st. It will have capacity of twenty-five tons per day.

Maricopa County.

(Special Correspondence).—The Wickenburg smelter has been hought hy the White Tanks M. Co. —— A. Salina is working a claim near the Garcia mine in the Vulture mining district.——F. Nicholas is working his claims near the Trilby mill. He has ore out which he will ship to the smelter.

Work will be resumed at the Gold Quarry mine, near Morristown, next week. A contract has been let for sinking a shaft.——The Arizona M. & D. Co. is working men at the Rylands mine, near Morristown.

Wickenhurg, Feh. 14.

(Special Correspondence).—G. Francis is putting in a gasoline hoist on his mine, 5 miles west of Morristown. —— R. E. Humphries says he will put men to work on his claims this week.——B. Johnson and J. Smith have located a claim near Seymour, on the Hassayampa river.—— D. Cleherat & Co. are making preparations to cyanide the tailings at Smith's mill, on the Hassayampa river below Morristown.

Wickenhurg, Feh. 15.

(Special Correspondence).—S. S. Moore of New York, secretary of the Relief G. M. Co., operating near Wickenhurg, states that the mine is ready for a mill, which will he huilt the coming season.

Wickenhurg, Feh. 15.

Mohave County.

Work will he increased on the Great West mine, near Kingman, says H. H. Smith, resident manager. It is intended to put in machinery for the mine and to increase the output of the mill. The Great West mine is in Blue Ridge range.

F. E. Griffith of the Philadelphia & Arizona M. Co., operating near Kingman, says he has arranged for resuming sinking at the mine. Electric machines will he used. The mill has been overhauled and the jigs will not he used.

Pima County.

The Helena G. M. Co., owning and operating the Helena group, near Greaterville, is preparing to put in Huntington mills to replace the small mill used to demonstrate the value of the ores. The group comprises 100 acres of mineral land with hodies of free milling ore, and is near the Greaterville placer workings.

Pinal County.

(Special Correspondence).—The mines of Lampker & Hunstock, north of the Superior group, near Superior, has heen bought hy W. Graichen for $30,000.

It is reported that a vein of sulphide ore 8 feet in width has heen struck in the Alice tunnel at Troy.

Superior, Feh. 15.

G. W. Wallace and H. Whitburn, of Duluth, Minn., have taken charge of the Copper Butte mine, near Florence. They have started work on a douhle-compartment shaft which will he sunk to depth of 500 feet.

Santa Cruz County.

Z. F. Rawson, superintendent of the World's Fair mine at Harshaw, says his company is sinking a 1000-foot shaft on that silver property.

Yavapai County.

Superintendent H. LeMontayne of the Sultan mine, near Hillside, says he is resuming work on the property, and more men will he put on.

The Groom Creek Co. (formerly the Alhua claim), at Groom Creek, is operated by Hall Bros., and they have driven their level at 200 feet for distanco of 600 feet. They are sinking and raising, and as soon as they breah through they will nado this their main working shaft. A boiler and hoist with 700 feet of cable will be put in. They aro taking out ore regularly, and have a pack train packing ore to the Gold Basin mill. They have a pipe line laid over the mountain to pump water from the shaft to the Gold Basin mill.

The Central Arizona M. Co., G. G. Green, superintendent, is putting up a milling plant on its President mine, near Martinez.

The Buffalo-Arizona M. Co. is operating 3 miles from Poland, with D. Rice, of Idaho Springs, Colo., as superintendent. The mines are on the east slope of Mount Union, on headwaters of Turkey creek. ——G. W. Middleton, manager of the Bradshaw Mountain C. M. & S. Co., which bought the Val Verde smelting works at Val Verde, will make improvements and increase capacity of the plant. —— Superintendent Campbell, of the Stark G. M. Co., near Prescott, says the company's mill is in full operation.

CALIFORNIA.

Amador County.

The mill at the Bunker Hill mine at Amador City was started up this week, says Superintendent Downs.

The Imperial mine has been sold to the Burlington M. Co. of Calaveras county, F. O. Courtmarsh of Glencoe superintendent. The Imperial mine is 1½ mile east of Sutter Creek. The Burlington Co. will develop the property. Hoisting works will he put up and a two-compartment shaft sunk.

At the Oneida mine, near Jackson, operations continue steadily, producing 7200 tons of ore per month. The winze being sunk 400 feet north of the shaft at the 2000-foot level, for prospecting purposes, is down 100 feet. It will be continued to the 2200-foot level. The electric cahle to furnish power for the pump heing set up has been put in place.

Butte County.

The Steifer M. Co., composed of Corning men and operating at Nimshew, has opened into the gold-hearing channel in its drift mine.

Calaveras County.

At the Gwin mine, at Gwinmine, F. F. Thomas, manager, the main and south shafts are sunk to a depth of 2000 and 1600 feet, respectively, and the hoist and mill of 100 stamps are in operation. In addition to the gold saved on the plates, there are forty Frue vanners collecting concentrates. Both the hoist and mill are run by water, the former having a head of 330 feet and the latter 400 feet. After using the water for these purposes it is carried 1 mile down the gulch, and there reused to compress air for the drills and pumps. As a safety measure, a boiler plant of three boilers has been completed to furnish steam in case anything should prevent use of water. The hoist at the main shaft is douhle, having lifting capacity of four tons 2000 feet at rate of 1500 feet per minute. The gallows frame is all steel, and measures 118 feet in height from the collar of shaft to roof. The ore is dumped from the skips onto two rock breakers, and then automatically loaded into 3-ton cars, and trammed hy mules into the mill. At present, the ore heing treated is taken from the 1600 and 1700 foot levels. A crosscut is being run for the ledge at the 1900 foot level. The shoot being worked is 60 feet in width. They have 250 men at work. At the south shaft no ore is heing taken out, though it is heing repaired and a douhle reel hoist set up. The water from the mine is handled with pumps, operated hy compressed air, with a capacity of 250,000 gallons per twenty-four hours, and in case of temporary disability to them two skips are used that hoist each 1200 gallons.

El Dorado County.

The New Highland G. & C. M. Co. has had men at work huilding an extension to the debris dam on Mameluke hill, near Georgetown, and has everything ready to start operations as soon as the permit from the Debris Commissioners is obtained. With the men the company has at work on the Porter and Holmes claims, twenty will he on the payroll, says Superintendent Parker.

At the Eureka-Woodside gold quartz mine, near Georgetown, heing operated hy El Dorado C. M. Co., the work of sinking the triple-compartment shaft is progressing under Superintendent W. E. Everson. The shaft is down 160 feet.—— Work on the ashestos mine, owned hy El Dorado C. M. Co., is progressing.—— The tunnel at the Ford copper mine is heing driven ahead and it is expected the ledge will he tapped this week.——The Georgetown Gazette says with the work heing done on other mines in that district, and also in Bear Creek, Josephine, Garden Valley, Greenwood and Kelsey districts, the mining outlook on the Georgetown divide is promising.

The 1-stamp double discharge mill at the Deutscher Bund mine, in Poverty Point district, near Placerville, was started up last week.——The Rescue gold-bearing quartz mine will be developed under superintendency of A. Anabel of Placerville. A shaft has been started and ground is being graded for a steam hoist.

Kern County.

President J. M. Wright of the Peerless and Fulton oil companies, operating at Kern river and Sunset, says on the Peerless one crew will be kept at work, but further than this no development work will he done for the present. The production of the Peerless wells during the month of January was 190,000 barrels, the contract with the Standard calling for 150,000 of this number. The receipts from sales were $38,000. At the Fulton six wells are completed. The first reservoir, with a capacity of 107,000 barrels, is finished and is heing filled.

The Flamioflume M. Co., which has been operating at Jawbone canyon, near Randsburg, has closed down. —— The New Century group of claims, uear White's Camp, has heen located by T. McCarthy and C. Taylor, and development work is being done.

Nevada County.

G. W. Root of Grass Valley has a bond on the Seven-Thirty quartz claim at Deadman Flat, in Rough and Ready district. He will, as soon as the weather permits, put up machinery, including a compressor, and sink a new shaft. The mine is owned hy the Evening Star M. Co. of San Francisco. It has heen developed to depth of 185 feet.

O. Coffin, superintendent of the Central Con. mine, with others, has honded the quartz mining claims on the Jennings' ranch at Banner mountain, near Nevada City. Jennings reserves the agricultural rights. These claims are north of and adjoining the Central Con., which is being operated.

The 10-stamp mill at the Federal Loan mine in Willow Valley, near Nevada City, is again in operation. Ogden Bros., who have had a hond on it for some time past, have succeeded the Eastern company that operated it for several months. There will be seven men employed at the mine, and ore will he taken from the 600-foot level.

At Rough and Ready the property of Black Bear M. Co. has heen sold to H. Fleischaker et al. of San Francisco.

F. P. Hall has purchased the J. A. Meighan interests in the Brophy mine at Shady creek, near Nevada City, and the company is being reorganized. Work will be resumed.

S. K. Murchie of San Francisco has hought the Native Son group of five mining claims in Blue Tent district, near Nevada City. He will hegin development next week.

Placer County.

The Hidden Treasure M. Co., near Michigan Bluff, is having a model of its mine made, which it will send to the St. Louis Exposition. The model will be a complete representation of the mine, even to the running of ore cars.

Plumas County.

On the south side of Grizzly Ridge, near Quincy, and owned hy C. Trimhle, C. McHugh, W. J. Schneider and W. Whitaker, the Cataract quartz mine is being developed.

San Bernardino County.

(Special Correspondence). — Manvel is the center of a district which seems just awakening to its possibilities. The Santa Fe from Goffs has a hranch line to Ivanpah. Barnwell (Manvel postoffice), the principal station, is 30 miles from Goffs and 15 miles from the Ivanpah terminus. From Manvel stages connect for Searchlight, Nev., 25 miles easterly, and Sandy, 60 miles northeast. The Clark road crosses this hranch line 8 miles above Manvel and passes within 16 miles of Searchlight. Construction work is under way and the promise of the early completion of this line is stimulating prospecting and the mining husiness generally.

Four miles north of Manvel is Vanderbilt camp, where the Gold Bronze M. Co. has a 10-stamp mill and a mine in which considerahle work has heen done down to the fourth level. The property is now tied up hy litigation. It is owned hy J. M. Hale of Los Angeles.——The Camphell group is also at Vanderhilt. Its principal workings are on the St. George and the Boomerang. On the latter is a 10-stamp mill, hut is at present idle, pending negotiations for a sale, which are said to be under way.——Near Vanderhilt a location has heen made hy W. Oshorn for O'Meara & Lynch of Tonopah, Nev., which is heing developed. He is sinking

a two-compartment shaft and the outlook is favorable.

Manvel lies noar the foot of the New York mountains, a group rising out of an elevated mesa, attaining an elevation of about 7000 feet. In area they are 5 by 9 miles. On the eastern slope is the Alpha group of claims, owned by the New York Co., of which H. Schrader and T. A. Johnson of Los Angeles are principal owners. On these about 3000 feet of work has been done, though temporarily idle. They propose building a smelter. In this canyon are other prospects, as yet only partially developed.

Over the range, to the south, is the property of the Giant Ledge Co., L. M. Gregory of Los Angeles president. The property comprises 800 acres of ground and includes a valley running down to the level of the plain, which will afford a spur from the Santa Fe branch easy access to the proposed mill, which can be reached by aerial tramways from the mines. The Giant ledge in places crops out 60 feet in width. Wherever opened up it has disclosed bodies of ore carrying copper, gold and zinc. It has been undergoing development the past two years in conformity to a systematic plan. In one place the ledge crops 70 feet above the surface. From the canyon intersecting tunnels have been run. Across the valley, below the millsite, runs a dike which brings the underground flow of water to the surface and provides natural advantages for treating the ores. A test shipment of zinc ore is being made.

Between Manvel and the New York mountains the Trio M. Co. is opening up a ledge of copper carbonate that at a depth of 100 feet has been crosscut for 14 feet without reaching the wall.

The Keystone mine, near Sandy, belongs to the same New York company as the one above mentioned. At present it is not working to its capacity. It also has a 10-stamp mill.

Manvel, Feb. 15.

Siskiyou County.

The Mono M. Co. proposes building a 12-stamp mill at its Punch Creek group of claims on Humbug creek, near Yreka. It will be operated by electricity.

M. Jacobs, C. Beisel and L. Marinel of Spokane, Wash., have taken over the Mount Vernon group in Siskiyou county for $35,000. Development work consists of 2000 feet of underground work. They intend to put up a 10-stamp mill with concentrators. It is a free gold proposition.

J. Johnston, part owner of the Headwaters quartz mine on Humbug creek, near Hawkinsville, has started development work.——A. C. Brokaw bas men steadily at work taking out quartz at the Golden Eagle mine on Indian creek, near Fort Jones, the ledge being 4 feet in width. He expects to put up a mill in the spring. Brokaw is also working his hydraulic claim in Quartz valley with good success, having abundance of water for elevators and giants.

Tuolumne County.

W. S. Wilhelm is operating the Kœnig mine near Parrotts ferry, near Columbia. —— M. R. Clement has bought an undivided two-thirds interest in the Toledo and Big Indian quartz claims, 2 miles southeast of Tuttletown.

The Hope mine, near Sonora, owned by San Francisco men, is being operated under Superintendent Corrigan. He has the mill ready to run. The tunnel has been retimbered and a shaft has been started, which will he put down to strike the vein below the tunnel level.

Superintendent De Sallier bas men at work at the Kanaka mine, near Groveland. A general overhauling will be made, tracks laid, etc , and more men will be put at work next month.

The 5-stamp mill at the Longfellow mine, near Groveland, is in operation. They are milling the ore that was left in the old ore bin, by which time the balance of the machinery will be on the ground, when they will shut down to strengthen the ore bin, place the rock crusher, compressor, engines, machine drills, etc. A 30 H. P. gas engine and pump are on the ground. Wood is being cut sufficient to last until arrangements are completed for the use of crude oil, says Superintendent Partington.

The mill is running steadily at the Mount Jefferson mine at Groveland. Sinking operations have been discontinued temporarily until the compressor is set up.

Yuba County.

At Camptonville, M. F. Hrubanik and W. A. Newsom, who have bonded the Honeycomb mine, are arranging to reopen the property. Tbo mill will also be started up.

Men have been at work dismantling the dredging boats on Bear river of tbe Bear River M. Co., near Wheatland, and the machinery has been shipped to Oroville, where it will be utilized in repairing boats thero of tbe same make. The buckets, which weigh 550 pounds eacb, were considered too light for the work on the Bear. One boat, with 1100-pound buckets, remains. Drillers are at work and dredging is expected to be resumed when heavier boats, adapted to conditions on that river, have been built.

M. Ramsey, superintendent of the Whitney mine, near Cabbage Patch, near Marysville, has put men to work and has development under way.

COLORADO.

Chaffee County.

The Buena Vista M. Co., composed of Buena Vista men, has bought the Hancock, Reliance and Kathleen mining lodes in Hancock mining district. They are near the Camp Sherrod mining district. The company will put in machinery and start development work. C. A. Smith of Denver is manager.

Clear Creek County.

(Special Correspondence).—The Bullion King mine is under lease to W. Bennett, wbo is taking out fifteen tons of ore per month. The ore is sulphide of lead, but contains considerable zinc, which is extracted before shipping. The vein is 2 feet in width. The shaft is 400 feet deep, but the work is being done between the second and tbird levels.

Tbe Santa Fe M. & M. Co., on Alpine mountain, is driving two adit tunnels. The lower one will cut the vein 300 feet below the surface. Leasers are at work on an upper adit taking out ore.——The Waltham M. Co., H. T. McNoil, superintendent, is building a testing plant. They expect to increase the capacity the coming summer.

Idaho Springs, Feb. 15.

(Special Correspondence).—The sale of the Pelican-Dives' Seven-Thirty group of mines, near Georgetown, was for between $300,000 and $350,000, the option having been held by J. F. Brandes of Denver and J. H. Eaton of Louisville, Ky., for Kentucky and New York men. Part payment has been made, and further payments will bo made this year. The property comprises eighty-eight patented claims, covering 250 acres, has 16 miles of underground work, and a recorded production of over $12,000,000 since its discovery in 1869.

Tbe oro averages $75 per ton in silver, lead and gold values. Bodies of smelting ore are blocked out; but the future profits are expected to come mainly from the concentrating ore, which has been allowed to accumulate in the stopes and on the dumps. To handle this ore a 300-ton mill will be built. It is intended to do away gradually witb the leasing system. There are 100 men at work, but this will be increased to 250 within the next year.

It is also intended to complete the Burleigh drainage tunnel this year, and make connection with the bottom of the Seven-Thirty shaft. This will drain and ventilate the entire group and reopen the Seven-Thirty's lower workings. Hoisting will he stopped, and the ore taken out through the Burleigh tunnel, at the mouth of which the mill will be built. O. O. McReynolds is manager at the mines.

Denver, Feb. 15.

The Gold Mountain group in Atlantic district, near Georgetown, has been bought by W. S. Leebrick. It consists of six claims and development work bas been done.

The Shafter M. Co. near Idaho Springs has bought ground for erection of a mill. The site is near the Jackson and Newton mills, and also near the Tanner cyanide mill. Manager A. H. Roller says he expects to have the mill completed by the time the Central tunnel cuts the Shafter lode in June. The mill will have a capacity of sixty tons a day.

Custer County.

A 1-foot vein of black oxide of copper is reported from the Louella mine, 2 miles from Silver Cliff. This ore body was opened in a drift run 32 feet from the 200-foot level of the shaft. The ore carries gold, silver, lead and copper values. The mine is under lease to Thomas, Wolff & Coughman.

El Paso County.

Work on a plant for treating the dust obtained from the ores milled at the Telluride plant has been started near the site of the Telluride plant in Colorado City. The process used will be a pneumatic cyanide method. The building will be 60x60 feet square, three stories high. It will have a capacity of fifteen tons of dust a day. The builders are said to be H. B. Haigh et al. They will treat the dust already accumulated, and that produced by the new companies in tbeir operations. The experimental plant and assay office of the General Metals Co. has been added to and remodeled.

Fremont County.

Six new coal mines are being opened up in Fremont county, says the Times. All of tbem will be in shape for production next fall. One of these mines is being opened by striking coal miners. The mines being opened are the Purity Oil Co. of Denvor, working south of Rockvalo; J. Ridle, working south of Florenco; F. P. Smith & Sons, working at Williamsburg; Maupin et al., working west of Brookside.

Gilpin County.

(Special Correspondence).—Tho Jenny Creek M. & M. Co., in northern part of Gilpin county, 14 miles from Central City, on the line of the Moffat Railroad, owns 220 acres in one body. They have one shaft down 80 feet and another 60 feet, besides a prospect tunnel 320 feet in length. They have let a contract to drive another tunnel 400 feet to cut the ore body 200 feet below the surface. They expect to reach the ore body in about 200 feet. The ore is a sulphide and averages $30 per ton. They will put in a stamp mill. C. F. Peterson is manager and C. B. Frantz secretary.

Baltimore, Feb. 14.

Shipments of smelting ores, concentrates and tailings from Black Hawk depot to the Denver smelters and outside points for month of January were 194 cars or 3880 tons—an increase of six cars over the previous montb.

Colorado Springs men are arranging to resume operations on the Golden Dollar mine, near Russell Gulch, which they have under lease and bond and operating as the Quartz Hill M. Co. It is intended to sink the shaft several hundred feet.

The Alps mine on Quartz bill, near Black Hawk, has twenty men on the payroll. It is being worked by a local pool under lease and bond, and J. Williams is in charge. One and one-half cords of ore are being sent daily to the mills in Black Hawk. The smelting product has an average of $150 per ton. They expect to increase shipments.

Gunnison County.

(Special Correspondence).—Tbe West Gold Hill M. Co., operating in Tin Cup district, is working on Sellors No. 2 mine. They are in 280 feet. The ore averages $10 per ton. A carload shipped from the fissure vein averaged $20. They are drawing plans for a 50-ton cyanide mill.

I. L. Johnson is working the Gold Cup and Lee mines, on East Gold Hill, and is down 900 feet on the incline. He has let a contract to drive 150 feet on the ore body on this level.

The Blistered Horn tunnel is being driven by the Brunswick M. & M. Co. At 900 feet they cut a vein 17 feet wide said to average $17. They drifted 50 feet on the vein and report striking a 12-inch streak that runs 500 ounces in silver and $10 gold per ton. Tbey expect to cut the Gold Cup and Lee mines on East Gold Hill before completing the tunnel.

Tin Cup, Feb. 15.

Manager Lockwood of the Brooklyn M. Co., near Elko, reports his tunnel and compressor buildings finished and the machinery in successful operation. The air drill is working and they are breaking from 3 to 4 feet of ground per shift in the tunnel.

Hinsdale County.

The Hidden Treasure mill, at Lake City, is in operation putting it in for the leasers who are breaking ore in lovels 1, 2 and 7.

Jefferson County.

(Special Correspondence).—The Oro G. Dredging Co., with headquarters in Chicago, Ill., is preparing to put up two 2000-yard dredgers on Clear creek, 2 miles from Golden. Tbe company has an option on 2900 acres extending 5½ miles on the creek bed. It has drills at work prospecting the gravel.

Golden, Feb. 14.

Lake County.

The lease on the Sixth Street shaft at Leadville having been transferred to the Midas M. Co., development and output will be increased. With the Coronado, the Midas and the Sixth Street in its combination, the Midas M. Co., Nicholson & Rodman managers in charge of operations, will be in position to develop more extensively than before tbe iron deposits that exist in the downtown section.

The Banker M. Co., at Leadville, will resume operations. The Banker shaft on Breece hill is near the Penn and the Ibex No. 4 shaft. There is said to be a body of copper sulphide in sight, carrying values in gold, silver and copper. The plans of the company include installation of a plant of machinery for development work.

Work has begun on the Penrose mine at Leadville. The work being done consists in pulling the pipes from the shaft. The old machinery will be taken out and a new plant set up. There are four lines of pipe running down the shaft, two for steam and two for water. The Midas M. & L. Co. is the operator, with D. E. Jones as superintendent. The shaft will be retimbered. President S. D. Nicholson of the Midas M. & L. Co. says the plans include sinking of the Penrose and Coronado sbafts through the parting quartzite to the Cambrian quartzito. The Penrose shaft is down 640 feet and the Coronado about same depth. Both will be sunk from 200 to 250 feet farther. In the meantime shipments from the Coronado and Midas will continue, the iron deposits in these properties being drawn upon to maintain output. The Coronado and Midas are shipping 250 tons a day. It is not the present intention to do any work on the Sixth Street shaft.

Sao Juan County.

(Special Correspondence). — The San Juan S. & R. Co., operating the Henrietta and otber mines in the San Juan, has completed an aerial tramway from the Henrietta mine to the railroad. The company intends starting the smelter at Silverton next month. The company owns 450 acres of ground, and on the Henrietta has over a mile of drifts, tunnels and shafts. A concentrating mill is under consideration.

Silverton, Feb. 14.

The pumps have been pulled from the Old London shaft, at Mineral Point, near Silverton, and the men discharged.

The Little Maude group of mining claims, near the head of Maggie gulch, near Silverton, owned by Born & Abbey, is being worked by Rice Bros. & Moreland under bond and lease. The bond calls for $85,000, with 50% net royalty on all ores extracted. This group is a producer of gold and silver ores. The lessees are making regular shipments. The group is developed by several openings on the vein and by a crosscut tunnel which cuts the Maude at a depth of 185 feet below the surface. A new tunnel will be started 200 feet below No. 1 tunnel. The vein is 12 feet wide. The ore shoot, 18 inches wide, is of brittle silver (stephanite), with some pyrite in a quartz gangue.

The Cortland group of seven claims on tho south slope of Tower mountain, near Howardsville, will resume. The owners are Louisville, Ky., men.

The Boston & Silverton M. Co., A. A. Lamont superintendent and manager, owns thirty-four claims in one group on the west slope of Boulder mountain, up Cement creek, 3½ miles from Silverton. The Yukon tunnel has reached a depth of 1850 feet and has cut a vein of ore on which drifts are being run. Tbe Lamont tunnel is in 900 feet and as soon as milling ore is struck a tram will be built to the mill, a distance of 4160 feet. The mouth of the Yukon tunnel and the mill are near the Silverton, Gladstone & Northern Railroad, and tbe road has a branch line to the ore bins.

San Miguel County.

E. M. Titus and W. Hutchinson, developing the Jumbo lode in Bridal Veil basin, near Telluride, report work progressing. They have men driving a tunnel on the vein, which is in 240 feet. They will continue the drift until depth of 500 feet is attained.

At Ophir Loop, the Butterfly-Terrible and the Silver Bell plants are running steadily, with fifty men at the former and twenty stamps dropping in the mill. Manager Keating says the steam plant put up during the property's idleness is being used as a motive power in tho mill, conserving the water supply for concentration purposes.

The number of men employed at the Smuggler-Union mines at Telluride is being increased, says Manager B. Wells. Three levels are being worked and the number of stamps dropping in the mill ranges from twenty to fifty. Concentrates are being shipped regularly.

With fifty men employed, the Nellie mine, near Telluride, is running steadily. The mill has twenty stamps dropping. About May 1, Manager C. Anderson says he will increase the number of men and start twenty more stamps in the mill. At present the Nellie trail between the mine and mill is impassable, and no effort will be made to clear it. Men going to and returning from work are transported on the tramway. Operations are under way on only two levels of the Nellie, but in the summer all six levels will be worked.

Summit County.

Another gold dredging company is preparing to operate in Breckenridge district. B. S. Revett et al. have organized the Reliance G. Dredging Co. under Wyoming laws and have bought the Jackson placer (the Magnum Bonum and Corkscrew), in French gulch, at Breckenridge, and expects to bave a dredger operating by July 1.

Teller County.

The recent strikes of high-grade mineral in different sections of Cripple Creek district are being made use of by the mining companies, says the Record, for demanding more exacting terms and conditions in granting leases, chiefly in percentage of royalty demandod. Where a flat royalty of 25% was previously considered a maximum, graded royalties are now demanded with 25% as a minimum, ranging as high as 50% on ores above a

certain value. Restrictions are embodied in recent leases as to depth, the company reserving right to operate below specified level to which the lessee is restricted, whether operator opens a bonanza or expends his money without return. Notwithstanding these exactions, there is still a strong demand for ground, and the number of properties that are being developed by the leasing system is on the increase. The Anaconda estate of 100 acres, on Gold hill, has thirty-five sets of lessees at work and has every block leased.— It is said the Hoosier mine, on Tenderfoot hill, will start up again.

The following table shows amount and value of Cripple Creek ores treated during month of January by different mills and smelters:

Plant—	Tons.	Value.
Smelters	10,000	$650,000
U. S. R. & R. Co	23,000	575,000
Portland	8,500	255,000
Dorcas	2,000	104,000
Telluride	4,000	100,000
Economic	2,500	60,000
Cyanide plants	1,500	9,000
Totals	51,500	$1,723,000

El Paso mine, on Beacon hill, Cripple Creek, sent out 3000 tons of ore during month of January. This will be increased during present month. The value of the ore shipped is said to have averaged $40 per ton.

The Requa Savage M. Co. has granted a bond and lease on part of its Gold King claim on Gold Hill, Cripple Creek, to F. A. Wright of Gillett for 75,000. The part under bond is three acres in extent, adjoining the Progress King, Lexington and others. The Gold King claim has several shafts, the deepest being 500 feet. Wright has started work.

Last week the mines of Cripple Creek paid out on their January payrolls an aggregate of $500,000. The total would have been $50,000 more, says the Times, but for the fact that the Stratton's Independence laid off all its men at the time of the accident, two weeks ago, so the property with 500 men had a short payroll.——The Strong mine management voluntarily increased the wages of its men 50 cents per day, all around, for the month. The men have been getting the regular schedule of $3 and $3.50 per day. There are eighty men at work, says Superintendent S. McDonald.

The Eagle sampler at Cripple Creek is treating 225 tons of ore per day. It has twenty-five men at work and this number will be increased, as the night shift is working three nights out of the week at present. President Franklin, manager of the sampler, says he expects to treat during the month 9000 tons of ore. Every sampler in the district is running full capacity.

IDAHO.

Blaine County.

The Red Elephant mine, near Hailey, has been unwatered and it will be retimbered and reopened.

Boise County.

F. Burbridge and A. Burch have a bond on the Iowa mine at Quartzburg, in the Boise basin. Development work has been started under Superintendent W. P. Belding.

The Ingle Co. will resume operations in the Twin Sisters mines, at Centerville, next spring. Men are cutting wood for fuel for hoist and mill.

Elmore County.

M. Mayfield of Boise and H. Crah of Atlanta report work progressing on their Gold Bug claim in Black Warrior district, below Atlanta. When the tunnel was driven 141 feet a 5-foot ledge was struck that assayed $60. They have five claims on the ledge and have opened it in fourteen places. The ledge was cut at depth of 100 feet in the tunnel. One hundred and thirteen claims have been located in the district. The country rocks are phonolite and granite.

Idaho County.

Near Elk City the Homestead group of mining claims has been bought by the Leroy M. Co. for $50,000, says W. H. Plummer, of Spokane, Wash., secretary and manager of the company. The company owns the Lerey mines also near Elk City, on which it has built a 10-stamp mill and is going ahead with development work. It is proposed to put in a small stamp mill on the Homestake. M. T. Newlon, of Philadelphia, Pa., is the president of the company.

The Grangeville Standard reports the consolidation of the three groups of copper holdings on the Salmon river, near White Bird— the Idaho C. M. & S. Co., the Salmon River C. M. & S. Co. and Mineral Zone C. M. & S. Co. The plan is to dam the Salmen river for power supply for a milling and smelting plant. The properties are 15 miles from Grangeville, on both sides of the Salmon river.

In Black Lead district of the Bitter Root range, McConnell & Co., of Moscow, are preparing to build a mill at their mine. The Black Diamond and Black Hawk claims, adjoining the Black Lead mine, have been bonded to J. M. Smith et al. of Lewiston.

At the Crackerjack mine, at Hump, the compressor and receiver are being set up. Two veins have been cut and drifted on, one of 12 feet wide and the second showing 26 fdet of ore by crosscut. The third, or main lead, is still 70 feet in from the end of the crosscut tunnel. As soon as the compressor is ready machine drills will be at work on this 70 feet. Electricity is used for power.

J. E. Jewell, of the Thunder Mountain Gold Reef M. & D. Co., which owns the Monumental group on Monumental creek, near Reesevelt, and the Confidence group (formerly known as the Mayflower), says work is progressing, and the company will put a mill on the Confidence in the spring.

The Dewey M. Co., owning the Dewey mine, near Grangeville, is preparing to build a concentrater plant to have capacity of fifty tons a day. The property is owned by Seattle, Wash., men, and O. Aheling is manager.

The Lucky Lad mine at Hump is shut down temporarily. One hundred and thirty feet of shaft have been sunk and 250 feet of drift run. —— The Spokane, after several years' idleness, has been worked this winter. —— The last of the Crackerjack machinery is on the ground and set up.——The Granite shaft is down 45 feet. —— J. Stone is developing his group west of Concord. He has plenty of timber and water.

The Lexington G. M. Co. has been incorporated by C. F. Allen of Clarkston, G. W. Thompson, J. C. Mayes, H. Witherspoon, A. C. Moore, T. B. Bartlett and E. A. Cox. The company owns the Lexington and Wild Horse groups in Buffalo Hump, on which development work will be started this month.

Considerable work is being done on the Del Rio mine, an extension of the Jumbo, near Hump. The latter property has been putting in thirty additional stamps. There were fourteen stamps already in the mill property, and four of these will be shipped to the Del Rio.

Placer operations on Salmon river will be increased the coming summer and a number of companies owning ground at various points are preparing for work. Among the first to start piping will be the Henrietta Co. at Riggins. This company nearly completed a flume and ditch last fall, and, as soon as it is finished, will start washing under Superintendent C. Clay. ——The Pittsburg-Idaho M. Co., which has bought the Short's Bar claims, took in a sawmill and turbine wheel last week. The mill will saw out 500,000 feet of lumber for construction of 5 miles of flume to bring 1000 miner's inches of water to the ground. After the mill is in operation, it is expected to require five months to complete the flume. The ground to be worked contains four gold-bearing channels of Salmon river, the highest of which is 400 feet above the river. The flume will deliver water 200 feet above the high channel. The company has built a wagon bridge across Little Salmon and will grade a wagon read to the mines, 1½ mile from the State wagon read.

Ore is being shipped from the Mt. Marshall group of five claims and the Sherman group of two claims in Marshall Lake district, near Grangeville. These properties are owned by J. C. Fox and P. R. Briggs. The Marshall Lake group has 3 feet of ore at the bottem of a 35-feet shaft which assays $30. The Sherman group has 7 feet of ore.

The McKinley gold mine, near Lucile, owned principally by Kellogg men, is being developed. A crosscut is being run to the vein at depth of 100 feet. This will be 140 feet long when completed, and is in 130 feet. They are running the drift on the 400-foot level. Samples of the ore from the vein 17 feet in width show $18 in gold per ton.

Shoshone County.

The Evolution mine is again in operation. A shaft house has been built and men are on development work, while preparations are being made for installation of pumps, hoist and compressor. Four claims comprise the group, which is 1½ mile below Osborne. Over 1200 feet of tunnel work have been done. It was located as a gold property, but explorations carried on have disclosed ore carrying silver, lead and copper as well. A shaft has been started 60 feet above the bed of the creek on the mountain side, expecting to strike the vein 175 feet below the creek level. The vein pitches southwest. Previous development work showed the ledge 23 feet wide between the walls. A drift of 180 feet was run on the vein. W. Osborne of Osborne is part owner.

A two-years' lease has been given O. R. Young of Wallace on the Wyoming mine on Grouce gulch, and he will start development work this week. The mine is near the Cœur d'Alene Dev. Co. in Government gulch. A tunnel is in 2000 feet. It is the intention of Young to raise from the lower tunnel.

Wallace reports state that Larson & Greenough, owners of the Morning and You Like mines at Mullan, are preparing to build an addition to their mill, to increase the capacity of the plant to 140 tons of concentrates per day. They will do away with the "slum" tanks on the outside of the mill. The building will connect the main mill building with the new vanner house. The machinery to be used will consist of eight Frue vanners, making in all sixteen vanners added to the plant in the past six months. Mill Manager W. H. Myers has introduced an improved method of draining the slum tanks in the mill, and what formerly required several hours of hand labor is now done in a few minutes by machinery. By the old method a man was required to swing a heavy iron shot against the side of the tank. In place of this, he has rigged up two drilling machines on solid blocks of wood, 2 feet from the floor, providing them with leather bumpers and air connections.

Washington County.

C. W. Jones of Weiser says he has a five years' lease of mining properties in the Seven Devils district from the American M. Co. of Helena, Mont. The mines leased are the White Monument, Peacock and Helena, carrying copper values. They are equipped with machinery in the way of hoisting works, etc. Jones says that as soon as the roads are in condition men and supplies will be taken to the camp and operations begun. He expects to put fifty men at work. On the Peacock a tunnel will be run to tap the ledge at a depth of 500 feet.

The Ladd Metals Co. has machinery on the ground for its smelter, building at Mineral. The foundations are completed. It is stated, wood alene will he used for fuel.

MICHIGAN.

Houghton County.

The report of the Quincy M. Co., at Hancock, shows: Average number of men employed, 1624; average number of miners, 586; average wages of miners on contract per month, $62; yield of mineral per fathom (6 feet) of ground broken, 443 pounds: yield of refined copper per fathom of ground broken, 325 pounds; total rock mined, 1,024,164 tons; rock hoisted, 1,006,173 tons; stamp rock treated, 958,935 tons. During the year the diamond drill was used in several different places throughout the mine; an aggregate depth of 1705 was bored, but nothing of value discovered.

The sale of the Arcadian's diamond drill last week marks final suspension of exploration on the Arcadian property, near Hancock, says the News. A cold wave and blizzard has been interfering with the rock service at all mills.

Tamarack No. 3 shaft, near Calumet, is hoisting at rate of 1100 tons, or 28 cars daily.

The Kimberly skip at Red Jacket shaft of the Calumet & Hecla mine, near Calumet, on the 13th inst. caught on an obstruction, tearing the guide rails from the 21st to the 12th levels. The compartment is out of commission.

Baltic rock shipments for January were the largest for any month since the mine became a producer, says the News, the daily average being 1900 tons. The company is no longer at a disadvantage in matter of milling capacity, and before March 1st the daily volume of rock treated is expected to reach 2000 tons. The capacity of this mine, near Painesdale, has been greatly increased as a result of the extensive development operations of the past year.

The situation regarding future of Isle Royale shaft No. 1, damaged by fire, is reported still uncertain. A contract to wall up the fourteenth level south of the shaft has been let by the company. The damaged shaft is without pumping facilities and a cement wall is being built to prevent inflow of water to No. 2. There are a number of surface openings in the ground tributary to the damaged shaft, through which water will flow when spring opens.

Ontonagon County.

The Adventure Con. C. Co. at Greenland reports for year ended Dec. 31, 1903:

Received from sales	$301,134
Running expenses	$237,413
Taxes	14,051
Smelting, transportation, etc	29,949
	$281,413
Construction account	61,611

Present operations are confined to the Knowlton lode, except one stope on the Merchant lode and four stopes on the Butler lode. From time to time throughout the year work was discontinued at the most unprofitable and unpremising points. Reduction in forces was made in August. West end of mine proved a failure and was shut down. Operations to date have shown value of lodes under Adventure bluff at shallow depth are not profitable.

The Victoria mine, at Victoria, will be given rail communication by extension of the road of the Holt Lumber Co. to the mill site. This will connect with the Duluth, South Shore & Atlantic near Ewen.

MONTANA.

Beaverhead County.

D. Hodgens of Butte has a lease on the Midnight mine, near Argenta. It is intended by Hodgens & Co. to build a cyanide plant on the Midnight to treat the low-grade ore in the mine and on the dump.

L. C. Graeter and E. I. Hall have an option on the Indian Queen mine, near Dillon, for New York men. Additions to the equipment are proposed.

Flathead County.

The total shipments for last year from the Snowshoe mine, near Libby, amounted to eighty carloads. This is for a steady run of six months. The eighty carleads averaged thirty tons to the car and the concentrates assayed $60 per ton. It is intended to put in additional machinery next spring and enlarge the capacity of the mine to produce. The new machinery will consist of additional concentrating tables and more sliming capacity, also a Huntington mill. On the 200-foot level, from which most of the ore was taken the past season, there is a shoot of ore 10 inches in width which assays $20 in gold. It is expected they will sink the working shaft additional depth, which is but 350 feet below the level of the main working tunnel. The principal values in the Snowshee have been in silver and lead. The gold values are said to be increasing with depth.

Jefferson County.

The Silica mine is 1½ miles from Basin, on the line of the Great Northern Railroad, and consists of a quartz averaging 95% silica, and carrying small values in gold, says the Basin Progress. The ore is shipped to the smelters, at Butte, for flux in treatment of copper ores. The mine is owned by E. E. Williams and D. Bevan, of Basin. Shipments of 1000 tons per month are made. The workings are open and the ledge is quarried, the practice being to drill a number of deep holes and with heavy blasts to break down from 200 to 1000 tons of ore at a shot, after which the ore is carried in cars to a chute, through which it is conveyed directly to the cars.

Madison County.

C. E. Dameurs, manager of the mines of the Damours G. M. Co., operating near Virginia City, says they propose to build a 30-ton mill on the company's ground.

Silver Bow County.

The Original Con. M. Co. has been incorporated under the laws of the State of Washington by W. A. and C. W. Clark, W. A. Clark, Jr., A. H. Wethey, A. J. Johnston and W. M. Bickford of Butte. The company is to work the Original, East and West Stewart and probably other mines operated by W. A. Clark.

NEVADA.

Elko County.

Mining at Bullion, Railroad district, 30 miles southwest of Elko, has been resumed. A company of California men has bonded the Weston & Frank group and has started work of development under Superintendent Knutzen.——Burke & Skaggs are opening up the Copper King, owned by them, showing a ledge of ore. ——The Charley Bressmer group, under bond to a company of Elko men, headed by A. W. Hesson, has been worked for the past year and development is going ahead.

Esmeralda County.

The main shaft in the Montana-Tonopah mine at Tonopah has reached depth of 735 feet, and only 50 feet of sinking remains to be done when a station will be cut and a new crosscut run north. The north crosscut from the 600-foot level is in 425 feet. The east and west drifts on the McDonald ledge from this level are in 70 feet and show a good face of ore. On the same ledge in the 500-foot level the west drift is in 240 feet and working in high-grade material. The raise from this drift is up 70 feet, and from it ore is being extracted. In the east tunnel leading to the North Star shaft a track has been laid and ore is being taken from the ledge cut in the North Star at 950 feet and which in its western course enters the Montana ground. Shipments of ore are going forward regularly, increased railroad facilities on the Carson & Colorado having been obtained.

Ore is being taken out and sacked for shipment from the ledge cut in the mine of the Tonopah-Gold Mountain M. Co. at Gold Mountain, southwest of Tonopah. The ore is said to average $140 per ton in

gold and silver. Several lessees are at work on the property and taking out ore.

Humboldt County.

Preparations are in progress for increased work by the Glasgow & Western Exploration Co. of Salt Lake City, Utah, at Golconda, where the company's furnaces are built, says Manager Stalmann. The smelter will go into operation with the thawing out of waters on which it is dependent. An electrical process, tested by the management with satisfactory results, is being added to the plant. With this equipment the plant will be prepared to treat 100 tons of ore daily, and with a steady supply of water. At the mines of the company work has been progressing steadily under Superintendent J. Farren, new ore bodies having been added to the supply. At the Adelaide group, the Copper Mountain and Copper Basin groups the work has opened smelting ore.

Lincoln County.

The Pioche-Nevada Con. M. Co. has heen incorporated at Salt Lake City, Utah, to operate the West Point group of claims, 2 miles from Pioche and on the road to Calientes. The officers are J. M. Burton, J. Zink, R. W. Brady, F. B. Steelo, F. L. Gardiner, C. E. & R. L. Rives.

White Pine County.

The Giroux Con. C. Co. continues work on its copper mines at Ely. Development is progressing. J. L. Giroux is manager.

NEW MEXICO.

Grant County.

The Ontario M. Co. will begin work on its property, near Lordsburg, April 1. The shaft will be sunk to depth of 600 feet. W. Davis and J. G. Pehler of Wheeling, W. Va., are directors in the company.

The Colorado F. & I. Co. of Puehlo, Colo., owns a number of claims in Fierro district, among them being the Anson S. and Iron Head. The ore mined by this company is all iron ore, and is shipped to Pueblo. The company has a crusher at Fierro, through which all the ore mined is run before shipment, putting it in shape for the smelters without further treatment. There are 200 men employed at Fierro, hut at present everything is at a standstill owing to the coal strike. As soon as the strike is over it will resume operations. Shipments during last summor averaged thirty cars of twenty-five tons each.

The Burro Mountain C. Co. bas been incorporated oy N. F. Leopold and A. C. Schwah of Chicago, Ill., and T. W. Carter of Silver City. They have a lease from the Southwestern C. Co. of all the mining property owned by that company in the Burros, consisting of nine patented and four unpatented claims. They will build a concentrating or leaching plant of at least fifty tons capacity per day. The lease includes an option to buy. This group has been supplemented by buying a number of adjoining properties, the principal of which are the Sampson, Loma Alto, Fanny, Last Chance, Copper Bell, tbe Sampson millsite, the Comstock, Celebrated Day, Favorite, Enterprise, Golf, S. T. and Any Old Thing, the J. H. Lester, the Fancy millsite, McKinlek, Clara and the Candlestick mines. The Southwestern C. Co. properties and the Sampson group are producers. T. W. Carter is manager.

The Hanover M. & M. Co. owns a concentrating plant in Hanover gulch, 1 mile south of Hanover, equipped with rolls, Huntington mill and concentrating tables, which is under lease to and operated hy F. Higgins. He is running it on silver-lead ores from the Surprise mine. The high-grade ore is shipped and the low-grade ore is heing run through the concentrator with satisfactory results, producing high-grade concentrates averaging 60% lead, with silver values. The Surprise is owned by J. W. Bible and is operated by Higgins under lease. It is opened up by a tunnel, cutting the ore body 90 feet below the surface. A crosscut 30 feet in length has been driven without reaching the hanging wall. The ore is galena. ——The Honeycomb copper mine (formerly the Humboldt), owned by the Hanover M. & M. Co., is being developed by a shaft 110 feet in depth and 1000 feet of drifts and crosscuts, exposing ore hodies. A recent shipment of 100 tons ran 12% copper, besides gold and silver values.

Santa Fe County.

At the cement placer gold fields of the Interstate Placer M. Co. at Golden, men are at work sinking shafts to hedrock to test the gold values of the cement. —— Men are opening new ground at the San Lazarus, near Golden. A cyanide mill will be erected.

T. P. White is working his gold properties near Golden and the Argo M. Co. has men at work on the Hazelton group. A shoot has been uncovered on the 400-foot level.

OREGON.

Grant County.

E. G. Stevenson, part owner of the Monitor mine, near Susanville, says the 5-foot Huntington mill is set up, but is not running yet, as the tailings to be treated are frozen. The first work to be done is the running through of 3000 tons of tailings. After the tailings have been disposed of the mill will treat the ore from the mine. For this a rock breaker will be added.

Superintendent McGuigan of the Alamo mine, near Granite, says the ten stamps are dropping steadily on ore. Power is furnished by three separate water motors. One runs the ore crusher and ten stamps; another the two concentrating tahles, while a third, a smaller wheel, runs the dynamo for lighting. Between thirty-five and forty tons of ore are heing milled per day. The stopes in the mine are being opened up. Stoping is heing done ou No. 2 level, from where there is a chute 480 feet to No. 3, or the mill level. As yet there has heen nothing taken from Nos. 1 and 3.

Jackson County.

The Omaha G. M. Co. is developing a quartz property near Gold Hill, on Foots creek, under superintendence of C. C. Clark. Two tunnels have been driven on the ledge—one to deptb of 270 feet and the other 235 feet. The ledge is 3 feet in width and gives average assay values of $12 in gold.

Josephine County.

The Eureka mine, on Soldier creek, near Grant's Pass, is being operated hy its former owners of Eureka, Cal., under management of A. F. Nelson. A 10-stamp mill is operated.

The Conner hydraulic placer on Briggs creek, near the mouth of Red Dog creek, near Grants Pass, is heing operated by Brinegar & Smith. They are working in the channel uncovered by Conner.

The monthly output at the Greenback mine is reported at $40,000. The property is on Grave creek, near Grants Pass, and has been producing for three years. W. H. Breevort of New York is president and C. W. Thompson is manager at the mine. The manager reports arrangements completed for heavier production this year than last. The mill has forty stamps.

Malheur County.

It is reported Manager J. F. Meikle of the Black Eagle mine, near Malheur, is arranging for building a 100-stamp mill in addition to the present 20-stamp plant.

In the Malheur district, 4 miles from the Black Eagle mine, near Malheur, the Uncle Sam group of ten claims has heen taken over by G. S. Stanley for Cadillac, Mich., interests. It is intended to build a 20-stamp mill. A hoist of 20 H. P. is being put on the shaft, that is 160 feet deep. A 60 H. P. steam plant will be put in for the hoist.

SOUTH DAKOTA.

Lawrence County.

(Special Correspondence).—The mill of the Tinton Tin Co. has been completed and was put in partial operation on the 11th inst. A series of experiments are being made.

Tinton, Feb. 14.

Pennington County.

The Golden West M. Co. is putting up a saw mill at its mine in Hornhlende district, says E. J. Kennedy, secretary and manager. A Chili mill of 100 tons daily capacity will be put in by the company in the spring and the saw mill will cut timber and lumher for the mill and other huildings. There is a Chili mill of five tons capacity on the property. There will be built in connection with the quartz mill a system of cyanide vats for the retreatment of sands. The ore of the Golden West is free milling. The Golden West Co.'s holdings consist of the Benedict and Yellow Bird groups, on Castle creek, 5 miles southwest of Rochford, and this stream will furnish water for power purposes.

TEXAS.

Hardin County.

Development of the Batson Prairie oil field, near Sour Lake, is progressing. Operations have been under way hut three months and eleven producing wells have been completed, and nine additional wells are expected to reach the strata this week. The wells which are producing are distributed among the following operators: Paraffine Oil Co., four wells; J. M. Guffey Petroleum Co., three; Honeymoon Oil Co., two; W. B. Sharp & Co., one. Tbree of these wells, viz., two owned by the Guffey Co. and one owned by tbe Paraffine Oil Co., are producing from the shallow strata. and have not heen drilled to the deeper oil sand. On Jan. 31 only four wells were producing, their combined output being sufficient to overload the pipe line facilities of the field. Thirty thousand harrels per day are their combined deliveries at present.

UTAH.

The month of January in the ore and bullion market closed on settlements aggregating $1,790,100, a gain over corresponding period of 1903, says the Tribune, though receipts from the various camps have heen interfered with by the weather. Stock on hand kept the furnaces in blast. The output of the copper bullion containing gold and silver during the month exceeded all previous shipments by the plants in Salt Lake valley to the Eastern refineries, reaching a total of 3,478,150 pounds, of whicb 2,803,150 pounds came from the independent plants. The value approximates $750,000.

	Pounds.
Bingham Con	720,000
Utah Con	1,300,000
United States	783,150
American S. & R	675,000
Grand total	3,478,150

To increase the output of copper the Utah Con. at Bingham will have soon completed enlargements that will enable it to reduce 800 tons of ore daily, while the Bingham Con. has a fourth furnace to go into operation. To meet the requirements of the valley furnaces in January the mines supplied 90,776 tons of ore, while in addition to this there was forwarded to furnaces outside of the State 6000 tons of ore.

Beaver County.

The Old Hickory and the Harrington-Hickory mines of the Majestic C. Co., at Milford, are closed down. There are a few men continuing work on the O. K. mine of same company. Financial trouhles are said to he the cause.

Box Elder County.

P. W. Madsen of Salt Lake City, manager of the Century mine at Park Valley, says ore has been struck in the crosscut run to the north from the main workings. The vein averages 6 feet in width and the ore assays $12 in gold. The mill is in steady operation with sixteen stamps dropping. J. H. Clark is superintendent.

Iron County.

The Johnny mill at Stateline is heing put in operation again. Developments in the mine since the close down have heen satisfactory, and ore has been blocked out.

Jnab County.

January shipments from Tintic district were:

	Cars Ore.
Ajax	8
Bullion-Beck	20
Carisa	14
Continental-Eureka	232
Dragon Iron Mine	50
Eagle & Blue Bell	4
Gemini	27
Grand Central	81
Lower Monarch	67
La Clede	1
South Swansea	10
Salvator	2
Star Con	4
Uncle Sam	11
Uncle Sam (concentrates)	2
Tetro	13
Victor	2
Yankee Con	23

Salt Lake County.

The Columbus Con. M. Co. has bought the Webster & Kearns mill at Park City, and as soon as tbe roads at camp permit will ship the machinery to its millsite in Little Cottonwood canyon, near Alta. The plant has a crushing capacity, says Manager Jacohson, of 150 tons daily, with two tables and three sets of jigs. Another table will be added to the battery and another set of jigs.

The Utah C. M. Co.'s new mill in Bingham canyon, near Bingham, is expected to be put in operation this week, says Superintendent Janney.

The Copper Prince Con. M. Co. has been organized at Salt Lake City to operate in Little Cottonwood district by T. Jacohson, C. K. McCornick and C. H. Post.

The Copper Belt railroad is said to bo moving an average of 750 tons of ore from Bingham daily, equal to 22,500 tons per month. This output will be increased. This does not comprise the entire output of the camp, however, as the tramways and other methods of transportation are carrying about 40,000 tons per month.

Manager Caitrow of the Ohio C. Co.'s mines at Bingham says the Winnemuck mill of the company is daily turning out 20 tons of concentrates from 125 tons of crude ore.

On Antelope island, in Great Salt lake, near Salt Lake City, the Fountain Oil & Asphalt Co. is preparing to start drilling operations for oil and gas. It has acquired by lease and otberwise over 6000 acres on the north end of the island. The company has heen incorporated by local and Ohio men, with T. P. Steffey of Salt Lake City president and R. M. Edmunds, J. B. Hall, E. Wilkes and E. J. Raddatz as officers.

The building of a concentrator at the Continental Alta mine, at Alta, in the early spring, to be followed by erection of a power house on Little Cottonwood creek, near Wasatcb, is announced by H. M. Crowther, manager the Continental M. & S. Co. The concentrator will have an initial capacity of 100 tons a day and will be used at first for handling the sulphide ores from the lower levels. The matter of handling the "sand carhonate," carrying values of silver and lead in the upper workings, will be disposed of later, after tests bave been made as the hest manner of reducing them. The power plant will havo capacity of 500 H. P., and the power will be conveyed 8 miles up the mountain hy wire and then used to operate the mine and mill. The question of transportation by electric power instead of the wagon road method now used will he taken up.

San Pete County.

The Oriental Utah M. & M. Co. has heen organized at Scofield, Carbon county, to develop mining properties in Nebo Basin district of San Pete county. J. S. McNeal is president, with T. Kelter, H. C. Lee, N. M. and A. Madsen officers. A. Madsen is manager.

Sevier County.

President P. A. Franklin of the Gold Dev. Co. says next month its general offices will be removed from Salt Lake City to Richfield, near which are its mines.

Summit County.

The station has been finished and the pump placed on the 700-foot level of the King Con. mine, near Park City, says the Park Miner. This pump works automatically by means of a butterfly valve and float, so tbat the services of pumpmen are not required. Sinking has been discontinued until the pipe lines leading to the pump on the 700 level have been placed. These consist of 4-inch and 6-inch pipes and will replace the small ones temporarily used to take care of the water. Superintendent Keetly says the water will be lifted by the pumps on the 700-foot level to those on the 500-foot level. Electric lights will be placed in the levels and will be used to work hy in the shaft. To do this a reel will be placed on the 700-foot level so that the lights may be lowered as the shaft goes down. When firing the lights will be hauled up. They will be protected by wire masks. Heretofore the water at all times present has caused trouble to the men in keeping their candles hurning.

The compound engine for the Daly-West slimes plant at Park City is being set up. It is of 125 H. P. capacity and will be used to drive the dynamos which are to run the machinery of the plant. The tanks are in place and the tables are heing set up.

Tooele County.

The Sacramento M. Co. of Mercur produced seventy-seven flasks of quicksilver during month of January, besides the usual output of gold. The ore which is being mined runs very well in mercury, while the average of that which went through the retorts last week was 26.5%, says Manager Bothwell.

The properties of the Overland M. Co. at Sunshine will be reopened under the direction of E. W. Clark. The mill will he overhauled and additional equipment put in.

Utah County.

It is reported the Silver Dipper mine at American Fork will be equipped with a mill this spring, The Silver Dipper has hodies of low-grade ore exposod in its workings. L. G. Hardy, manager, says in addition to the milling ores that carry values in silver and lead, and that might be profitably shipped without concentration with more favorable facilities for transportation, the company has developed first-class ore that will be shippod as soon as the roads permit.

WYOMING.

Albany County.

It is reported the New Rambler copper mine in Douglas Creek district, near Laramie, will resume operations this month, the property having passed to the possession of the original owners. During the past few years cobalt, platinum, iridium and other minerals have been found in the ores of the New Rambler.

FOREIGN.

The European production of quicksilver for year 1903 is reported as follows:

Country.	Metric Tons.
Spain	930
Austria	520
Italy	270
Total	1,720

The output of the Spanish mines shows decrease from 1902, while Austria and Italy show slight increase.

AFRICA.

Transvaal.

A petition containing 45,100 signatures

of white men have been forwarded to the government, praying for the passage of a law favoring and making possible the employment of Asiatic unskilled labor. The petition has been presented in legislative council at Pretoria.

AUSTRALIA.

Western Australia.

The gold output of Western Australia, by months, for 1903, compared with 1902, was:

	1903		1902	
	Tons.	Ounces.	Tons	Ounces.
January.	158,069	181,173	125,359	143,822
February	160,939	187,771	140,600	158,108
March	179,888	195,541	148,914	166,812
April	171,880	201,885	112,852	158,938
May	169,558	178,287	151,538	171,813
June	166,405	*224,026	157,236	173,185
July.	185,458	161,681	167,617	174,194
August.	183,775	183,707	167,719	182,591
September	183,567	186,088	173,377	186,965
October	185,072	188,262	169,233	188,057
November.	183,176	188,360	165,044	187,037
December.	190,869	203,142	175,763	199,816
Totals	2,160,656	2,310,116	1,899,322	2,092,268

*Including 38,921 ounces which belong to previous returns, but, having been omitted, are herein included.

The management of the Lake View Consols mine at Kalgoorlie is making additions and improvements to the gold saving equipment at its mill. The motive power is being increased. Twenty stamps have already been replaced in the mill of the Lake View. In the mine itself, at the 1400-foot level, the development drive on the main Lake View lode will be extended farther. On the Perseverance lode at this level, where general mine work is in progress, about 500 feet south of the Perseverance Co.'s boundary, encouraging results are showing in the workings.

The Great Boulder mine at Kalgoorlie has cut the vein at 1750 feet, where it is stated to be 23 feet wide, averaging about $20 per ton.——It is stated that ore reserves in the Kalgurlie mine have been materially increased by recent development. A long drift is being run south to reach the Oroya-Brownhill shoot. The sinuous windings of this ore shoot have greatly puzzled the engineers in charge of the mines of the district. Some weeks ago the indications were that the shoot was passing into the Associated's ground. The Associated obtained permission to prove the northeast portion of their property from the Oroya workings. This proved that the shoot had unexpectedly turned westward in the direction of the Kalgurlie.

BRITISH COLUMBIA.

East Kootenay District.

C. M. Edwards, operating a placer mine on Moyie river, near Fort Steele, has stopped work temporarily, pending the arrival of hoisting machinery and pumps.

Nelson District.

The 2-mile tramway to the Hunter V. mine at Ymir is completed and shipments of ore have begun. It is a double-rope tram, with a capacity of 400 tons of ore a day. It is expected shipments will be 80 tons a day. At the mine the ore is being quarried out from the deposits and conveyed by subsidiary trams to the main tramway. It is said to be a desirable smelter flux. The British Columbia Standard M. Co. owns and operates the Hunter V.——At the Foghorn mine developments are said to be showing a body of pay ore. The end of the 1200-foot crosscut tunnel is 250 feet east of and 900 feet beneath the ore exposed in the prospect shaft. A drift is being run toward the shaft and has gone 120 feet. The face shows 6 feet of ore averaging $10 a ton. The vein is the third one opened in driving the crosscut.——At the Dundee mine operations are in full swing. The drifts and stopes have been cleaned out and high-grade ore is being broken down for shipment.

Rossland District.

J. Kirkup, government agent at Rossland, reports to the Bureau of Provincial Information the following is the scale of salaries and wages being paid by Lo Roi M. Co. at Rossland:

	Per Month.
Superintendent	$300 00
Office manager	300 00
Bookkeeper	125 00
Clerk	100 00
Surveyor	125 00
Timekeeper	100 00
Storekeeper	100 00
Mine foreman	175 00
	Per Day.
Shift bosses	$ 5 00
Timber boss	4 00
Machine men	3 50
Timber men	3 50
Blasters	$4 and 3 50
Skip tenders	3 50
Cage tenders	3 50
Cage helpers	3 00
Car men	$3 and 2 50
Shovelers	3 00
Nippers	2 50
Track men	3 50
Pipe men	3 50
Pipe men's helper	3 00
Pump men	3 50
Scavengers	3 00
Diamond driller	6 00
Diamond drill runner	4 00
Diamond drill helpers	$3 and 2 50
Sampler	4 50
Aerial trammers	3 50
Waste trammers	3 50
Sorter boss	4 00
Crusher men	2 75
Sorters	2 50
Feeders	3 50
Master mechanic	6 00
Millwright	4 00
Electricians	$3 50 and 3 00
Machinists	$4 and 3 50
Machinists' helpers	3 00
Machine repairers	3 50
Boiler makers	4 00
Hoist engineer (large hoist)	4 00
Hoist engineers (other than above)	3 75
Compressor engineers	1 00
Firemen	3 00
Wipers	$3 and 2 50
Oilers	3 00
Blacksmith foreman	4 50
Blacksmiths and drill sharpeners	4 00
Blacksmiths' helpers	3 00
Blacksmiths' helpers (underground)	3 50
Carpenter foremen	5 00
Carpenters	3 50
Framers	3 50
Framers' helpers	$3 and 2 50
Watchmen	3 00
Yard foreman	3 00
Laborers	2 50
Teamsters	3 00
Messenger	2 00

NOTE.—Underground men work eight hours per day; surface men, with exception of the following, work ten hours:

	Hours.
Hoist engineers (small hoist)	8
Compressor engineers	12
Firemen	12
Carpenters	9
Electricians	9
Watchmen	12

The tonnage of ore shipped from and crushed at the Rossland mines for month ending Jan. 30 was as follows:

Mine.	Tons.
Le Roi	24,260
Center Star	5,850
War Eagle	4,860
Kootenay	1,030
Jumbo	1,325
Le Roi Two	1,940
Le Roi Two (milled)	1,180
Spitzee	30
Total	40,475

Mining and development work is temporarily suspended at the Kootenay mine at Rossland. Shipping of ore will be maintained through February. The mine has considerable tonnage of ore broken down in the stopes. Filling the stopes with broken ore instead of timbering has resulted in the mine having a large surplus ready for drawing off in all the stopes, and it is this material that is being shipped. Diamond drill exploration has also been discontinued. No further mining will be done at the Kootenay, says the Rossland Miner, until the question of reduction works is settled.

Vancouver Island.

The Tyee C. Co. reports the increasing output of its Tyee mine at Mount Sicker has made it necessary for the company to increase capacity of its tram line. The work is completed and the company is shipping 200 tons per day from the mine to E. & N. Railway, thence to the company's smelter at Ladysmith. Work at the mine is progressing steadily. The Van Anda mine will ship its output to Ladysmith to extent of 15,000 tons of ore per annum.

The Yreka mine at Quatsino is again in shipping condition. Operations were hindered during the past season by scarcity of water. The number of men at work has been increased. February 1st there were 500 tons of ore on the dump ready for shipment. N. Tregear is manager.

FRANCE.

A British company, incorporated as La Mangiarde, Ltd., has obtained mining concessions from the Government to operate in the Department of Alpes Maritimes, and has started work at La Mangiarde, near La Tour-sur-Tinee. They are operating at an elevation of 5412 feet above sea level, where copper croppings have been located. Machinery will be put in.

MEXICO.

Chihuahua.

W. P. Dunham of Los Angoles, Cal., E. Smith of Denver, Colo., and R. H. Reid, have bought La Esperanza mine in the Consuela group, near Terrazas, for $1,200,000. La Esperanza is at northern extension of the Dolores mines of the Venture corporation of London. The new owners of La Esperanza own the Pinos Altos. They have also bought a piece of ground at south extension of the Dolores for $250,000. Work will begin next week.

The Occideutal S. & R. Co. has been organized to take over the Creel smelter at Chihuahua hy E. Creel of Chihuahua, S. Chase of Portland, Or., W. Selover et al. The plant will be remodeled and capacity increased from 200 tons to 700 tons.

N. C. Thompson, manager of the Candelaria M. Co., says additional pumping machinery will be put in at their mines at San Pedro.

The Kentucky-Mexico I. Co. has been incorporated in Louisville, Ky., by members of La Luz G. M. Co., operating at Maguarichic. The following are officers: S. L. Pearce, J. J. Kavanaugh, C. W. Stark, W. D. Pearce, H. D. Rodman and M. O'Doherty. W. D. Pearce is manager. This company will take over and develop certain gold and silver properties held by W. D. Pearce at Manterde, 100 miles southwest of Minaca, near line of the Orient road, and some properties at Maguarichic.

It is reported the Candelaria mine of Storer & Partridge in Parral will be started up next week.——A diamond drill is in operation on the San Carlos mine, adjoining the Tres Mercedes mine, near Parral. The property consists of 23 pertenencias. It is owned hy B. Davis, Noake & De Smeth et al.

Durango.

The Bacis G. & S. M., Ltd., of London, England, is developing properties in district of Santiago Papasquiaro. 192 kilometers west from Durango. The holdings comprise 94 pertonencias. The ore, which carries silver and gold, is reported to run $30 per ton. Development consists of twelve tunnels driven a total of 10,800 feet, besides 2555 feet of drifts and crosscuts. The tunnels cut the ore bodies at depth of 1200 feet below the surface. Equipment consists of a 30-stamp mill (650 pounds per stamp), one Bryan mill, twenty-eight 4-foot Frue vanners, two boilers for heating pans. The plant is run by water power through medium of turbines which develop a total of 150 H. P. The company proposes putting in a cyanide plant and additional power equipment.

Guerrero.

J. F. Dowling of the La Dicha C. M. & S. Co. says they are preparing to increase equipment at their mines at La Dicha.

Jalisco.

Additional machinery will be put in by the Amparo M. Co., near Ezatlan, including an electric lighting plant and a lumber mill, says Superintendent G. J. Graham.

Manager F. W. Page of the Mexican M. & S. Co. at Masoota says he is preparing to build a smelter.

Lower California.

As a result of the strike in the Esperanza mine, owned by J. A. Mendoza, south of El Triunfo, the mining industry in Lower California is improving, says Modern Mexico, and prospecting is being carried on extensively in the hills, especially on placer lands. There are a number of paying mines, such as the San David, Aurora, Purisima, Telemaco, Penelope, Viznaga, Ulises, Moctezuma, Texas, etc. Silver mines have been worked near La Paz for several years and exploitation of copper mines has heen carried on successfully in Santa Rosalia district, in the municipality of Mulije and in San Fernando. The principal mining concern in the peninsula is El Boleo, in Santa Rosalia, owned by the Rothschilds. This company employs 3000 men. It has smelters and a narrow-gauge railroad, which runs from the mines to tho furnaces. Its annual production averages 11,000 tons of copper. Sulphur deposits are found on the Gulf coast of the peninsula. Seventy-five miles southeast of Ensenada indications of petroleum have heen found. The turquoise mines at La Jara are in operation. They are owned by a Colorado company. Lower California principally produces silver and copper.

Sonora.

The Tarasca G. M. Co. reports work progressing on its mines, 10 miles north of Torres. Development is said to have opened up 597 feet of the ore body. They are taking out and sacking 1000 tons of ore for shipment. It is intended to build a mill at the mine, as they have ample water rights. From the bottom of the vertical shaft, a crosscut has heen run east 390 feet to cut La Miniatura and La Tarasca veins. The principal workings are on El Ubarbo vein where a vertical shaft cuts the vein at depth of 200 feet. Below that point, an incline goes down on the vein for 150 feet. From the shaft a drift is run 400 feet northwest on the vein, and 200 feet southeast. The north face shows 2 feet of ore. There are extensive "antigua" workings. The company's holdings cover 120 acres. R. Barnett is superintendent.

President W. Greene says the output of the Greene Con. C. Co., at Cananea, in January was 5,000,000 pounds, and the operating expenses for the month were $392,000, which included some charges for improvements. He says the actual cost of mining the company's copper for the month was 7 9/16 cents f. o. b. mines. To this must be added $1.57 a hundred for transportation. For the four months ended Nov. 30 it cost the company 10⅛ cents f. o. b. to mine copper.

It is reported that the Rey de Oro M. Co. proposos building a 10-stamp mill near Magdalena.

The Imperio de Cobre M. Co. is developing a copper property in Arizpe district, south from Cananea, and has twenty men at work. The ores run 8% copper and 20 ounces silver per ton. A. Goldbaum of Hermosillo is president and S. Cohen is general manager.

It is reported the Nogales C. Co., owning the Cerro Prieto gold mines in Magdalena district, is arranging to build at Cerro Prieto a quartz mill with gas power machinery.

Reports from the Juanita placers, 65 kilometers south from Alamos, in Alamos district, shows progress. They are owned and operated by the Sonora G. M. Co., with main office in Mexico City. H. H. Greenleaf is manager. The property covers an area of 22 pertenencias and the gravel is said to run from 15 to 30 feet in depth and to average $1 per cubic yard. It is equipped with sluice boxes and centrifugal pump, the latter having capacity for handling 2000 cubic yards per day. Additional machinery is going in, says Superintendent R. D. Hughey.

The mill at the Constitution & Italia M. Co.'s camp in Magdalena district, will be completed and running next week, says Manager Magruder.

The Verde Reina M. Co. has heen organized to work the copper mines in the Verde Grande region, northwest from Hermosillo. R. Valenzuela of Hermosillo is principal owner and manager. Development work is in progress.

R. V. Daniels of Cananea, of the Arizona M. & Dev. Co., says work will be increased on the Gold Treasure mine, in the San Jose mountains near Naco, owned by the company. The Gold Treasure mine has a blanket ledge of gold-bearing quartz 3 feet wide assaying $15. A 20-stamp mill will he built. The materials are on the ground, with the boilers and engine. The power plant will be large enough to furnish power for more stamps, which will be added as the production of ore demands. The Gold Treasure is near the Cananea railroad and a siding will be laid to the mine. The ore from the mine will be taken down the mountain side on a tramway.

Layne & Clark of Cananea, owners of the San Miguel mine, are preparing to further develop the property and place machinery. The mine has 250 feet of tunnels and shafts. A quantity of ore is on the dump at the mine, which will he shippod.

Tepic.

There are two companies operating in the mineralized section of La Yesca. The section is a two and a half days' ride from the railroad.——The Zapopan G. M. Co. has started work again and has good roads between its mines and mills. Tunnel and general work on the Zapopan mine is under way, and on the San Miguel the old tunnel has been cleared and track laid. The entire tunnel will he cleared hy March 10.——The Compania Minera de Buena Vista is working the Buena Vista mine and reports taking out $75,000 per month.

Obituary.

R. J. McCARTNEY, superintendent of the Silver Lake mill, near Silverton, Colo.

GEO. W. SANDERS, formerly connected with the Vulture mine, died at Phœnix, Ariz., on the 5th inst.

THOS. WREN, an old-time pioneer miner of Nevada, died at Reno, Nev., on the 7th inst., aged 80 years.

A. W. KENZIE, a noted metallurgist and chemist and a prominent pioneer in metallurgical advance, died at Braddock, Pa., on the 13th inst., in the 84th year of his age.

W. A. HAMILL, a pioneer mining operator of Colorado and formerly part owner in the Pelican-Dives and the Terrihle mines in Clear Creek county, died on the 3rd inst. at Denver, Colo. Deceased was a veteran of the Civil War, and was a brigadior general in the National Guard of Colorado.

W. GUNDRY, for the last twenty-five years engaged in mining operations in the Tintic district, Utah, died on the 9th inst., at Salt Lake City, Utah, aged 58 years. Deceased came to the United States when 17 years of age, and became a miner at the Calumet & Hecla mine, Michigan. In 1875 he removed to Utah and became interested in mines in the Cottonwood district, Salt Lake county, subsequently removing to Silver City.

ALVINZA HAYWARD, a pioneer mine owner and operator of California and on the Comstock lode, Nevada, died at San Francisco, Cal., on the 14th inst. Deceased was born in Vermont, February, 1822. He was interested in the Eureka, (Amador Con.) and the Plymouth Con. mines in Amador county and the Springfield mine in El Dorado county, Cal. With C. D. Lane he was part owner of the Utica group of mines at Angels, Cal., and of the

Con. Eureka (Deadhorse) miue, Tuolumne county, Cal. On the Comstock, Nevada, he was interested in the Hale & Norcross and the Crown Point mines.

Personal.

F. L. BOSQUI is examining property at Goldfield, Nev.

L. D. GODSHALL, of Denver, Colo., is in Arizona on mining business.

H. DYATT has returned to Leadville, Colo., from a trip to Chicago, Ill.

J. B. FARISH of Denver, Colo., is in San Francisco, Cal., on mining business.

T. BARDEN is superintendent of the Ohio C. Co. mines at Bingham, Utah.

O. R. WHITAKER has returned to Denver, Colo., from San Juancito, Honduras.

R. G. DRINNAN is assistant manager of the Crow's Nest Pass Coal Co., at Fernie, B. C.

W. A. STEVENS, metallurgist with H. E. Wood & Co. of Denver, Colo., is iu the East.

CHAS. IRWIN succeeds Jos. Smith as manager of the Watseka mine, Rochester, Mont.

MANAGER CAITROW of the Ohio C. Co. at Bingham, Utah, is in Ohio on company husioess.

G. I. WRIGHT is managor of the Del Monte mine, at Railroad Flat, Calaveras couoty, Cal.

S. N. KNIGHT of Sutter Creek, Cal., is on a business visit to Portland, Or., and Seattle, Wash.

B. F. HARTLEY of Auburn, Cal., interested in Placer county mines, is in San Francisco, Cal.

W. F. DETERT, president af the Argonaut M. Co. at Jackson, Cal., is in San Francisco, Cal.

R. A. HAWKINS of Milford, Utah, interested in Beaver county mines, is in the East on business.

TODD C. WOODWARD has gone from Nova Scotia to Williams, Ariz., to the Anita Copper Co.

F. W. HOAR has resigned as superintendent of the Old Dominion C. M. & S. Co. at Globe, Ariz.

L. D. RICKETTS is general superiotendent of the Old Dominion C. M. & S. Co. at Globe, Ariz.

CURTIS M. LINDLEY, late of the University of California, is actively engaged at Kellogg, Idaho.

P. H. RAMSDEN, a mining engineer of Guanajuato, Mexico, is in New York City from Denver, Colo.

J. GLUYAS is superintendent of the Red Cross and Huron mines at Washington, Nevada county, Cal.

PHILIP ARGALL of Denver, Colo., has returned there from Mexico, where he has heen the past month.

R. J. CORY, manager Denver, Colo., branch Allis-Chalmers Co., has returned there from New York City.

G. W. WALLACE of Duluth, Minn., is manager of the Copper Butte mines near Florencc, Pinal county, Ariz.

G. J. BANCROFT has returned to Deover, Colo., from New York City, wl ere he has been on mining husiness.

A. COLVILLE is superintendent and mine manager at Coal Creek, B. C., for the Crow's Nest Pass Coal Co.

J. R. CARROLL of Hancock, Mich., is visiting mining properties io Utah and Idaho in which he is interested.

W. TOWNSLEY, JR., of the Grasselli Chemical Co., Cleveland, Ohio, made a trip to Denver, Colo., last week.

H. WHITBURN of Duluth, Minn., is superintendent of the Copper Butte group near Florence, Pinal county, Ariz.

H. Z. OSBORNE of Los Angeles, Cal., manager of the Dorleska mine in Trinity county, Cal., is in San Francisco, Cal.

G. G. S. LINDSEY is managing director of the Crow's Nest Pass Coal Co., operating at Fernie, Michel and Morrissey, B. C.

J. J. OTT, the veteran assayer of Nevada City, Cal., 77 years old, will celebrate his 19th birthday on the 29th inst.

Q. A. WHITE, a mill man from the Resurrection mine, Leadville, Colo., is now with the Akron mines, White Piue, Colo.

J. H. TALBOT, maoager of the Reina del Oro M. Co. at El Tiro, Sonora, Mexico, returned thore last week from Nogalos, Ariz.

W. A. FARISH, of Salt Lake City, Utah, former manager the Majestic M. & S. Co., is examining mines in Sonora, Mexico.

O. A. TIBBETTS has resigoed as manager of the Ohio C. Co., operating at Bingham, Utah, due to press of personal husiness.

A. C. BATES, of the Gutta Percha Ruhher & Manufacturing Co., returned to San Francisco, Cal., this week from a trip to New York.

D. H. JACKSON goes from Placerville, Cal., to Tonopah, Nev., March 1 to hogin sinking. He returns to Placerville, thence to Philadelphia, Pa.

G. A. BADGETT of Tonopah, Nev., superintendent of the Montana-Tonopah M. Co., is examining mining properties io San Diego county, Cal.

S. C. MYERS, representing G. W. Myers of San Francisco, Cal., for the Chrome Steol Works, Brooklyn, N. Y., is visiting the mines of Calaveras county, Cal.

H. C. BOSWORTH, manager of the Denver Fire Clay Co., Denver, Colo., is making a trip through Arizona aud Sonora, Mexico, in interest of his company.

C. O'KEEFE of Nogales, Ariz., president and maoager of the Sooora M. & M. Co., operating at Tubutama, Sonora, Mexico, has returned from a trip to New York.

H. KNUTSEN of Kalgoorlie, Western Australia, is in Colorado, making observations on the processes used in milling in that State, especially the cyanide process.

E. HOFFMAN, recently superintendent of the Indianapolis M. Co. in Tooele county, Utah, is superintendent of the Silver Shield Co. mioes at Bingham, Utah.

H. C. WEBER, superintendent of the Weber Gas & Gasoline Engine Co., Kansas City, Mo., is visiting the principal mining camps of Sonora, Mexico, on business.

G. A. OVERSTROM has returned to Chicago, Ill., from Craigmout, Ontario, where ho had been superintending erection of a plaot for the Canada Corundum Co.

C. W. PURINGTON of Doveton & Purington, mining engineers, Denver, Colo., has returned there from Cananea, Sonora, Mexico, where he has heen since Octoher last.

B. BALLANTYNE, for two years with the Golconda M. Co., near Sumpter, Or., has resigned as master mechanic and electrician, and will devote his time to his own interests.

G. CHARTERS, manager of the San Ricardo mine at San Ricardo, near Magdalena, Sonora, Mexico, returned to camp last week from a several week's visit in Canton, Ohio.

JOHN MCGEORGE of the Wellman-Seaver-Morgan Co. resigns March 1st, after which he will be at 501 Citizens buildiog, Cleveland, Ohio, having opened ao engineering office.

JNO. HOWELL, late general manager of the Broken Hill Proprietary mine, Australia, is io San Francisco, Cal., and contemplates an extended visit to the St. Louis Exposition.

W. B. ROBERTS has sold his Los Angeles, Cal., assay and chemical laboratory to the H. K. Wheeler Co. Mine examinations in Mexico will keep him in that country for the next few months.

SUPERINTENDENT GILBERT AND FOREMAN WILEY of the Ladd Metals Co. mines near Mineral, Washington county, Idaho, have heon appointed manager and superintendent, respectively.

F. P. SWINDLER, former superintendeut of the mines and mill at De Lamar, Nev., has returned there, vice F. Keith, resigned, who has acceptod a position at Salt Lake City, Utah, with J. H. Hammond.

MANAGER C. W. CLARK of the United Verde C. Co., at Jerome, Ariz., is in the Bermudas with W. A. Clark of Butte, Moot., principal owner of the United Verde. He will return to Jerome next month.

J. N. ESSELSTYN, until recently manager of the Mountain View group, near Sumpter, Or., has heen appointed as consulting engineer for the properties heing operated by the Geisor-Hendryx Co. in Sumpter district.

P. P. BUSH, general Western manager of the Vulcan Crucible Steel Co. of Aliquippa and Pittsburg, Pa., whose headquarters is in Denver, Colo., is in San Francisco, Cal., on his way to Portland, Or., and Spokane, Wash.

THE Western Society of Eugiueers, 1734-41 Monadnock block, Chicago, Ill., have elected the following officers: H. W. Parkhurst, president, 1. C. R. R., No. 1 Park Row; C. W. Hotchkiss, first vice-president, room 401 La Salle street station; W. L. Ahhott, second vice-president, Chicago Edison Co., 139 Adams street; Prof. W. D. Pence, third vice-president, Purdue University, Lafayette, Ind.; Andrews Allen, treasurer, room 1127, Monadnock block.

Commercial Paragraphs.

"Territory Embraced hy the Machinery Sales and Engineering Business of Chas. C. Moore & Co.," is the legend emhlazoned on a colored map of the western part of the North American Continent washed hy the waters of the Pacific from where the plaiotain leaves at Guadalajara, Mexico, rustle in the tropic hreeze to where the free American of Alaskan descent hathes his harharian hrow in the surf that thunders on the shore of far Attou. The idea is a clover one.

THE St. Louis Repuhlic of Jan. 29 gives the decision of the U. S. District Court io what was known there as "the colored strand trademark suit," which is of general interest. A St. Louis manufacturing house sought to restrain a competitor from using a trademark for thoir make of ropes, which, it was chargod, was an infringement on that adopted by the complainants. Their description of its trademark was as follows: "The trademark consists of a red or other distinctively colored streak applied to or woven in a wire rope. The color of the streak may be varied at will, so long as it is distinctive from the color of the body of the rope." In its decision the court held that this streak of color applied to or woven in the rope does not constitute a legal trademark, thus sustaining the demurrer to the hill seeking to enjoin the defendant from infringing on a registered trademark. Should this decision stand, it may occasion considerahle change in trademarks in other lines of business.

Trade Treatises.

1904 Catalogue No. 45 B., from Fairbanks-Morse & Co., Chicago, Denver and San Fraocisco, is devoted to hoists and hoisting machinery operated hy gasoline, naphtha, distillate, kerosene or crude oil.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., bas official reports of tbe following U. S. patents issued to Pacific Coast inventors:

FOR TBE WEEK ENDING FEBRUARY 9, 1904.

751,975.—JAR CLOSURE—W. E. Brown, Los Angeles, Cal.
751,610.—HOOK AND EYE.—E. A. Campbell, Los Angeles, Cal.
751,613.—LIFTING JACK—R. F. Cook, S. F.
751,836.—ROLLER—W. E. Cumback, S. F.
751,901.—BRIDLE BIT—H. A. Cummings, Del Paso, Cal.
751,722.—NOZZLE—W. A. Dohle, S. F.
751,848.—PLUG TOBACCO PULLER—J. Goldsmitb, Eugene, Or.
751,791.—METAL GRINDER—J. H. Haskins, San Diego, Cal.
751,926.—LOCOMOTIVE ALARM—C. D. King, Olympia, Wash.
751,659.—WBETSTONE CASE—D. F. Larkin, S. F.
751,560.—MOTOR VEHICLE.—C. E. Larrahee, S. F.
751,661.—GATE HINGE—J. Leffler, La Grange, Cal.
751,863.—CLOTHES DRIER—F. S. MacDougall, Seattle, Wash.
751,532.—ROCK BREAKER—W. A. Merralls, S. F.
751,668.—DOOR VENTILATOR AND SCREEN—J. H. Moskow, S. F.
751,676.—FRUIT ELEVATOR—C. D. Nelson, Lordsburg, Cal.
751,678.—WBEEL BRAKE—H. Neusser, San Rafael, Cal.
751,751.—EXPLOSIVE—B. D. Pike, S. F.
751,694.—ROTARY ENGINE—J. E. Shearer, S. F.
751,758.—PUMP PISTON—R. E. Small, Los Angeles, Cal.
751,457.—CATTLE GUARD—J. Sneider, Buckley, Wash.
751,818.—SOUND INTENSIFIER—G. T. Swenson, San Pedro, Cal.
36,788.—DESIGN—M. Alves, West Berkeley, Cal.
36,782.—DESIGN—C. W. Robinson, San Diego, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, tbe following are worthy of special mention:

GATE HINGE.—No. 751,661. Feh. 9, 1904. John Leffler, Lagrange, Cal. The object of this invention is to provide a hinge of simple construction whicb may be attached to the right or left of a post to allow the gate to swing in one direction or the other.

MOTOR PROPELLED VEHICLE.—No. 751,660. Feh. 9, 1904. C. E. Larrabee, San Francisco, Cal. Assigned to Larrabee Automobile & Mfg. Co., a corporation. This invention relates to improved mechanism with self-propelled vehicles; and it consists in the combination, witb suitable engines or motors, of crank shafts, connecting rods and levers having short and long arms and toothed segments and racks with intermediate gears through which power is transmitted to the propelling wheels of the vehicle.

COMBINED SCREEN, WINDOW, AND VENTILATOR ATTACBMENT FOR DOORS.—No. 751,668. Feb. 9, 1904. J. H. Moskow, San Francisco, Cal. This device contemplates the doing away of the cumhrous, unsightly separate screen door and the substitution for the usual glass panel of tbe outer door of a hinged screen normally closing the opening and allowing ventilation, a hinged sash adapted on occasion to he closed over the screen, and so afford a door secure against tbe cold or the elements, and means co-operating with the sash when open to keep the door in normally closed position.

Latest Market Reports.

SAN FRANCISCO, February 19, 1904.

METALS.

SILVER.—Per oz., Troy: London, 27½d (standard ounce, 925 fine); New York, har silver, 59½c, refined (1000 fine); San Francisco, 59½c; Mexican dollars, 47@48c Sao Francisco, 46½c New York.

Silver has made a decided advance the past week, going to 59½ cents, the present quotation. To just what cause this increase in price is due is not apparent, but the fact that an advance has been made must he satisfactory to tho miners of the metal.

COPPER. — New York: Standard, $12.50; Lake, 1 to 3 casks, $12.50; Electrolytic, 1 to 3 casks, $12.37½; Casting, 1 to 3 casks, $12.37½; San Francisco: $15.00. Mill coppor plates, $17.00; hars, 18@24c. London: £57 2s 6d spot per ton.

Copper remains unchanged from last week's quotations for Lake, with electrolytic and casting a fraction higher. Heavy shipments of copper have heen made to Europe, reaching in January ahout 25,000 tons. It is thought Februrary shipments will not exceed 12,000 tons.

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4⅛c 1000 to 4000 lbs.; pipe 6½, sheet 7, har 5¾c; pig, $4.85. London: £11 12s 6d ℔ long ton.

SPELTER.—New York, $5.10; St. Louis, $5.00; London, £21 12s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.37½@28.75; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32½c; har tiu, ℔ lb., 35@37½c. London, £125 10s spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumhers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; too lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feot, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices aro: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.40 ℔ hhl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ℔ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.60 @13.85; gray forge, $12.60; San Francisco, har, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer hillets, Pittshurg, $23.00@23.00; open hearth hillets, $23.00 @23.00; San Francisco, har, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 25@14 75
Northern 2	13 75@14 25
Northern 3	13 25@13 75
Southern 1	14 10@14 60
Southern 2	13 60@14 10
Southern 3	13 10@13 60

Forge	12 35@12 85
Charcoal	18 00@19 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 40@ 1 45
Bars, steel	1 46@ 1 46
Rails, standard	28 00@30 00
Rails, light	24 00@30 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 00@13 00
No. 1 cast, not ton	11 00@12 00
Iron rails	15 50@16 50
Car wheels	13 50@14 50
Cast borings	4 00@ 5 00
Turnings	8 00@ 9 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallott's, 6¼c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9¼c; less than one ton, 11¼c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Homp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11¼c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3¼c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; cblorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2½c; powdered sulphur, 2@3c; flour sulphur, Fronch, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulpbide of iron, 8c ₱ lb.; copper sulpbate, 5¼@5½c; cbloride of lime, spot, $2.50@2.75; sulpburic acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, bd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boilod, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21½c; Astral, 21½c; Star, 21½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 15c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., $1.00.

BISMUTH.—Subnitrate, ₱ lb., $1.75.

MERCURY.—Bichloride, ₱ lb., 90c.

MOLYBDENUM.—$2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 75c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

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MINING ENGINEER, WITH LARGE PACIFIC Coast experience, desires charge of a mine; understands milling, concentration, chlorination, cyanidation; or will act as consulting engineer. Address "Pacific," this office.

NORWEGIAN GRADUATE ENGINEER would like position with land company. Can take charge of work in field or office. Ten years experience. Address "Norway," this office.

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WANTED—POSITION WITH MINING COMpany as manager or assistant. Examinations, surveying, assaying; also familiar with drift and hydraulic mining. Best of references. Address W. H. J., this office.

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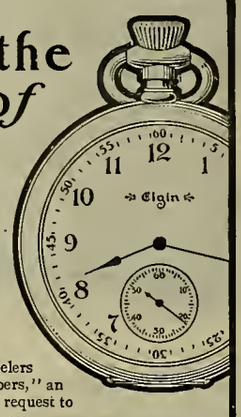

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Whole No. 2275.—VOLUME LXXXVIII. Number 9. SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 27, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

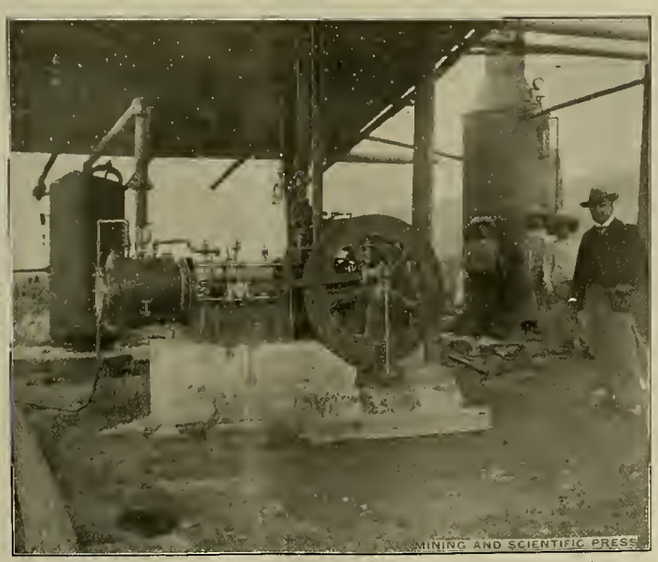
An Oregon Gold Mine.

In Grant county, Oregon, are a number of valuable and promising gold properties, among them being the Badger mine, near Susanville, on Elk creek, a small tributary of John Day river, and about 30 miles west of Sumpter in an air line, but about 55 miles by wagon road. A dark gray clay slate is the most important rock formation of the district. This formation strikes N. 70, E., with a dip of 65° to the south. There are numerous small dikes of aplite cutting the slates. Serpeutine, gabbro and diabase are also found in the vicinity. On the main range near the head of Elk creek, on the summit of the Blue mountains, the granite is exposed. The placers of Elk creek undoubtedly derived their gold from the quartz veins of the vicinity. In 1869 a pan mill was built on the Monumental vein to work the ores of that mine. There are numerous free gold prospects scattered about the district, but the principal values are in heavy sulphide ores containing comparatively little free gold. The Badger vein was discovered in 1869, when it was known as the McQuade vein. Considerable free gold was obtained by milling the decomposed croppings, this ore averaging $25 per ton in arrastras. Later a 10-stamp mill was built, but the ore does not readily yield its values to ordinary gold milling processes, and the high grade ore is sorted out and shipped to the smelters, the remaining lower grade material being crushed in a concentrating mill, built after the 10-stamp mill was found unsuitable, concentrated and the concentrates shipped. The accompanying engraving illustrates the company teams loading these high-grade ores for shipment to the railroad and smelter. The mine is 2½ miles northeast of Susauville, at about 4300 feet altitude. The vein is a fissure, the accompanying slate walls being seamed with numerous quartz seams, which are perpendicular to the schistose structure of the rocks. The first-class ore consists of a massive irregular mixture of sulphides, pyrite, arsenopyrite, zincblende, with a little galena, chalcopyrite and tetrahedrite (gray copper). Ore containing this latter mineral is usually rich in silver and also carries considerable value in gold. Shipping ore always contains galena.

Loading Concentrates at the Badger Mine, Oregon.

Overcapitalization of Mining Companies.

Oue of the most objectionable features of new mining companies, and also one of the most serious obstacles in placing stock of such concerns, is overcapitalization. The average promoter is not a miner, nor is he always the shrewd, experienced business man he would have the public believe, for if he were either a miner or a business man he would see the uselessness—the folly—of greatly excessive capitalization. Ordinarily shares in new concerns are offered at a price far below par, and evidently the intention is to make the shares look reasonable in price as compared with the par value, while the natural inference is that the investment must accordingly be a good one. A compauy organizes with one million shares having a par value of $10 each, representing $10,000,000. Then a "limited amount" of stock is offered at 50 cents per share—only 5% of the par value, with a threat to raise the price to $1 at an early date. Those seeking investment can see a profit of 100% at least, if they buy promptly, and take a block of shares at 50 cents, in the belief that at the date fixed by the company for advancing the price of shares their shares will also advance and will theu be worth at least twice what is paid for them. As a matter of fact, capitalization bears no relation to actual value of the mine whatever. There are scores of mines, both good and bad, which abundantly prove this. A notable instance is that of the Calumet & Hecla, incorporated for $2,500,000, of which only $1,200,000 has been paid in. The mine has paid $85,000,000. Other mines capitalized at $10,000,000 have never paid a dividend and never will. Another fallacy is the practice of figuring the percentage on capital stock or market value of dividends paid. A mine may be able to pay from $50,000 to $200,000 per month and ou the strength of this the stock may go to $50 or over per share, representing an actual value of $10,000,000. After a few months the dividends suddenly cease and the stock falls so rapidly that the holders are unable to sell at any price. There are numerous instances of this kind. The best and most satisfactory way to promote a new mining scheme is first to secure a good mine, capitalize it at a good figure, and place the stock at a price commensurate with the present value of the mine.



Air Lift Plant in Operation in Mexico.

(See Page 150.)

Air Lift Plant Showing Discharge of 105 Gallons per Minute

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, FEBRUARY 27, 1904.

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AN effort is being made in Congress by Representatives from New Mexico to throw open to location the mineral veins and deposits on land grants in that Territory. This is by no means a new step in this matter, as it has been a subject of contention between prospectors and the owners of grants in the Southwest for many years, and without satisfactory result—at least, not to the miner. When this subject was introduced in the House of Representatives of the Fifty-seventh Congress, a bill was framed which in effect, in part, provided as follows: That thereafter all gold, silver and quicksilver deposits, or mines, or minerals of the same, on lands embraced within any land claim confirmed by the decree of the court of private land claims, or as to which a suit may be pending in any court having jurisdiction thereof, are hereby declared to be free and open to exploration and purchase, under the mining laws of the United States, the local mining laws and regulations in addition thereto and consistent therewith as may be prescribed by the Secretary of the Interior from time to time, by citizens of the United States and those who have declared their intention to become such. The Committee on Mines and Mining sought the views of the Secretary of the Interior upon the measure, and Secretary Hitchcock replied that it was the opinion of the Department that only such deposits and veins of minerals as were known to exist prior to the confirmation of the grants were applicable to the intended legislation. It is evident from the above, which is only a brief extract from a lengthy opinion, that no rights under the general mining laws, in the opinion of the Land Department, can be acquired on Mexican grants where the title has been confirmed by the Government. There are certain possible exceptions where the grant claim is finally rejected by the United States; or in cases where an excess has been claimed and the surplus resorts to the public domain, or where grants fall within the jurisdiction of the court of private land claims.

Gross vs. Net Value of a Mine.

The process of properly sampling and valuing a mine is one involving an amount of labor and responsibility on the part of the engineer, or other person making the estimate, which is proportional to the development of the mine and the value involved. As mines may be bought, though possibly not being offered in the market, there are two sides to the question of the value of a property—the owner and the buyer. Each side may be represented by one or several persons, or each side may be a corporate company. In any case the position of either side is essentially similar. The owner, or his engineer, blocks out the mine, samples every accessible portion of it, and all samples are assayed. The result, comprising the number of feet or inches in width of each sample taken, and the value obtained by assay of each sample, is plotted on a mine map. Each block of ore, with its several samples, widths and values, is figured separately, and from this data the value of the mine, as represented by the sum of all the blocks, is calculated. This is the gross value, and if the work of measurement, sampling and assaying has been carefully done, valuable information has been secured, upon which the owner may fix his own idea of the net valuation of his property. There are many instances where the owner and prospective buyer may, and do, readily arrive at the gross valuation of a mine—actual, probable and possible—but the harmonizing of the ideas of net value is often a difficult and sometimes an impossible thing. The owner naturally figures as closely as he can on expenses and investment, and arrives at figures representing the net value of the property from his point of view, but which figures are greatly at variance with those of the possible purchaser, who is not prone to underestimate. The owner may figure a stated amount for mining and reduction and deduct these from the gross assay value, and find a large net profit in the property.

The would-be buyer may or may not be willing to accept the figures of the seller as to working costs—presuming that they have already agreed upon the gross value. The buyer argues that it is improbable that the ore can be worked closer than 90% of its assay value, and it may not yield this much. He also figures that the getting of the metal (base or otherwise) to market or mint will cost something. He estimates the cost of equipment, if the mine is not already equipped, or extensions and necessary changes in plant, and also adds an interest charge to capital invested, all of which may have been omitted or overlooked by the seller. The buyer figures for net results, the seller for all he can get, and, owing to these conflicting views, many sales, after expensive investigation and long-continued negotiation, fail and are never consummated. A favorite argument of the seller is "the mine has produced so many thousands, or millions," as the case may be, when in reality this is a poor argument for the seller, as the mine can never reproduce those millions, though other millions may still remain. In the earlier years of mining in the West investors took desperate chances, and large fortunes were lost in consequence, though here and there were exceptions so notable as to prove a strong incentive to others to venture. In days of excitement mining deals are easy of accomplishment; but when the days of adversity come, as they always do where extravagance and unsuitable methods have prevailed, these must give place to economy and scientific practice, and men then learn to judge the real merit of a mine and fancy prices fall. The investigation and valuation of mining property has been reduced to a science, in which the element of common sense plays an important part. Nearly every factor in the valuation of a developed mine can be arrived at with almost a certainty. Why, then, should there be a conflict of opinion as to the actual value of any mine? If this can be satisfactorily adjusted between the two sides to a deal, the prospective value may also be fixed in a way which should be satisfactory to both sides.

Owners commonly overrate not only the net but also the gross value of their property. A mine may possess large value when measured on a basis of tons in sight and values as determined by samples and still, while insuring a profit, be incapable of being worked on a scale commensurate with its magnitude, for various reasons—situation, climate, etc. In some European countries mines are in operation today which have been worked for a century, or possibly several centuries. In the Western United States similar mines would have been exhausted in less than fifty years. The element of time is important and the buyer includes this with other factors in determining the net value of a mine. The owner argues that the value is there and time is not a matter for important consideration. Often the expense of equipment is very large, and in view of the interest value of the money invested, it is business to get the mine in a producing stage as quickly as possible and to work the mine out as fast as is expedient with due regard to the lives of men employed and the proper working of the mine. It is improbable that all of these differences of opinion will soon be harmonized, but where it is so readily possible to determine the most of the elements involved, there should no longer exist greatly varying ideas of the value of a mine.

MINING COMMISSIONER WHITE of Colorado will undertake to compel mines in that State not already equipped with the necessary safety devices in shafts to put them in. A legal technicality has arisen as to the authority of the Commissioner to enforce his orders. There are laws in Colorado providing for safety devices for cages and skips, but none for an overwinding device on mine cable. What particular usefulness any sort of device "on the cable" can have is difficult to understand. The crosshead or draw bar of a cage or skip is an obstruction which shows what happens when the engine overwinds. Either the cable must part (which it usually does under such circumstances) or the top of the head frame is torn to pieces. The latter rarely occurs, though more or less damage to the upper portion of the frame usually results in a case of overwinding. The proper sort of device is one which will prevent the skip from falling down the shaft in the event the cable breaks. This placed at the proper point in the head frame will insure the cage or skip remaining stationary after the rope breaks in a case of overwinding, but in all other parts of the shaft the only hope for safety lies in clutches which shall grip the guides so firmly that there is no likelihood of the cage going down unless the guides be torn to pieces, and to guard against this latter contingency the guides should be made of timber of such size and strength as to make their destruction in this way impossible.

THE injunction granted plaintiffs against the Amalgamated Copper Company by Judge Clancy at Butte, Mont., some time since, and which tied up about $3,000,000 set aside for the payment of dividends by that company, is no longer operative. The Supreme Court of Montana on the 1st inst. dissolved the injunction, and as the plaintiffs' attorneys did not make application for a rehearing it is probable that the lower court will be asked to dissolve the injunction in accordance with the Supreme Court decision. This injunction arose over the decision that the Amalgamated Company, not being a Montana corporation, had no right to hold the stock of another corporation and to vote the same. The court, in keeping with this decision, restrained the Amalgamated Company from disbursing the accumulated dividends.

IT is an easy matter for a mining engineer or a geologist to be led into error by too superficial examination or by forming a too hasty conclusion, in the investigation of a mine or in studying a mineral zone or formation. One may be cautious and slow to arrive at conclusions without being pessimistic. The average miner is optimistic, and he has small regard for those who do not share his exalted opinions as to the value of his mine, but to the trained and experienced mine examiner facts must be available upon which to base conclusions. Indications are given their full value; but something more tangible and positive than indications, or proximity to good values on adjoining property owned by some one else, are essential to a favorable report. It is nearly as bad to make a mistake through ultra-conservatism as it is to err by being over-sanguine and visionary as to unseen values.

CONCENTRATES.

In determining the value of assessment work done on a mining claim in the State of Nevada, $4 is fixed as the value of a day's work.

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Ores containing molybdenite yield better results if crushed with rolls than with stamps, as with the former the tendency to slime is greatly lessened.

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Mine water of copper mines frequently contains sufficient value in copper in solution to justify passing the water over scrap iron to precipitate the copper. Tin scrap, if obtainable, is generally used for this purpose.

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Where copper sulphide occurs disseminated in schist, ore of this kind is usually easy to concentrate. The value of the concentrated ore will depend upon the amount of iron sulphide present, and also upon the completeness of concentration.

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In concentration by water all particles of the same, or approximately the same specific gravity, do not settle in the same box or other receptacle. Scaly minerals will be carried along by the current when granular minerals of the same specific gravity settle.

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A hoisting cable 2 inches in diameter and 3000 feet long will weigh 18,900 pounds. To this is usually attached a cage or skip weighing from 4000 to 5000 pounds and a load of 8000 to 12,000 pounds, a maximum of 35,900 pounds. This is raised at various shafts at speeds ranging from 1000 to 6000 feet per minute.

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It is not customary or the best practice to roast sulphide ores before concentration. Such ores concentrate better without roasting. The values in some gold ores containing substances which interfere with amalgamation, such as graphite, molybdenum, etc., will yield a good percentage of their value by concentration.

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A convenient way of testing for heavy spar (barite) is to heat the pulverized mineral with sodium carbonate on charcoal before the blowpipe. Place the fused mass on a surface of clean silver (coin) and add a drop of water. If sulphur be present, a black or yellow stain of silver sulphide will be formed on the surface of the silver.

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Steam turned into a shaft where blasts have just been fired will quickly dispel powder smoke and gas, if introduced near the bottom of the shaft. Where steam sinking pumps are in use this is a convenient means of quickly getting rid of smoke, but it is also bad for timbers, causing them to rot much more quickly than they otherwise would.

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No chairs or other obstruction placed at the level of the floor at the collar of a shaft will afford safety to men in a case of overwinding where the head frame is high. It may save men from being dropped to the bottom of a deep shaft, but a fall in a cage a distance of 50 or 60 feet is sufficient to seriously injure if not kill any one who may be on the cage.

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Bismuth is comparatively rare, and occurs chiefly in metallic state. It has a reddish-white color and brilliant lustre. It is easily dissolved in nitric acid. The alloy known as "Wood's fusible metal," which melts at 60.5° C., is an alloy of bismuth 4 parts, lead 2 parts, cadmium 1 part and tin 1 part. This alloy expands upon cooling and solidifying, and is used in making casts.

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Sulphuric acid may be made at any mine where sulphide ores are roasted, but it is not considered profitable in view of the limited amount of acid required in most metallurgical operations, and of the comparatively small amount of ore treated. As sulphuric acid can be bought at two cents or less per pound it does not pay to manufacture the acid in the mountains and ship it to large commercial centers for distribution.

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The "serpentine" hook commonly called by miners "pigtail" hook, used for hoisting at prospect shafts where a windlass or whim is in use, has only the fact that it is convenient and quickly adjusted to recommend it. In lowering a bucket, should the bucket strike the timbers, the hook is likely to become detached, and it is looked upon by experienced miners as an unsafe device. One of the numerous "safety" hooks is far better.

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In order to avoid the operation of the mechanics' lien law in the State of Nevada, it is necessary that the owner, or a person having or claiming an interest in a mine, shall within three days after he shall have obtained knowledge of the construction, alteration or repairing, give notice that he will not be responsible for the same, by posting a notice to that effect in a conspicuous place on the land or building in question.

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The water supply for a stamp battery and that for concentrators should always come from a tank in which the water is kept at a constant level, in order that the flow of water to batteries or concentrators may not be variable. A constant level of water in the tank can be secured by arranging a float connecting by lever with a valve, which opens or closes as the water rises or falls, thus admitting more or less water to the tank as required.

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An improvement upon an already patented article may be patented, but the right of the improver does not extend beyond his improvement. He may not use the original article, neither may the original inventor use the improvement, without license. The rights of the two parties are reciprocal. A patent in the United States gives the patentee the exclusive right to manufacture, sell or use the invention throughout the entire territory under control of the United States. The sale or use in the United States of a patented article manufactured in a foreign country is just as much infringement as though the article were manufactured in the United States without authority from the patentee. The redress of the inventor for infringement of a patented article is by suit brought in the Federal Court, praying for an injunction and damages.

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The spitting of the lead "prill" when cupellation commences is unusual, and may be due to dampness of the cupel or to a sudden draught of air which causes the surface of the lead to suddenly contract, forcing the molten interior through the outer crust. Cupels should be placed in the muffle at the time of starting the fire, then they slowly heat without cracking, and have the temperature of the muffle when ready to place the prills in the cups. They should be marked and placed in position when first put in the muffle, so that they need not be disturbed, and the several prills placed in their respective cupels, and the furnace closed. When cupellation commences, the door of the muffle (usually a piece of fire brick) should be withdrawn slowly, so as not to cause a sudden rush of cold air into the muffle, as this may cause spitting of the lead and occasion loss.

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It is difficult if not impossible to estimate with even approximate accuracy the size of timbers required to hold any particular mass of rock in place in a mine, for the reason that it is impossible to know accurately the amount of weight or pressure the timbers may be required to stand. The jointing planes, unseen fissures and possible swelling of the ground by oxidation and absorption of air will exert pressures not wholly attributable to "dead weight," and in the absence of definite information the miner places timbers his experience has taught him should support the ground. Often the timbers are larger than were required, and in other instances timbers two or three times as large would be insufficient. In some instances timbers are seen falling into decay and dropping from their original position, while the rocks still stand with no sign of caving. In other cases heavy timbers placed in the mine are seen to be taking heavy weight within twenty-four hours, and in a month or less require reinforcement or renewal.

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Copper ore (chalcopyrite) often occurs in sedimentary rocks—limestone and quartzite and the slaty or schistose rocks adjoining the copper-bearing stratum, situated in the direction of drainage may become enriched with copper carbonates and oxides from the copper sulphate leached from the sulphides in the process of weathering. This would possibly result in the formation of a rich ore deposit in a rock which normally contain no copper. In such deposits as these the copper is not likely to descend a great distance from the surface. There are examples of this sort of deposit at several places in the Black Hills of South Dakota, on upper Rapid creek, near Castle creek, and on the mineral zone known as Blue Lead, near Sheridan. In the deposit on Rapid creek the surface of the black slate formation which adjoined the quartzite the ores were high grade (green carbonate and black oxide chiefly), but a flat vein of quartz intersected the slates a few feet below the surface and the copper values dropped from 20% to 40% above the vein to about 2% immediately below it. The quartz vein had acted as a dam to the copper solutions and the enrichment of the slates was confined to the superficial portions. The quartzite at the surface was barren of copper, only a siliceous limonite remaining. In depth a mixture of copper and iron sulphides were found, constituting the normal ore.

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Many of the mining districts of the southwest in Nevada, southern California and Arizona, which have dry mines near the surface in depth, develop water, and in several noted instances, as at Piocho, Nev., and Tombstone, Ariz., when water level was reached the quantity of water was very large, and at once became a source of great expense. Probably a shaft sunk in any portion of the desert region will reach water if continued deep enough. Water is usually found by sinking a well in dry lake basins, but this water is nearly always heavily charged with mineral salts, which to a great extent unfits it for boiler use, though it is generally found all right for amalgamation, probably due to the presence of alkalies in the water. The cost of pumping water at desert wells depends upon the depth from the surface of the ground to the water, the size of plant employed and kind of fuel used. Gas engines using distillate have been used to advantage for this purpose and may be recommended, as the load is not greatly variable. At Hedges, San Diego county, Cal., at a cost of $22 per day, 100,000 gallons of water were delivered daily through a pipe line from the Colorado river, a distance of 14 miles, the vertical lift being 500 feet. The fuel was driftwood, etc., gathered by Indians along the bank of the Colorado river. The pumps were operated by steam. A second pipe line was laid and double the quantity of water was pumped at only 60% increase in expense.

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The Whiting hoisting system was introduced by S. B. Whiting. It comprises a system of grooved wheels, like those in use at cable car power house stations. The rope passes several times around two drums, which are usually both driving drums. One end of the rope is attached to the hoisting cage or skip. The rope passes over the sheave, around the first drum or grooved wheel several times, then over an idler pulley, and thence over a third wheel to the sheave over the adjoining compartment of the shaft. The idler is used to adjust the position of the skips in relation to the several levels. This is accomplished by placing the idler on a movable carriage. The idler is usually in a horizontal or inclined position. When hoisting, the movable carriage is clamped to the track and is also held in position by a rope which is connected with a winding drum. The length of track required for this differential arrangement of the skips is one-half that required in the shaft. If it is necessary to adjust the position of the skips by 500 feet, the track must be 250 feet long. In order to overcome the constantly changing relation of weight of cable and skips when these are run in balance—that is, one moves down the shaft as the other is hoisted—the "tail" rope has been introduced. A rope is secured beneath the bottom of each skip, the rope passing around a sheave wheel at the bottom. This equalizes the weight of skips and cable at all points, and the engine has only the load of rock to hoist. The introduction of the tail rope system is claimed to have made hoisting from great depths more economical, but it has been applied to a limited extent in the Western United States, though of frequent application on the Rand. The tail rope system is applied where all hoisting is done from one level.

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The capacity of a blast furnace of given hearth area depends upon several important factors. Among these are distance between tuyeres; hot or cold blast; character of ore, amount of fuel used, blast pressure, and physical condition of ore (that is, whether coarse or fine), and the personal equation, represented by the smelter in charge, is a large one. The amount of water required by a water-jacketed furnace, cooled from hearth to throat, is variable and depends, says E. D. Peters, upon whether the ores smelted are of a nature to form a protective coating upon the walls of the shaft, and one which does not accumulate so rapidly as to require frequent barring for its removal; whether the coke used is kept supplied with all the ore it can possibly take care of, so that it may have no energy left to waste in heating the jacket; whether the coating substances accumulating on the inside of the furnace are good heat conductors or not; whether the ore is granular, or contains too large a proportion of fines, in which case it will be necessary to frequently allow the ore column to sink deep in the shaft, and thus expose the walls of the jacket to a powerful, though temporary, heat; upon the specific heat of the slag, and upon the pressure of the blast, and the skill of the general management of the furnace. The maximum amount of water required per hour for a furnace of 3 square feet hearth area when running normal and to its fullest capacity is 460 gallons; a furnace of 12.5 square feet hearth area requires 1300 gallons; one of 18 square feet, 1800 gallons; one of 30 square feet, 2000 gallons, and one of 36 square feet, 2200. When blowing in or out, the quantity of water required will be from two to three times the amounts above stated, as at such times the jacket is exposed to a much higher heat than usual and for a longer period.

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The amount of water required for the successful operation of a concentrating mill varies greatly. If the ore be mostly silica, much less is required than if it be clayey. The character of the mineral to be concentrated is also important in determining the amount of water to be used. In the Lake Superior mills, where native copper is concentrated, a very large amount of water per ton is used. At Butte, Mont., where copper and iron sulphides are concentrated from siliceous ores, much less is required. In concentrating copper-silver ores at the Gagnon mine at Butte, 5000 gallons of water were used per ton of ore. This was with steam (Ball) stamps. Where gravity stamps were used in concentrating Butte ores 3000 gallons were found sufficient. At the Colorado concentrator in Butte, with a capacity of 300 tons per twenty-four hours, 600 gallons of water were used per minute, or about 2700 gallons per ton of ore treated. In a gold mill, where amalgamation followed by concentration is practiced, the amount of water used is much less than where concentration of copper ore is in progress. Ordinarily, 1000 to 1200 gallons of water are sufficient for battery and plate amalgamation, but it is good practice to use as little as possible to do the best amalgamating and keep the mortars and plates clear. When the pulp from the plates goes to the vanners clear water is added to the concentrating machine. This amount is varied with the various characters of ores treated, or with the changes which may occur from day to day in ore from the same mine, where ore from one part of the mine or from some particular vein is more highly sulphuretted than other portions. Where water is scarce, it may be conducted from the mill to the settling reservoir and the clear water pumped back and reused. The loss seldom exceeds 50%, and where proper arrangements are made should not reach that amount.

The Hendryx Electro-Cyanide Process.

Written for the MINING AND SCIENTIFIC PRESS by C. M. FASSETT.

In Republic, Wash., are three idle cyanide mills, all built by men of large experience in this branch of metallurgy, and with an outlay in the neighborhood of $750,000. The mills are models in their design, and the character of the machinery and appliances for thorough and economical work, but they are idle. There are thousands of tons of good milling ore broken and blocked out in the mines along the main belt, yet the mills are idle. The district is paying no dividends. The mine which has shipped the best ore and upon which the most expensive mill has been built is about to be sold, with all its improvements, to satisfy a mortgage loan of less than $100,000. Some of the mines are now shipping ore to the British Columbia smelters, and although they are getting a very low freight and treatment rate, considering the highly siliceous character of their ores, it is hard to figure a profit on anything that assays less than $10 per ton, and the value of the bulk of their ore is less than that figure.

No wonder times are dull in Republic.

Now comes W. A. Hendryx of Los Angeles, Cal., who says he has a process by which these ores can be worked up to 80% of their assay value in gold and silver, at a cost not exceeding $1.50 per ton, and with machinery inexpensive to install and well adapted to be added to crushing mills now in existence. After considerable experimenting on charges of 100 to 200 pounds of ore in a small plant installed three months ago in my testing laboratory in Spokane, the Mountain Lion G. M. Co. ordered the installation of a Hendryx agitator in their mill at Republic, to follow their crushing plant of heavy stamps and Huntington mills. This work is now being done and the plant should be in operation by the time this is published. The owners of Republic mines are watching this mill with almost breathless interest.

The agitator now going in is 16 feet in diameter, with straight sides 9 feet high and a conical bottom 8 feet deep. The central well is 2 feet internal diameter. Its capacity is about 100 tons per day, on the supposition that three charges can be worked in twenty-four hours.

Whether or not a success is made by this process on the peculiar ores of Republic (and it is rather hard on the process that its first trial in this section should be on these difficult ores), the process is worthy the attention of any progressive mining man. It consists of agitation of the crushed ore with a very dilute solution of potassium cyanide, and the deposition of the dissolved gold and silver upon plates by means of an electric current at one operation. The pulp of proper consistency is charged into the agitator, together with enough alkali to overcome its acidity and sufficient cyanide to bring the solution to .05%. This agitator is the essential mechanical feature of the process. It consists of a cylindrical tank having a conical bottom of 45° pitch. In the center of the tank, and extending nearly to the bottom and top, is a cylindrical well in which revolves a vertical shaft, supported and driven from above the tank. On the shaft are secured three screw propellers, and in the center of the shaft, which is hollow, is the stem of the discharge plug at the bottom of the tank, operated by a hand wheel at the top of the shaft. A circular apron extends from the top of the well in all directions toward the sides of the tank, having a slight slope outward. Underneath this apron and outside of the well are supported the anode and cathode plates, supplied with current by a small plating dynamo.

The revolution of the shaft carrying the propellers creates a strong upward current in the shaft, and the result is a rapid and uniform circulation of the whole charge upward through the well and downward among the electrically charged plates. When the assays show that the operation is completed the plug is drawn up and the pulp discharged into a settler, whence the separated solution is pumped back to the stock tank and the tailings sluiced out.

The claims made for the process by its inventor are:

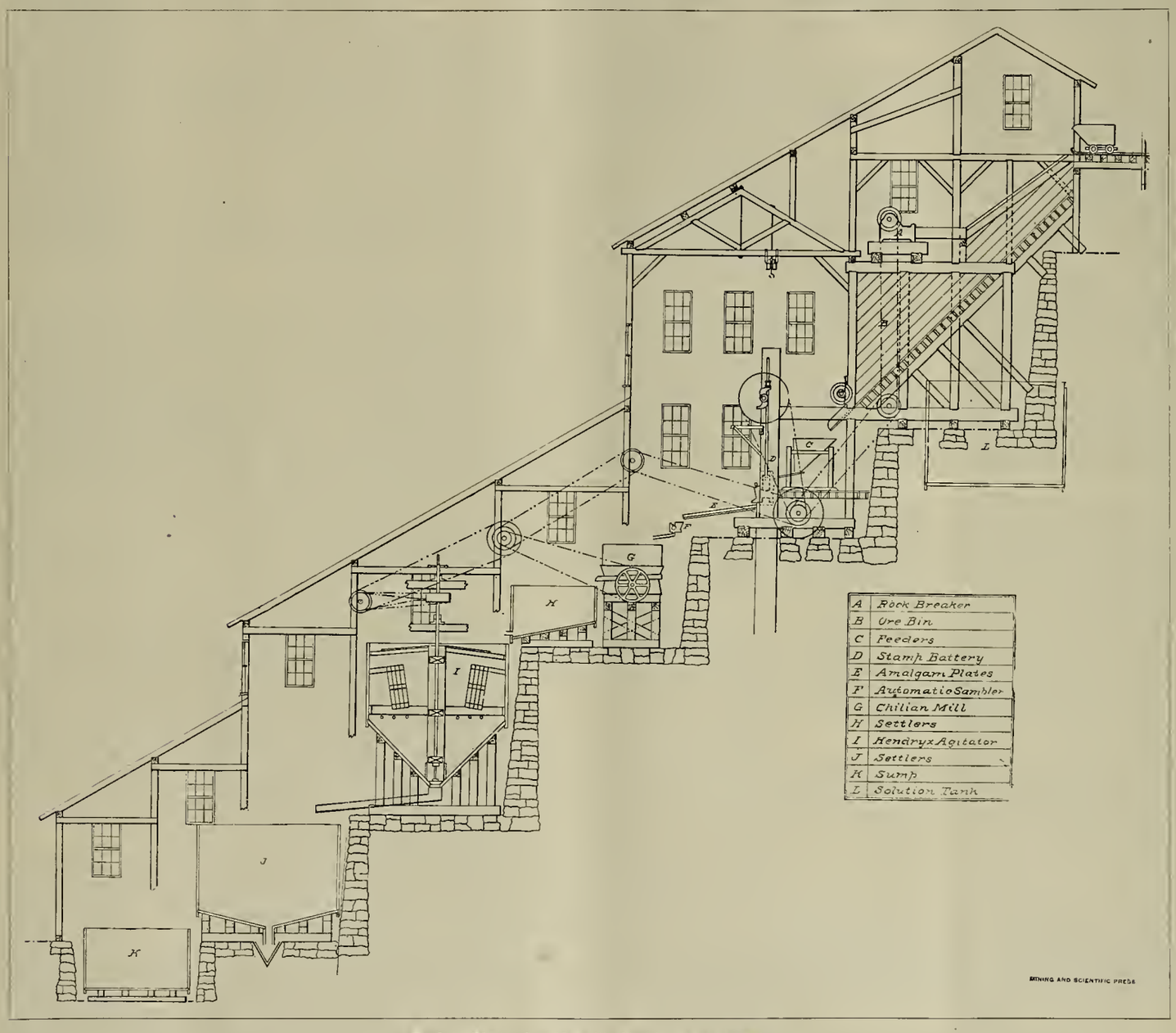
First—That it will extract all the values that any cyanide process can.

Second—That it will deposit the precious metals in the form of marketable bullion without the intervention of any troublesome precipitating and refining process.

Third—That it will make the extraction with less cyanide, on account of the perfect aeration and the regenerating action of the electric current.

Fourth—That it will do this work at a much less expense for plant and operating costs than the ordinary methods.

Fifth—That it is especially adapted to handling tailings and slimes from amalgamation and concentration plants already equipped and running.



Hendryx Electro-Cyanide Mill, Showing Arrangement.

Any metallurgist will recognize the fact that there is little novelty about the Hendryx process, but if he has had experience in trying to agitate fifty tons in a vat, or to pass a constant current through a charge of pulp which is not of regular and stable consistency, he will appreciate the utility of a machine which will agitate 100 tons as readily and as completely as one, which will keep the pulp in perfectly homogeneous condition, aerate it thoroughly, and which cannot be stalled by a momentary shut down of the power.

In the three months I have been experimenting with this process we have treated all classes of ores from many States. When the precious metals in an ore are not soluble in cyanide, the Hendryx agitator will not make them so; when they are soluble or can be liberated by fine grinding, I believe the machine will treat them quicker and cheaper than any other known method.

Three years ago I was employed to make a series of cyanide tests for a company operating in Mon-

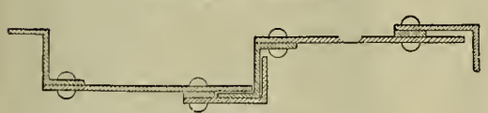
tana. They had a very porous, thoroughly oxidized ore, on which a small cyanide mill was doing very good work. A new mill with a capacity of 200 tons per day was constructed and is now in successful operation on the property. The ore is treated in vats from six to eight days. With the Hendryx agitator we made an extraction of 97.4% of the gold in this ore, at twelve mesh, in four hours, with a cyanide consumption of less than one-fourth pound per ton of ore. One 16-foot agitator would have a daily capacity of over 200 tons, and the metal would be in the form of bullion instead of a troublesome zinc slime.

I know this sounds like the claims of an inventor, but I never invented anything and have no interest in the exploitation of this or any other process. I know the experiments have been carefully conducted under my immediate supervision, and that the results have been as stated. If there is any reason why our experiments will not yield like results on a larger scale I do not comprehend it. The Hendryx process will not work on every ore, but that it is a very valuable addition to the metallurgy of gold and silver I am fully convinced.

Interlocking Metal Piling.

In engineering work some method is often needed for effective and economical ways to overcome difficulty experienced in sinking mine shafts and other forms of excavation, more especially where there is danger of caving or where the material must be immediately protected. In cofferdam work, in cases where quicksand, etc., is encountered, some quick work and satisfactory mode of handling the excavation is of economic value. Some time ago considerable interest was elicited by the publication herein of details of the Poetz freezing process, a method not always immediately applicable. Herewith is illustrated a new and effective device for such immediate

Sheeting Not Interlocked.



Sheeting Interlocked.

use—an interlocking metal sheet piling to be used in constructing retaining walls, deep foundations, cofferdams, submarine work, sinking mine shafts, etc., and all kinds of earth excavation, particularly where quicksand is encountered. The sections of this sheet piling are of standard rolled shapes and are composed of 15x⅜-inch plates, 4x⅜-inch Z-bars and 6x3½x⅜-inch angles and can be obtained up to 60-foot lengths. These sections are readily interlocked and are to be driven successively, thereby rendering the sheeting water-tight, strong in structure and efficient in use. Great strength is obtained in this form of sheet piling, inasmuch as the web of the Z-bar is parallel with the line of pressure. An important point is the saving in weight of metal used in this form. This sheet piling can be pulled and redriven many times, and when through using can be discarded at a high scrap value. This piling is driven with the ordinary pile driver, and the makers say, can be driven through any kind of soil. A model will be sent upon application.

This is made and furnished by the H. Wittekiud Interlocking Metal Piling Co., Cable Bldg., 28 East Jackson Boulevard, Chicago, Ill., who will furnish detailed information on request.

Phosphorescent Sphalerite.

To the Editor:—Commenting upon the article by Dr. Eakle, in your issue of January 23d, upon "Phosphorescent Sphalerite," I beg to call attention to the fact that phosphorescent, or more properly "triboluminescent" sphalerite, has been known for years in the mines of Butte. There is a copper mineral here (enargite) which in luster and cleavage and by candlelight resembles zinc blende; and it is a common practice for miners and shift bosses to determine whether an ore is rich by reason of its content of copper or poor because of the zinc by scratching it with the point of a candlestick or even a piece of wood. The blende shows streaks of light upon rubbing; and the enargite remains dark. Horace V. Winchell.

Butte, Mont., Feb. 19, 1904.

The mining code of the Philippine Islands permits no extra-lateral rights on quartz locations. The locator takes 1000 feet square instead of the usual rectangular location. A discovery of mineral in place must be made, and the location must be recorded. No person, company or corporation can hold more than one claim on one vein, which is an unwise law, as it practically prevents large mining operations, only justified by a large number of claims. This phase of the law has been the subject of much discussion, and its repeal recommended. The provisions of the Federal law as to annual labor, forfeiture to co-owners, etc., is also operative in the Philippines.

Cyaniding in the Southern States.

Written for the Mining and Scientific Press by Ernest Gayford.

The Colossus Gold M. & M. Co. is probably the first to successfully apply the cyanide process for the recovery of gold from the low-grade ore of the Southern States.

Their 100-ton plant has now been in operation on the large deposit of tailings from the old Howie mine, 20 miles north of Charlotte, N. C., since June, 1903, and has proved a marked success.

The writer entered the service of the company in July, 1902, with instructions to thoroughly test and examine the ore from the Howie mine and the tailings from the numerous old mills, as to their adaptability to successful treatment by modern methods of cyaniding as practiced in the Western States.

The Howie is one of the oldest mines in the Southern States and has produced by mint returns over $700,000. It has been operated off and on since 1882, the ore being mined in an extremely primitive manner and treated in arrastras and drag mills, amalgamation being the only known method of saving the gold.

From 1885 to 1890 the mine was operated on a somewhat more extensive scale than formerly; but the methods were still crude, saving poor and appliances out of date. The only assay office was at the U. S. Mint in Charlotte, and this was very rarely patronized; so that the management at that time was working in the dark, simply calculating the value of the ore by what was saved in the mill. Even to-day it is very hard to convince the old-time Southern miner that an accurate value of ore per ton can be obtained from an average sample carefully assayed, and, unless free gold is visible after panning, the ore is immediately condemned as utterly valueless.

The first work to be done was to ascertain the values contained in the old tailings dump, and then, should they be found to warrant further research, to determine whether the material would yield commercial returns if treated by any modern chemical process.

The main tailings bed was from one-half to three-quarters of a mile in length, 50 to 100 feet wide and varying in depth from a few inches to 4 feet, and in one place 6 feet; it was the product from drag mills and arrastras, some of it over seventy years, and none of it less than ten years old.

The tailings were thickly covered with vegetation and undergrowth; in some places large trees had grown upon them and in numerous places crops of green corn were flourishing.

The mills had ground the ore to a fine powder, so that over 90% passed a 100-mesh laboratory screen. The ore as it came from the mine carried a good deal of iron pyrites; this had been decomposed into ferrous sulphate, and, taking it altogether, it looked from a cursory inspection about as unpromising a material to handle as could possibly have been manufactured.

After having the tailings bed cleared of trees, brush and undergrowth, it was laid out into blocks 50x100 feet, each block numbered in rotation, and sample holes dug down to the natural soil, 25 feet apart, from each corner post diagonally across each block. From each hole samples were taken, the value of each block ascertained separately, and a careful record kept of the gold value of each block for future reference.

The values were found to be such that, should the material be amenable to treatment, a good profit should be forthcoming. We were, therefore, ready to proceed with our tests.

The two great stumbling blocks anticipated against cyaniding were abnormal consumption of cyanide, due to decomposed sulphides, roots and other organic matter, and the "unleachability" of the material, due to its fineness.

After numerous small tests on pound samples with varying strength solutions, percentages of lime, and time in contact, it was found that the gold was soluble, indicating, so far as so small a sample could show, that the material would leach without artificial means to assist it, but that the consumption of cyanide was very large—in fact, almost all the cyanide was consumed, the fresh salt having to be added with each solution before returning it on the charge.

A qualitative analysis of the solutions showed that the consumption was due to the organic matter, rather than to sulphates in solution.

We then decided to screen a 500-pound sample through a 6-mesh screen, to free it of nearly all the foreign matter, and, as the tailings carried an average of over 12% moisture, it was evident that we must eliminate this first; so the sample was dried, screened and treated with a standard solution of 0.3%, followed by weaker solutions and waste water, the gold-bearing solutions being run through zinc shavings to ascertain the percentage of precipitation.

The result of this test showed us that drying and screening increased the extraction about 5% and decreased the consumption of KCy down to about two pounds per ton; also, that in a fairly clean solution we need anticipate no trouble in our zinc boxes.

This test was verified by further tests, and we were ready to start on plans for the erection of a tailings plant.

It may be noted here that subsequent mill work showed us that our preliminary work as to sampling, measuring and laboratory tests were accurate.

The plant was designed and erected by our consulting engineer, Frank P. Callow, a Western man, and was briefly as follows:

The tailings, after being cleared off, were shoveled from different places in the dump into dump wagons, each holding 26½ cubic feet, or one ton, and drawn by two mules; these were dumped into an inclined pit leading to a bucket elevator; here eight pounds of dry slacked lime per ton were mixed with it and it was shoveled into the elevator boot, from whence it was raised to a storage bin of 200 tons capacity. From here it was fed by an automatic feeder into a rotary dryer. This delivered the dried material into the second elevator, which lifted it into a 4x8-foot, 4-mesh revolving screen, which screened out all roots, etc., the cleaned tailings dropping into a small receiving bin. The roots, etc. (oversize) were carried off by a chute set at a 60° angle.

From the receiving bin it was taken by cars and dumped into the leaching tanks, six in number, each being 28 feet in diameter and 5 feet in the clear, and holding 100 tons.

We found that material of such fineness, carrying so much water, would not move of its own momentum at any angle, "standing back" even at an angle of 70°. This necessitated a shoveler to help it along wherever it stopped, and in this matter we were very materially helped out by the cheaper labor of the South.

Leaching took five days, the residue being sluiced out by water under pressure obtained from a 5½x3½x5 duplex steam pump.

Somewhat well established theories were upset in our leaching operations. Material of which 91.20% passed a 100-mesh screen leached comparatively freely; the gold was practically all dissolved by the forty tons of 0.3% solution used to saturate the charge; fresh water, used to displace this, gave just as good results as if it were followed by further KCy solutions, and the precipitation was perfect, in spite of the fact that the solution at the head of the strong zinc boxes rarely carried more than 0.05% free KCy, and at the weak end boxes not more than 0.025% KCy.

Although no trace of copper could be found in the tailings by any chemical analysis, the zinc in the lower compartments of the zinc boxes often showed a bright copper color, which, however, interfered in no way with the precipitation of the gold.

It was found necessary to keep the stock solutions thoroughly aerated by supplying free air to them in the stock tanks. This not only kept the consumption of KCy down to its right place, but also assisted in extraction. For this purpose a small air compressor was used and a continuous stream of air was led into the solution in each of the stock tanks.

The tank floor was open, the belting and storage bin having only a temporary roof over them, the plant, including machinery, tanks, lumber, erection and all equipment costing in the neighborhood of $10,000, the boiler and engine being on the mine at the time of its purchase.

We were by these methods able to make an extraction varying from 80% to 90% on what at first seemed a very uninviting material at a cost per ton of $1.03, of which 45 cents was for chemicals.

Comparing costs here with those in the West, we find:

	South.	West.
Labor, per day	60c to $1.50	$3.00 to $4.00
Cyanide, per pound	20½c	30c.
Cordwood	75c	$3.00 to $7.00
Lumber, per M	$5.00 to $6.00	$14.00 to $30.00

This last item is for sawing and delivering of lumber cut on company's land, of which there is an abundance.

It will be seen from these figures that there are extraordinary natural advantages here.

We are now preparing to build one section of a large dry-crushing cyanide plant, to treat ore from the Howie mine. The vein has been open-cut for a distance of 200 feet and a shaft for the lower levels is making good headway.

It is the purpose of the management to keep increasing their milling capacities year by year as developments warrant until a plant of adequate size to handle the ore from such an immense deposit, as the Howie vein is proving itself to be, has been attained.

There are numerous good gold properties in the South that are only needing capital and intelligent handling to assure astonishing results; but for some reason mining here seems unpopular, especially to the average Southerner. While one may be interested in cotton he will receive the sympathy and support of every one; but should he try to produce that even more necessary article—gold—he will be looked at askance by all and with pity by many.

The Colossus Gold M. & M. Co., under whose auspices the above work is being done, is under the management of Gill S. Peyton.

Some Features of Mining Operations in the Homestake Mine, Lead, South Dakota.

NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by
BRUCE C. YATES, E. M.*

The holes are drilled about 6 feet deep and fully 5 feet of ground is blasted out with one round. Ingersoll-Sergeant rock drills—D24 and D32—are used. Where two machines are used mouuted on one bar, one helper attends to both, and the same number of holes can be drilled in a little more than one-half the time required when only one machine is used.

Figs. 9, 10 and 11 show the manner of placing holes in face of drifts.

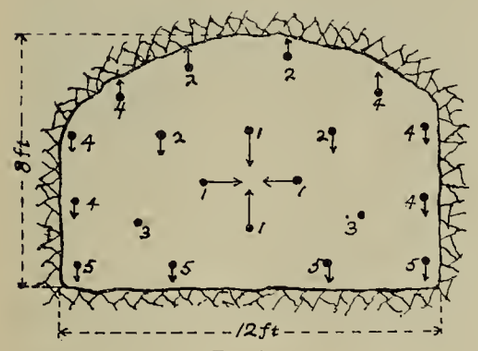


FIG. 9.

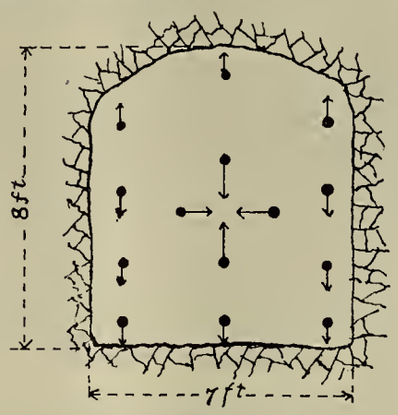


FIG. 10.

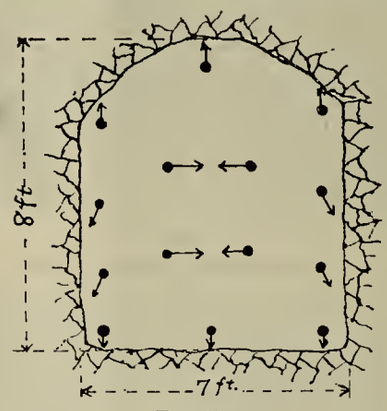


FIG. 11.

Distribution of Holes in Drift, Homestake Mine.

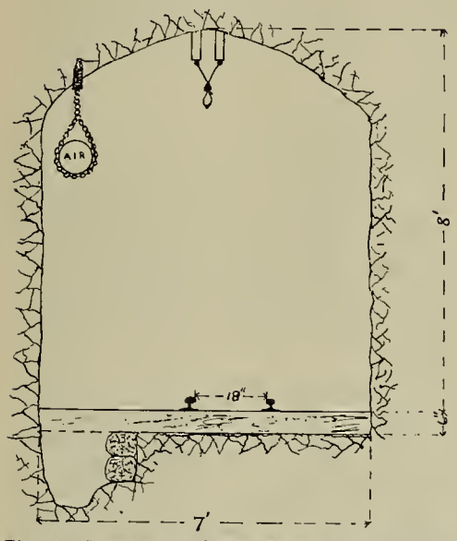
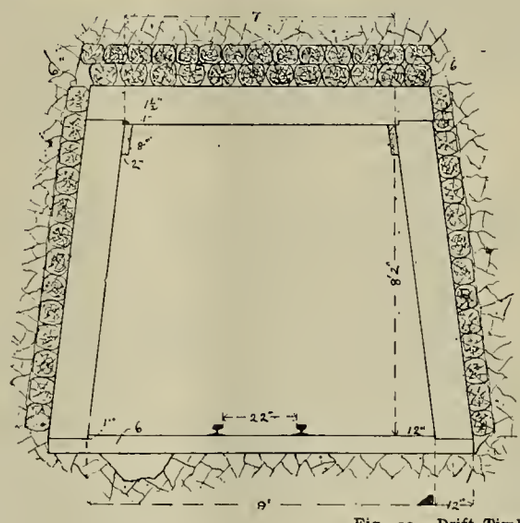


Fig. 12.—Cross Section of Drift, Showing Air Pipe, Drain and Electric Light.



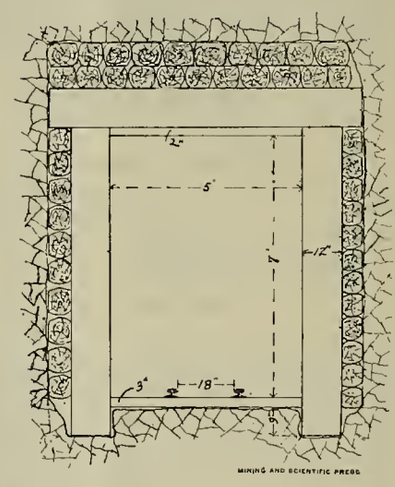


Fig. 13.—Drift Timbering.

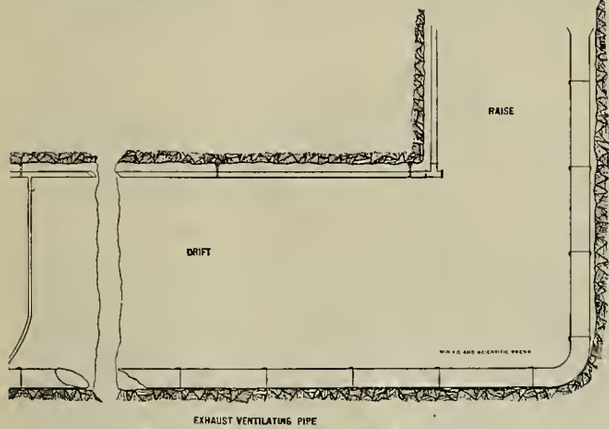
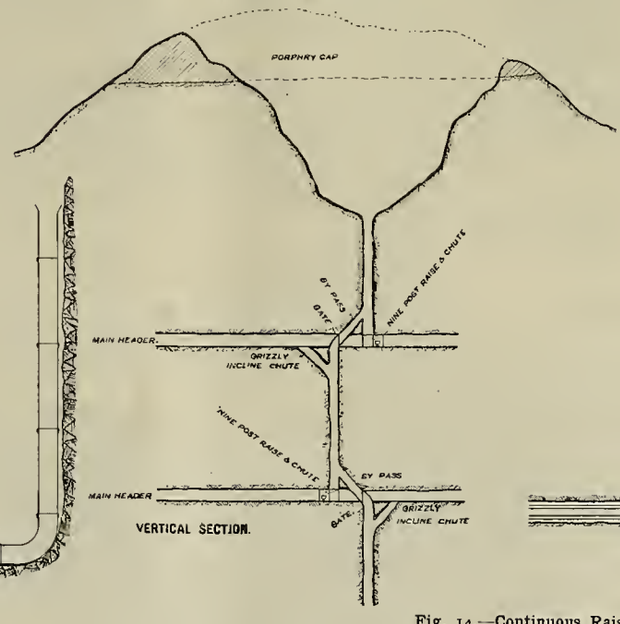


Fig. 15.—Exhaust Ventilating Pipe.



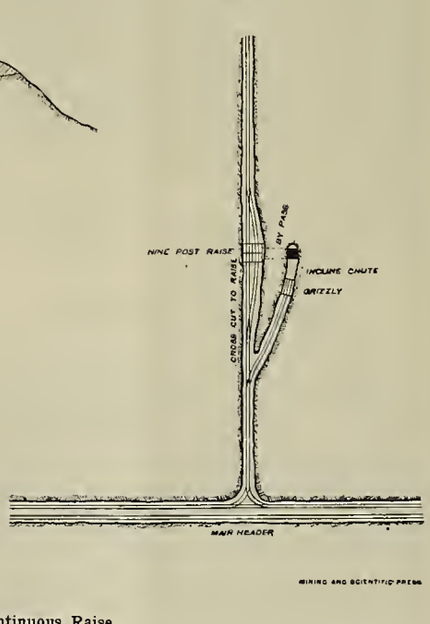


Fig. 14.—Continuous Raise.

The number of cubic feet of rock excavated at each round is (7x8x5 feet) 280 cubic feet. Ten cubic feet of this rock will weigh 1 ton, so that 280 cubic feet = 28 tons. Dividing $41.15 by 28 gives $1.47 as the cost of excavating 1 ton of rock from the face of a 7x8-foot drift. It may be of interest to note in connection with the weight of the rock that the shovelers will have to remove from twenty-five to thirty cars of broken rock. Homestake mine cars have a volume of 20 cubic feet. This would indicate that the volume increases 100%.

Tabulating the cost of double-track 12x8-foot drifts in a similar manner gives the following:

One miner, three shifts, drilling, at $3 50	$10 50
One helper, three shifts, drilling, at $3	9 00
One miner, one shift, blasting, at $3 50	3 50
One helper, one shift, blasting, at $3	3 00
One shoveler, three shifts, at $3	9 00
Explosives—Powder, caps and fuse	16 90
Blacksmith labor, repairs, and machine shop labor	6 50
Total cost of 5 feet	$58 40
Cost per foot	11 68
Cost per ton of rock excavated	1 22

This statement shows a decided reduction in cost per ton in comparison with the smaller drift, and this is as it should be, for it is well known that rock can be broken more easily from a large face than from a small one.

Crosscuts and drifts in ore are from 18 to 24 feet wide and 10 to 12 feet high. These being more or less irregular, no estimate of cost can be had. It is, perhaps, needless to say that per ton of rock excavated the cost is materially less than in smaller drifts.

As there is very little water in the Homestake mine, considering the extent of the openings, the main working drifts are run on a nearly level grade. No working track has a grade greater than 1%, and most of the long headers have a grade of 0.2%. The drainage is provided for by a ditch 1 to 3 feet deep at one side of the drift. Long stringers of 6-inch plank extend across the ditch and are supported by lagging at one end, while the other end rests on the ground. These stringers are spaced about 12 feet apart aud serve as ties. Short ties are used between the stringers.

Fig. 12 represents a cross section of a 7x8-foot drift, and illustrates the method of taking care of the water, laying the track, the position of the air pipe and electric wires.

*Copyrighted.

In some cases the air pipe is laid on the stringers, directly over the ditch. This method is preferable where there are not too many crosscuts, as it does away with a considerable expense in providing hangers for the pipe. When the pipe is suspended the electric wires may be supported by wooden cross arms, which are fastened to the pipe by a yoke made of round or strap iron. When required, tunnel sets are put in, but they present no unusual features to the average mining man.

Fig. 13 shows the usual manner of timbering.

Raises.—Raises are made for one of four purposes, namely: ventilation, ore storage bins, transferring ore or waste from one level to another, or to provide an opening through which waste may be dumped into a finished stope.

Permanent raises for ventilation, ore bins, etc., are located in the country rock far enough away from the ledge to be undisturbed by mining operations.

The purpose of the waste raise is to provide a storage for waste taken from dead work when not immediately needed in the stopes, and are so arranged that waste may be drawn out or dumped in on any level. The main waste raises are connected with the surface, and the porphyry, which here forms a cap overlying the vertical formation, is drawn through them and used for filling.

Fig. 14 gives an idea of the arrangement of one of these continuous raises, which may be used for waste or ore. The ore raises do not, as a rule, connect with the surface.

The method of procedure is as follows: On one or several levels, if convenient, crosscuts are driven to the point from which it is desired to make the raise. Care must be taken to have the crosscuts on the different levels alternate on each side of a vertical plane. When the crosscut has been driven far enough beyond the position of the raise to provide a passing track for empty cars the drift is widened, four sets of regular stope timbers are put in, in the form of a square, and an ordinary board chute located in one set. Above these timbers the raise is gradually drawn in to a 6x6-foot raise. From this point the raise is carried up in the usual manner. Sprags across the raise, about 5 feet apart, are used to sustain the working platform and serve as a ladderway. The smaller size machine drills are used for drilling and are raised and lowered by rope and pulley. The raise on the level below is located about 15 feet to one side or the other, and is raised straight to the upper level. After connection has been made an inclined by-pass is made to connect with the upper raise above the timbers.

Another small inclined raise connects the lower raise with the crosscut at the top of which are located the grizzlies. The bars forming the grizzlies should be spaced about 1 foot in the clear so that no large rock can get into the raise. The successful operation of these continuous raises depends in a great measure upon the grizzlies. The by-pass is closed by a gate made of steel plate, sliding in cast-iron grooves fastened to upright timbers, and operated by rack and pinion. This gate is used in the main ore bins under the crushers and is made at the company's shop. It has the advantage of being easily operated, and can be operated gradually, which prevents rushes of rock. Similar arrangements are made on the other levels. As soon as one raise is made it can be put into service and the raise from the lower levels finished when needed.

In making an ore storage bin, the timber sets are carried up six or seven posts high. When connection is made with the level above the timbers are removed, with the exception of the sill floor in which the chutes are located. The by-pass and small raise to the grizzlies are located as in the waste raise.

Ingersoll A-32 machines are usually used in making raises. One miner and helper will make a 6-foot by 6-foot raise 100 feet high in ordinary ground in sixty shifts, provided they are not required to "car" the rock. Blasts are fired by ordinary caps and fuse. Forty per cent dynamite is used as elsewhere in the mine. The manner of placing the holes is similar to that used in small drifts.

When a stope has been worked nine or ten floors high, raises are put up in convenient places to the level above, through which the filling is dumped. These raises are all in ore and consequently pay their own way.

When a raise is to be made near the face of a long tunnel where the air is bad some artificial means of ventilation must be provided. A device which I believe originated with one of the assistant foremen has proven very successful. A 6-inch or 8-inch light iron pipe is laid from the entrance of the drift to the foot of the raise. Near the entrance a small ½-inch pipe is tapped into the main air pipe and brought down to and into the large pipe with the end which projects into the pipe turned out. It has been found that a very small amount of air which has a pressure of from seventy-five to eighty pounds will effectually clear the raise in a few minutes. This device is used also in running long drifts. An exhaust fan would possibly be a more economical machine so far as power is concerned, but the first cost would be greater, and the air is used only when the machine drill is not in service.

The arrangement of the pipes is shown in Fig. 15.

(TO BE CONTINUED.)

Hydraulic Mining in Cariboo, B. C.

NUMBER II.—CONCLUDED.

Water Supply.—The quantity of water available for use during the season of 1903 was 52,437 miner's inches less than the quantity of water used during the season of 1902, 131,167 miner's inches less than the quantity of water used during the season of 1901, and 333,795 miner's inches less than the quantity of water used during the season of 1900.

Precipitation for season 1902, inches	23 40
Precipitation for season 1903, inches	17.48
Less than precipitation for season 1902, inches	5.92
Quantity of water available and used during season of 1902, miner's inches	179,520
Quantity of water available and used during season of 1903, miner's inches	127,083

The winter snowfall turned out again below the average for the district and fell 26.67 inches short of that reported for 1902. The spring and summer rains turned out also below the usual average and fell 1.41 inches short of the precipitation reported for season of 1902.

The snow went off during the months of April and May under the most unfavorable weather conditions, i. e., moderately warm days, cold nights accompanied by northerly winds, and contributed but a small percentage of its water to the reservoir lakes. The unusual shortage in precipitation, together with the unfavorable weather conditions under which the snow went off, accounts for the shortage in the season's water supply.

SUMMARY OF MINING OPERATIONS FROM THE TIME OF COMPLETION OF WATER SUPPLY SYSTEM IN 1898.

Year	Precipitation in Inches.	Water Used in Miner's Inches.	Time Run. Days.	Time Run. Hours.	Cubic Yards Gravel Washed.	Product.
1899	28.65	353,056	144	8	1,952,535	$ 92,678 93
1900	30 67	460,878	171	13	1,843,938	350,085 77
1901	29.30	258,250	104	13	2,430,288	142,273 41
1902	23.40	179,520	65	15	630,442	61,395 19
1903	17.48	127,083	53	7	373,000	44,943 70

In 1899, the season's operations were confined, mainly, to cleaning out the deposit of boulders and debris left in the bottom of old Chinese workings, and the low-grade deposits of gravel and volcanic mud lying on the rims north and west of said old workings, which accounts for the light product in proportion to the quantity of water used.

The precipitation for season of 1900 was 30.67 inches, and made, with the 100,000 inches carried over from 1900, 480,878 miner's inches of water available for use, a quantity exceeding the estimated holding capacity of the reservoirs, aggregating 470,370 miner's inches, as shown by the following table that accompanied the hydrographic map prepared in 1897.

TABLE OF WATER SUPPLY.

Locality.	Watersheds. Area. Million Sq. are Feet.	Area. Acres.	Area. Sq. Mile.	Reservoirs. Depth, Feet.	Top Area. Square Feet.	Top Area. Acres.	Bottom Area. Square Feet.	Contents. Million Cubic Feet.	Contents. 24 Hrs. Min. Inches.
Polley's lake	337	7,736	12.09	8	40,660,000	933	35,400,000	304	140,741
Bootjack lake	174	3,965	6.24	6	27,500,000	631	26,500,000	162	75,000
Main ditch, below Hazeltine	352	8,081	12.63						
Main ditch, above Hazeltine	155	3,558	5.56	33	27,000,000	620	8,000,000	550	254,629
Dancing Bill	79	1,814	2.83						
Morehead lake	460	10,560	16.50						
Little lake, above Morehead ditch	99	2,273	3.55						
Totals	1,656	38,017	59.40			2,184		1,016	470,370
Little lake, below Morehead ditch	95	2,180	3.41						

By reference to section No. 4 on the longitudinal section accompanying this report, it will be noted that the intrusion of an immense deposit of slide rock replaced a large area of high-grade gravel and reduced the average yield of the ground. This condition, together with the light precipitation and short water supply, accounts for the reduced product for that season.

The short water supply and inclusion of large deposits of slide rock in the lower bench accounts for the light product for the seasons of 1902 and 1903.

The tables indicate that the product is dependent mainly upon copious precipitation and a water supply ample to operate the mine full time with at least 2500 miner's inches of water during the open season, including a period of about six months, commencing on or about May 1st and ending on or about November 1st.

It is, therefore, evident that the precipitation must return to what it was prior to 1894, as reported by government agents and old settlers, varying each season, with few exceptions, from 30 to 40 inches annually, or the company's catchment canals must be extended to control a much larger area of watershed, or to some stream affording an abundant and permanent flow of water throughout the season. Surveys are now under way to determine the possibility and probable cost of extending the system to a source that will insure an abundant and permanent water supply that will be ample to carry operations over seasons of light precipitation.

The heavy precipitation recorded for September ultimo, amounted to 6.24 inches and caused the water in the storage reservoirs to rise as follows:

Morehead lake, rise 86 inches, being now 13 inches lower than maximum height. Polley's lake, rise 20 inches, being now 3 inches higher than for 1903. Bootjack lake, rise 15 inches, being now 5 inches higher than for 1903.

With so large a quantity of water on hand in the reservoirs the outlook is certainly favorable for a good water supply for the ensuing season.

The outlook for the ensuing season's operations is, therefore, very favorable for a large output at reduced cost, calculating, of course, on the precipitation being ample to afford a good season's water supply.

The receipts and expenditures attending the operation of the company's mines for the season will be found in the following statements:

MINE OPERATING EXPENSES, 1903.

EXPENDITURE.

Mining account—		
Mining	$18,330 22	
Excavation for sluices	8,703 00	
		$27,033 22
Explosives—		
Mining	$ 7,418 15	
Excavations for sluices	1,120 00	
		$14,538 15
Sluice maintenance and extension		9,449 80
Portable hydraulic plant maintenance		37 33
South Fork ditch maintenance		2,870 38
Morehead ditch maintenance		2,815 84
Camp maintenance		1,189 50
Mine and camp light maintenance		398 46
Wagons and harness maintenance		144 07
Telephone maintenance		77 57
Prospecting account		729 22
Stationery and printing		283 47
Postage and telegraph		134 34
Incidental expenses		11 40
Lands and leases (lease purchases, rentals, etc.)		5,267 30
License account (free miner's certificates)		110 00
Fire insurance		803 00
Traveling expenses (transportation of miners, etc.)		6,030 87
Mine office expenses		1,307 00
Bullion expenses (royalty, insurance, transportation, etc)		1,633 24
Management		5,228 18
Stable expenses		628 85
Tools and implements, loss for season		288 70
Horses account, loss for season		190 00
Quicksilver account, loss for season		242 69
Total operating expenses for season		$81,451 57

RECEIPTS FOR SEASON 1903.

Gold product for season	$44,943 70
Profit on stores sold	2,123 19
Total receipts for season	$47,066 89

INVENTORY.

There is on hand at the company's stores and mines, as per inventory made August 5, 1903:

Miscellaneous provision stores, mining supplies, hydraulic plant, etc	$42,783 81	
Explosives	20,764 50	
Blacksmith stores	1,724 63	
Quicksilver	2,644 60	
		$67,917 63
Horses	$ 1,192 00	
Wagons, sleighs and harness	2,109 92	
Saw logs, lumber, flats, fuel, sluice blocks, etc	7,943 74	
Tools and implements	15,557 40	
		$26,803 06
Total as per inventories		$94,720 69

Mineral Resources of Uganda.

Uganda is one of the countries of east equatorial Africa, and this section, like many other portions of Africa, has been prospected in a superficial and hasty manner, in the hope of finding gold-bearing deposits. The English consul general at Entebebe in his annual report, recently issued, says that so far prospecting for precious minerals in Uganda has led to no practical results. It is known that there is gold in certain parts of the protectorate, but the question, of course, is whether it can be worked at a profit. The East African Syndicate sent prospecting parties through the protectorate during the year and took up an extensive prospecting area of 100 square miles along the bluff to the end of Lake Albert, but after a time these parties were withdrawn to join the exploration parties in the British East African Protectorate. It is to be hoped that they will resume work in Uganda later on. Iron abounds everywhere, and it is reported that there are some indications of coal in Ankole and Busoga, but no specimens have yet been brought to Entebebe. Mica has been found of a quality and size which would pay for working. Salt is produced from the salt pans at Kibero, on Lake Albert, and the salt lake at Katwe, on Lake Albert Edward, and furnishes revenue to the Government. The revenue from the Katwe salt has nearly trebled during the year, owing doubtless to improved methods of manufac-

ture. It is used locally, and would probably not pay for export. A species of Epsom salt has been discovered in Busoga, and has been sent to England for analysis. Alum has been found in Busoga, samples of which were valued in the London market at £3 5s per ton.

The Geology and Copper Deposits of Bisbee, Arizona.*

NUMBER IV—CONCLUDED.

Written by F. L. RANSOME.

In general, the zone in which the metamorphic silicates are developed is that in which most of the ore bodies are found. In the western part of the Copper Queen mine, however, extensive ore bodies occur in limestone that is perhaps outside of this zone. In other words, the deposition of metallic sulphides appears to have had a wider range, and to have extended farther from the porphyry into the fissured limestone than did the formation of the metamorphic silicates.

That the original ore deposition was genetically connected with the intrusion of the granite-porphyry of Sacramento hill is reasonably certain. The other factors, which by their fortunate conjunction determined the original mineralization of this part of the district, were the contact of this considerable mass of porphyry with limestones, the occurrence of the Dividend fault and other less important fractures, and the attitude of the limestone beds with reference to the porphyry and to these faults. The hypothesis is advanced that the deposition of the cupriferous pyrite and the metamorphism of the limestone, schist and porphyry was effected by the mingling of solutions from different sources in the vicinity of the Dividend fault and of the Sacramento hill porphyry. The principal function of the porphyry is believed to have consisted in the supply of heat to such solutions as rose from great depth through the fault fissures and in determining the locus of chemical activity that resulted in the deposition of the ore.

The source of the ore materials is uot known. They may have risen through the Dividend fault from depths far below the bottom of the syncline of Paleozoic rocks. They may have been collected by solutions moving through one or more of the Paleozoic limestones on their way down to the locus of deposition. Lastly, they may have been derived from both sources.

Few, if any, of the ore bodies now known and worked in the Bisbee district were formed directly by the original mineralization just discussed. That process resulted, so far as underground workings show, mainly in the formation of bodies of cupriferous pyrites passing peripherally into metamorphosed and pyritized limestone. These bodies contained originally too little copper to be classed as ore, as that term is defined by present economic conditions of working. Further concentration was necessary, and the profitable ores of to-day have been derived from these pyritic masses by secondary processes involving general oxidatiou, with all of its attendant chemical phenomena, transfer of material, and the local enrichment of certain portions of the sulphide masses by the formation of chalcocite, and, in some cases, of chalcopyrite.

Tbe lower limit of oxidation of the Bisbee ores is very irregular and is apparently uncontrolled by any constant ground-water level. In the Calumet & Arizona mine oxidized ores occur at a depth of 1000 feet, while residual masses of sulphide ore occurs in the adjoining Copper Queen mines within 150 feet of the surface. Masses of lean pyrite are sometimes completely enclosed in an envelope of high-grade chalcocite and oxidized ores.

IV. FUTURE OF THE DISTRICT.—Although more or less mineralization occurs at many points in the Mule mountains, there is little to indicate that any deposits of copper ore will ever be found in the Bisbee quadrangle approaching in importance those already known and probably awaiting discovery in the faulted limestone syncline about Sacramento hill. For more than twenty years the Copper Queen mine has produced an average exceeding 16,000,000 pounds of copper annually. Recently, the Calumet & Arizona Co. has begun energetic operations in ground almost surrounded by the property of the Copper Queen Con. M. Co. Not only is there sufficient ore known in these mines to keep them in operation for many years to come, but there is no clear evidence that the bottom of the ore-bearing ground has been reached in any of these extensive workings. Moreover, the statement may be ventured that the specter of the "lower lime" has hitberto had an undue influence in restricting prospecting to nearly horizontal planes. There is certainly a reasonable hope of finding ore bodies in the Martin and Abrigo limestones beneath the masses that have been so profitably worked in the overlying Carboniferous beds. The occurrence of small bunches of ore iu the Abrigo limestone at the Whitetail and Wade Hampton claims sbows that ore deposition may take place in these lower beds. It may be, tbat owing to their greater depth, such ore bodies if discovered will be found to consist of low-grade cupriferous pyrite, unenriched by the generally descending solutions that have contributed so largely to the value of the known masses. This, however, is a point that prospecting alone can determine. It would seem that near the Dividend fault the conditions are favorable for the continuance of enricbing processes to depths greater than those now reached in this part of the underground workings.

But more than this, it may be pointed out that less than half of the semicircular mineralized zone about the porphyry mass of Sacramento hill has been explored at all. Ore was first discovered at the surface on Queen hill at the northwest end of the zoue. From this discovery, developments have been pushed by underground exploration to the south, often with little or no surface indication of ore. There still remains, however, an extensive area of unknown, but promising ground, lying just south of Sacramento hill and extending eastward toward the southeastern continuation of the Dividend fault, which is here concealed by the Glance conglomerate. This is the eastern half of the semicircular mineralized girdle about the intrusive mass of porphyry. While structurally the beds south of Sacramento hill form a less favorable nook for the deposition and concentration of ores than that enclosed between the Czar and Dividend faults and the northern contact of the porphyry, yet their attitude with reference to the intrusive stock and to the probable continuation of the Divident fault down Mule gulch is distinctly favorable to mineralization. The developments in the Spray and the Calumet & Arizona mines have shown that profitable ore bodies are by no means confined to the structural pocket in the vicinity of the Czar and Holbrook shafts. There is no known reason why they should not yet be found skirting the southern contact of the porphyry for some distance eastward towards Mule gulch. It is thus probable that the ore zone, if present, also turns south along the contact of the limestones with the porphyry, and does not extend eastward under Mule gulch itself.

It is true that the easterly dip of the beds south of the porphyry stock, carries the Escabrosa limestone to a much greater depth near Mule gulch than it has in any of the present workings. It is probable that this depth, a short distance east of the Gardner shaft, may be so great as to preclude the occurrence within the Escabrosa limestone of any but original, unenriched pyritic ore, which may or may not be workable. But judging from surface indications, there has been considerable mineralization of the Naco limestone south of Sacramento hill, and there is nothing improbable in the occurrence of higb-grade ores in this limestone at statigraphically higher horizons than those in which ore bodies have hitherto been found. The exploration of this ground calls for no greater outlay or boldness than is already displayed in other parts of the district with less assured hope of reward.

The outlook for finding profitable ore bodies within the main porphyry stock of Sacramento hill is not regarded as particularly promising. As the dump of the Copper King shaft shows, this rock may be very heavily impregnated with pyrite. But the mineralization seems to tend more to abundant dissemination than to the formation of solid sulphide masses. Even if the latter occur, it is doubtful whether they would be found sufficiently cupriferous to constitute ore. Moreover, the chemical and physical character of the porphyry render it very much less favorable than the limestones to the deep oxidation and secondary concentration that has played so important a part in the genesis of the known ore bodies. Very little exploration of the porphyry has been made, however, and work in this direction cannot be condemned as altogether vain.

In conclusion, it may be said that Bisbee is less likely to suffer from a lack of ore than from a too rapid exhaustion of those bigh-grade oxidized ores which are necessary for the economical smelting, by present processes, of the low-grade sulphides.

* Abstract Trans. Amer. Inst. Min. Eng.

Iron Ore Production in the United States.

The iron ore produced in the United States is divided into classes as follows:

1. Red hematite, including all anhydrous hematites (sesquioxides of iron) known by various names, such as red hematite, specular, micaceous, fossil, slate iron ore, martite, blue hematite, etc.

2. Brown hematite, including the varieties of hydrated sesquioxide of iron recognized as limouite, gothite, turgite, bog ores, pipe ores, etc.

3. Magnetite, those ores in which the iron occurs as magnetic oxide, and including some martite which is mined with the magnetite.

4. Carbonate, those ores which contain a considerable amount of carbonic acid, such as spathic ore, blackband, siderite, clay ironstone, etc.

The amount of red hematite ore mined in the year 1902 in the United States amounted to 30,532,149 long tons, or 85.9% of the total.

During the year ending December 31, 1902, 126 iron ore operations in the United States each produced 50,000 or more long tons of iron ore, the total for the 126 mines being 31,561,628 long tons, or 88.8% of the production for the country.

Of these larger mining operations reported, 102 produced 28,584,023 long tons of red hematite; fourteen contributed 1,303,484 long tons of brown hematite; seven supplied 1,255,358 long tons of magnetite; two mines furnished a mixture of 330,439 long tons of red hematite and magnetite, and one mine a mixture of 88,324 long tons of red and brown hematite.

Of these larger mining operations forty-six are in Michigan, thirty-five in Minnesota, fifteen in Alabama, seven in Tennessee, five in Wisconsin, four each in New Jersey and Virginia, three in New York, two each in Colorado and Georgia, and one each in Pennsylvania, Wyoming and New Mexico.

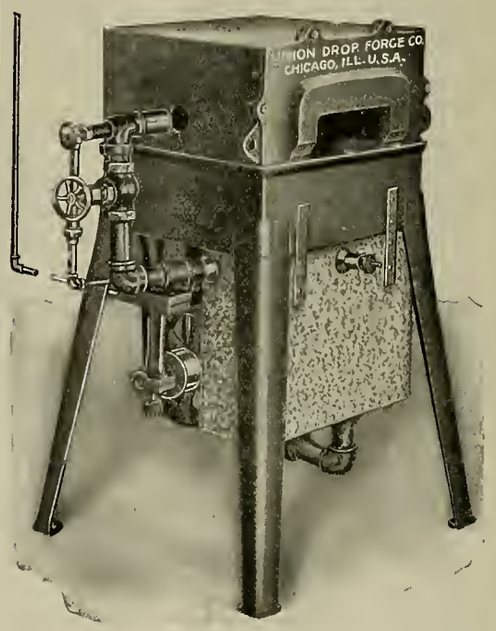
Of these 126 operations, one contributed over 1,800,000 long tons, one over 1,600,000 tons, one over 1,400,000 tons, two over 1,200,000 tons, one over 1,000,000 tons, two over 900,000, one over 700,000 tons, three over 600,000 tons, five over 500,000 tons, three over 400,000 tons, seven over 300,000 tons, fifteen over 200,000 tons, thirty-two over 100,000 tons, and fifty-two between 50,000 and 100,000 long tons.

Fuel Oil Equipment.

The increasing use of oil for fuel gives importance to devices deemed efficient or economical for such use. The use of oil for fuel in smelters has been discussed herein and practical details given.

There are, however, other and smaller systems devised for general use that are deserving of notice. One of these which is worthy of note is the fuel oil equipment illustrated herewith.

The accompanying cut represents a fuel oil equipment designed to combine a heating, tempering and annealing furnace in a small space. To connect the furnace pulley by belt to pulleys on main or countersbaft, attach oil pipe to a barrel or tank of fuel oil, which will put the furnace in readiness for use. To get the best results from this furnace the manufacturers say the fuel oil tank or barrel should be not less than 6 inches to 8 inches higher than the burner, and back from the furnace from 10 feet to 15 feet, or farther still if convenient. When lighting the furnace a free passage of air through the burners should be obtained, after which the oil valve should be opened slowly, the oil naturally mixing with the air, and being plainly discernible. A piece of lighted waste, saturated in fuel oil and placed in front of the spray will ignite. When the flame is started the oil valve can be regulated until perfect combustion is obtained.



Fuel Oil Equipment.

The dimensions of the furnace, No. 11, are: Inside, 12 inches long, 10 inches deep, 9 inches high; the dimensions of the furnace, No. 11, are, outside, 18 inches long, 17 inches deep, 16½ inches high. This furnace is intended to do away with the necessity of an expensive oil equipment such as reservoirs, blowers or compressors, pumps, etc. The furnace can be operated with gravity pressure.

The distinctive feature of this system of burning oil for forging, annealing, hardening, or for any purpose for which iron, steel, copper, aluminum or bronze is to be heated, consists in vaporizing the oil with a blast, the arrangement for doing which is complete in the burner. The blast is either furnished from a fan, blower or steam pipe. When the burner is used in connection with steam the steam is furnished direct from the boilers. When the burner is used with air the blast is furnished through air pipes direct from the blower or fan which is driven direct from tbe shaft by belt. By this system all units of heat in tbe

oil are formed into gas and not stored, so that there is no lost heat.

In addition to the saving in fuel is an increase in the amount of work that can be done in the same time and with a smaller force of men over coal or coke, a forging or welding heat can be obtained within fifteen minutes. This process does away with a storage space for coal or coke, the hauling of same, the smoke, dirt, gas, hauling away of ashes and the consequent uneven heat occasioned by loading a furnace with fresh fuel, a steady and even heat being maintained without a break.

This compact fuel oil equipment is made and furnished by the Union Drop Forge Co., 64-76 E. Ohio street, Chicago, Ill., who will furnish full details on request.

Precautions in Overwinding.

To the Editor:—After reading on page 91 of your issue of February 6th, concerning the accident at the Independence mine at Victor, Colo., I call to mind an occurrence something similar at the Union shaft at Virginia City, Nev., where the engineer ran the cage up to the sheave with eighteen men, none of whom were hurt except those who jumped. The reason that the cage did not fall was that the guides commenced to narrow in about 20 feet above the collar of the shaft, and by the time that the cage got near the sheave the guides pressed so hard on the shoes of the cage that they held it in suspension without the aid of the safeties, and the cage had to be gotten out with jackscrews. I have known of several devices to prevent overwinding, but the narrowing of the guides is the best that I have seen. It is very simple and has a sure grip if the rope parts. I have erected and helped erect a great many frames and I have always put the guides in as here described.

Liscum, Ariz., Feb 20. J. F. Smith.

Manager R. J. O'Neill of the California Gulch shaft at Leadville, Col., thus describes the safety catches placed by him in the head frame of his shaft:

Take a piece of spring steel 4 inches wide by ⅜-inch thick and about 2 feet long. In one end of this drill six holes for ½-inch bolts in a space of 6 inches, which leaves 18 inches for a spring. Heat and bend the spring, giving an offset of 3 inches from a straight line. On the upper end weld a 1¼-inch bolt at right angles to the spring. Have this bolt long enough to go through the guide and have the thread on this extend far enough so that it can be secured through the guide until the spring is out of the way of the cage. In placing the spring on the guide it should be countersunk so that the bolts at the bottom will not interfere with the cage, and so that when the cage passes up through the spring it will not force the guides apart. Place the springs on the guides opposite each other, leaving about a foot between the top of the springs and the bottom of the cage when the latter is at the sheave. Bore the holes for the top bolts so that they will spring back through the guides when the cage has passed, and leave the springs projecting under the cage. To lower the cage it is only necessary to screw the nuts on the upper bolts until the springs are flush with the guides.

With this device on the guides, Mr. O'Neill says the cage can pass to the top of the gallows-frame, forcing the springs out of the way. When it passes the springs they fly back into place, projecting 3 inches from the guides under the bottom of the cage, thus making it impossible for the cage to drop back into the shaft. It would be well, he thinks, to brace the guides at the point where the springs are put on, to prevent them spreading. Mr. O'Neill has placed these springs on several mines where he has been employed and has always found them to work successfully.

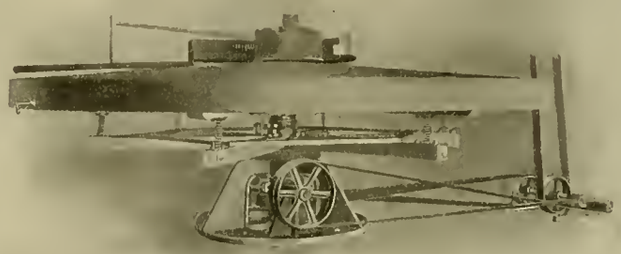
Utility of the Air-Lift Pump.

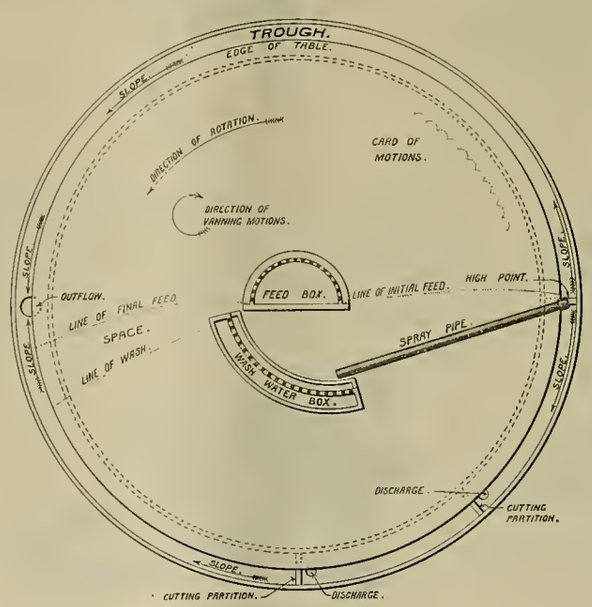
The principle upon which the so-called air lift pump operates is well understood and it has been applied with satisfactory results in mines, on farms and elsewhere, to lift water from streams, wells, shafts and reservoirs in many places throughout the West and in Mexico. The lifting of the column of water in the pipe is accomplished by the introduction of compressed air into the column pipe at a point near its foot. Two of the engravings on the front page illustrate the air lift in operation in Mexico, where it is employed in raising water from a well for irrigation. The total depth of the well is 413 feet, cased to 157 feet, with 7½-inch diameter pipe. The remainder of the well, to a point near the bottom, is cased with 6-inch inside diameter pipe. The depth of water when the lift is not in operation is 125 feet; depth of water when pumping, 128 feet; lift above the surface, 6 feet, making the total lift 134 feet. The diameter of the discharge pipe is 3 inches, and diameter of air pipe 1¼ inch. The horizontal distance from well to tank is 10 feet. The depth of air and water pipe beneath the surface is 308 feet, being about 63% of the radius of submergence. When in full operation 105 gallons of water is lifted per minute. The air pressure when starting is 82½ pounds per square inch, the plant being at an altitude of 7000 feet above sea level. The working air pressure is 79 pounds, and the steam pressure at the boiler is 80 pounds. The compressor used is the Ingersoll-Sergeant class F, with steam and air cylinders, 10x10 inches, running at 150 revolutions per minute. The volumetric capacity of this machine at sea level is 134 cubic feet of free air per minute, which is equal to 105 cubic feet of air at an altitude of 7000 feet. The plant has high efficiency, and the fact that it lifts this large amount of water, about 8½ miners' inches, indicates its usefulness about mines. The same compressor can be utilized for other purposes, running rock drills, etc., in the mine, as well as lifting of the column of water.

The Sperry Slimer.

Among the latest devices designed for the treatment of ore by concentration, and especially for the saving of slimes, is the Sperry slimer, illustrated herewith.

The addition will be noted of a circular vanning motion to the common form of buddle, designed to develop increase of capacity and introducing radically new features and conditions to materially change the methods and general practice of this form of concentration, retaining all the good qualities of the buddle.





The Sperry Slimer.

By the addition of this vanning motion it is expected to make the stratification of the pulp complete before the wash water is added and to allow feeding one-half of the table, thereby giving greater load.

The entire mechanism is supported on a self-contained cast base at the center and beneath the top to protect the working parts from wear occasioned by grit.

Referring to the cut showing the plan of the top, the action will be readily seen. After the surface has been thoroughly cleaned by the spray pipe, it approaches the initial line of feed. From this line the pulp is gradually added to the surface for about one-half of the rotation to the final line of feed, at which point it has received the full load. During this gradual addition, the vauning motion is operating on the pulp to stratify it. The increasing width of the current from the center to the edge is intended to afford an opportunity for the finest of the metallics to settle to the surface, which is soft, smooth rubber.

The wash water is then added in a gentle flow over the silica sufficient to remove it and not break up the stratum of metallics.

The adjustments permit the slope of the top to be changed while the machine is in operation. The size of the circle of the vanning motion can be similarly increased or decreased.

The speeds of both the rotation and the vauning motion are adjustable. These, with the complete control of the wash water, make it possible to obtain the widest range of adjustments, giving a most complete shading to meet all sorts of conditions.

The power required to operate is stated to be about ½ H. P.

The regular size of the table is 10 feet diameter and requires 11 feet square floor space

The point of adaptability to a variable load is brought out by the inventor as an advantage, and he gives as a further reason that the machine does not require a "bed." He states that a capacity of from ten to fifteen tons have been developed under ordinary circumstances. The Sperry slimer is being placed on the market by the Heudrie & Bolthoff Manufacturing & Supply Co., Denver, Colo.

Geology of the Transvaal.

Since the Boer war important additions have been made to the knowledge of the geological structure of the Witwatersrand gold fields, says the London Mining Journal. Much time has been spent in the examination of old workings, and many bodies of ore, previously over-looked, have been discovered, chiefly on the South Reef of the Central Rand. Moreover, the publication of geological maps by Dr. Molengraaf in 1902 and by M. H. de Hora, by T. Kassner and by F. H. Hatch in 1903 indicates that much attention has been devoted to the investigation of the geology of the whole district. In Cape Colony admirable survey work was carried out during 1902 and 1903 by the Geological Commission. Thus, by degrees the gaps in our knowledge are being filled up. The problem is one of great complexity. No fossils are found, and it is necessary to trust entirely to stratigraphical relations or to petrographical similarities over great distances. The geological formations now recognized in the Transvaal may be summarized as follows, in descending order: Karroo system—Coal measures; Dwyka conglomerate. Transvaal system—Waterberg sandstone; red granite; Gatsraud and Magalieburg series; dolomite; Black Reef series; Klipriversberg amygdaloid. Archæan system — Upper Witwatersrand beds; Lower Witwatersrand beds or Hospital Hill series; granites and schists. Three unconformities are shown:

1. Between the Dwyka conglomerate and the Watersberg sandstone.
2. Between the Black Reef series and the Klipriversberg amygdaloid.
3. Between the latter and the Upper Witwatersrand beds.

Of the Witwatersrand beds the upper series consists of quartzites, grits and numerous conglomerate beds with a few slate beds, while the lower series comprises quartzites and numerous slate beds, with few conglomerate beds. The division between the two is taken at the horizon of the conglomerate beds known as the Main Reef series; but the two divisions have been proved by Dr. Hatch to be conformable. There are many interesting problems in connection with the gold deposits still unsolved. G. A. Denny, for example, contends that the slates that characterize the Lower Witwatersrand beds are true igneous rocks.

Dr. Hatch, however, asserts that microscopic examination shows them to be true detrital sediments of quartzite nature, and his extensive experience of microscopic work adds great weight to his opinion. Another question, regarding which there is no general agreement, is the genesis of the gold deposits.

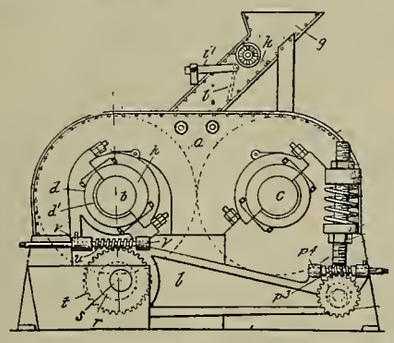
In the explanatory note to his map, Dr. Hatch states the pebbles of the conglomerate consist of quartz, which is apparently derived from the breaking down of ancient vein quartz. In his paper read before the South African Association of Engineers on August 26 last he states, however, that it has always been his view that the auriferous contents of the banket beds were introduced by the agency of underground waters subsequently to the deposition of the conglomerate beds. The advocates of the sedimentary theory and of the infiltration theory both adduce well-considered arguments, and it is difficult to say which has made out the better case. The comparison of the Rand conglomerates with the gold placer deposits of to-day is certainly open to objection, for no such placers have been described with all the gold in bright unoxidized grains of pyrites, as it is in the banket. The bright and unoxidized appearance of the pyrites is not satisfactorily accounted for in any of the theories propounded.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 16, 1904.

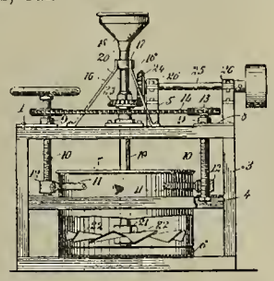
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

CRUSHING MACHINE.—No. 751,672; J. H. McCormick, Beartown, Mont.



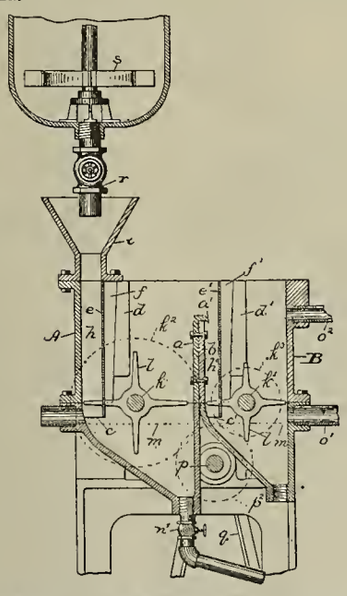
In crushing machine, combination with crushing rolls, of pair of bell crank levers on opposite sides of machine in similar positions, tiltable bearings on corresponding arms of bell crank levers adapted to carry one of rolls, shaft for each of bell cranks journaled in framework of machine, eccentric on arch of shafts rotatably mounted thereon, bell cranks engaging eccentrics at their elbows, meaus for revolving eccentrics independently of each other whereby either end of roll may be given combined vertical and horizontal adjustment, eccentrics engaged by other arms of bell cranks at ends, and means for rotating eccentrics independently of each other whereby arms of bell cranks engaged thereby may be given vertical adjustment independently of each other whereby either end of roll may be giveu horizontal adjustment with respect to stationary roll.

ORE SEPARATOR.—No. 752,027; H. J. Burroughs, Los Angeles, Cal.



A separator comprising main frame, two-part separating tank therefor, means for adjusting one portion of separating tank vertically relative to other, feeder for tank, and means for revolving feeder.

AMALGAMATOR.—No. 752,246; P. J. Nelson, Baltimore, Md.

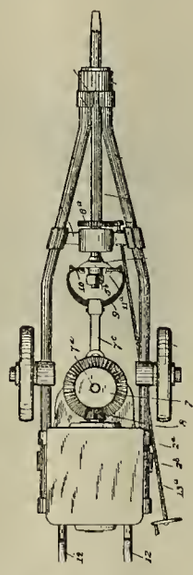


Amalgamator, comprising tank provided with mercury chamber; partition secured in tank and forming therein feed passage for slime and like to mercury chamber, partition being provided in its lower edge with recesses; and revolnble beaters arranged to sweep through recesses into both feed passage and mercury chamber.

GATE AND CHUTE FOR COAL OR ORE POCKETS.—No. 752,555; G. L. Holmes, Chicago, Ill.

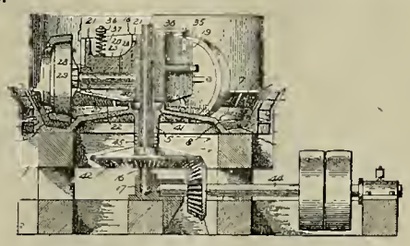
In gate and chute for coal or ore pockets, combination of gate to cut off flow of coal with transverse rod below bottom of discharge way, gate pivoted on such rod, aud outer spout pivoted concentric with but on pivots independent of rod.

MINING MACHINE.—No. 752,180; E. P. Rauscher, Columbus, O.



In mining machine of pick type, combination of frame, socket bearing supported in frame, ball universally movable in socket beariug, pick stock passing through and reciprocable in ball, and means for mechanically rotating pick stock.

ORE MILL.—No. 752,138; W. E. Wild, Denver, Colo.

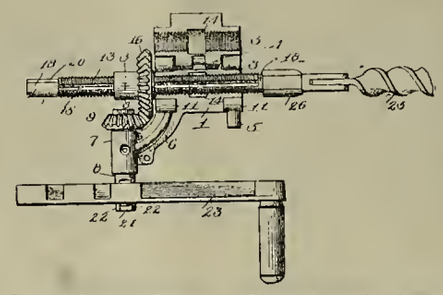


In ore mill, roll support, comprising central hub having wings which extend tangentially therefrom; and which are recessed to form guideways, bottoms of which incline downwardly toward hubs, and are apertured adjacent thereto, while their sides have vertical grooves formed therein; bearing blocks located in guideways, each having horizontal bore, tongues which fit in vertical grooves, and oil holes, one of which extends through top of block into bore, while other extends from bore through bottom of block and communicates with guideway of support; rolls having shafts which are journaled in bore of block, rolls having shoes with two grinding faces at angle to each other, in combination with chamber having central bore surrounded by oil cup, anular die having faces which coincide with faces of rolls, and shaft extending through bore, to which support is keyed, and means for revolving shaft and support.

METHOD OF TREATING REFRACTORY ORES.—No. 751,401; E. H. Miller, London, England.

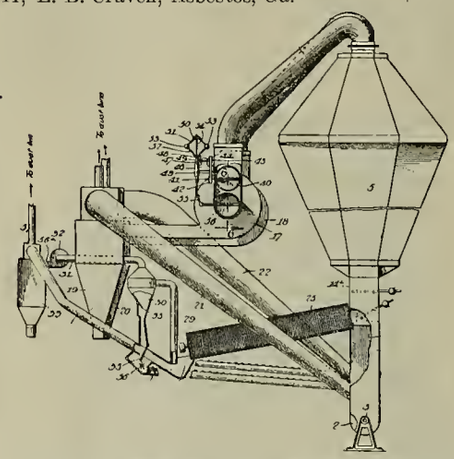
Process for treatment of refractory lead-zinc ores consisting in mixing ore with siliceous matter and pitch, with addition of lime according to silver value of ore, forming mixture into dry blocks, packing blocks in furnace with suitable air spaces, and sprinkling layers with lime and gradually raising temperature, whereby substantially whole zinc content of ore is converted into metallic zinc which distils over, and lead and silver contents of ore are also converted into metallic state in which state they are retained in residue in retort and recovered therefrom by melting out.

MINING DRILL FOR COAL OR ROCK.—No. 752,490; A. Walker, Whatcheer, Iowa.



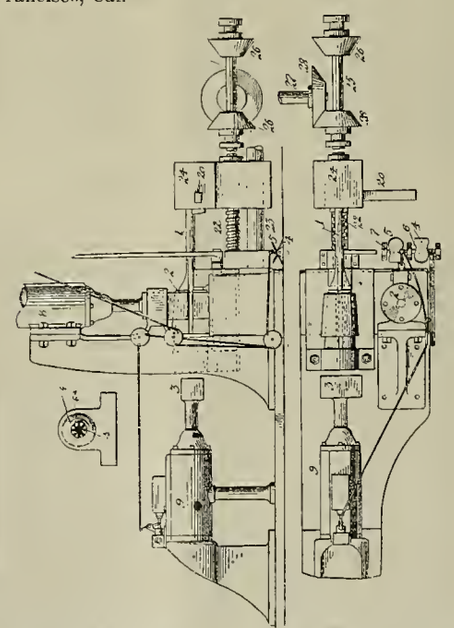
In drilling machine, combination with threaded drill rod, of boxing for drill comprising two semicylindrical sections hinged together along one edge, each provided centrally upon its interior with semiannular recess, sections being internally threaded on both sides of recesses, two recesses when boxing is closed registering and forming continuous annular recess for reception of lubricant, and threads ou two sections also registering to form continuous threads for engaging threaded drill rod.

REDUCING AND SEPARATING MACHINE.—No. 752,044; E. B. Craven, Asbestos, Ga.



A device of class described, comprising pair of reduction mills, separator having compartments connected with mills and subcompartments provided with discharge valves, partitions within compartments, movable deflectors at upper ends of partitions, stationary deflectors in upper part of separator chambers, means for inducing air currents through separator chambers and through fan casings, dust collectors receiving air currents and particles suspended therein from fan casings, and means for returning air currents from upper ends of dust collectors to reduction mills.

DRILL SHARPENER.—No. 752,026; J. L. Bryson, San Francisco, Cal.



In machine for described purpose, dolly comprising anvil, separated arms extending therefrom and having grooved ends, support for drill bits in line with free ends of arms, means for adjusting support relatively to arms, means for closing and releasing free ends of arms, and a hammer.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

The Carvey McNeer bench property in Nizina has been sold to H. V. Winchell. The group consists of thirteen bench claims on Rex and White gulches, for which $100,000 will be paid. He is also said to have taken over the holdings of the Chittateau Dev. Co. Equipment will be taken in via Valdez and work started the coming season.

ARIZONA.

Apache County.

Twenty-five miles northeast of St. Johns, C. W. Davis and A. Shreeve report finding three veins of coal—one 4 inches thick, one 6 inches and the other 4 feet—of coking quality. A company is being formed at St. Johns to develop it. When the railroad which is expected to go through that part of the country is built, the expense of getting the coal to market will be lessened.

Cochise County.

The diamond drill at the Wolverine & Arizona mine, near Bisbee, is in operation on the Broken Premise claim, towards the White Tail Deer ground, which adjoins the claims of the Wolverine & Arizona. The drill is in the 550-foot level in the main shaft. The management of the Wolverine & Arizona says the operation of the diamond drill will not interfere with other development work. Sinking the shaft and running drifts will continue.

The Commonwealth, at Pearce, has resumed work. They are running a drift on the seventh level and another drift east of the hoist. It is expected they will start twenty stamps next week. They are also taking out ore in the side of the cave.

H. C. McCreery, operating on the Copper Chief group of claims, Johnson district, near Wilcox, says work is progressing and he has opened a body of sulphide ore. The development work consists of a shaft down 200 feet and in ore. Two drifts have been run, one east and the other west. It is proposed to build a mill.

The Douglas Dispatch says two of the furnaces of the new Copper Queen smelter at Douglas will be blown in by March 1st.

Maricopa County.

(Special Correspondence). — W. Wadlington has put men to work on his mines in the Eagle Tail mountains. Until the recent rain there has been no water in those mountains for some time.

The Joplin claim in Vulture district, near Wickenburg, has been sold to R. S. Slusher of Phœnix. The ore carries lead and silver.

Wickenburg, Feb. 22.

Mohave County.

(Special Correspondence). — The Mossback mine in Silver Creek district, near Acme, above Needles, Cal., owned by C. H. Burlock et al of Los Angeles, Cal., has been bonded by S. M. Slocum, who has started development work. This group of three claims shows limestone cropping 300 feet in width. Burlock, in blasting out a place for tools, uncovered a calcspar ledge carrying values. This is being sunk on, and it is increasing in value and size. At present depth of 40 feet it is 14 feet wide and averages $9 per ton. He intends to sink 100 to 200 feet and then crosscut the ledge. Abundance of water can be had from 4 miles above and brought to camp by ditch.

The Black Mountain G. M. Co., under superintendence of A. I. Richardson, is doing considerable development work on its group.——Near Silver Creek spring on slope of Gold mountain is a ledge cropping for length of nine claims. The three eastern are held by M. Hawkins. The middle group is owned by R. J. Holmes, and 700 feet of work is done on it. In one tunnel 265 feet in on the ledge the ore is 12 feet in width and assays average of $32. The western group is owned by R. E. Zuver et al, and 500 feet of work has been done, with development work continuing. The ore is being sorted, sacked and stored. When the ore body has been blocked out stopes will be started and a mill built. Water is coming into the mine and may develop in sufficient quantity for mill purposes. Water can be developed at the spring which is 1 mile from the mine. The ledge, running 10 to 40 feet in width, cuts the country rock for nearly 3 miles in length. All the ravines running from it have been dry placered and stringers along the hillsides have been worked for pockets of ore for a number of years.

Needles, Feb. 23.

E. S. Osborne and C. W. Wardwell have taken over a group of mines near Parker. They have taken in supplies and have started work. The ores carry gold and copper values.

The Gold Roads mine, near Acme, continues regular shipments of bullion, sending out $42,000 in the first thirteen days of February. It is reported the management will put in electrical transmission lines from the railroad to operate the mines and mill and at the same time make changes in the reduction and handling of ores.

Santa Cruz County.

The Tolluride G. M. Co. has been incorporated at Negales by L. A. Teague, B. W. Haines, A. Cane, R. L. Logan and C. O'B. Reddin.

CALIFORNIA.

Butte County.

(Special Correspondence).—The Steifer M. Co. drift mines at Nimshew, owned and operated by Steifer Bros., will be equipped with machinery. They are preparing to put in electric power. The cemented gravel will be handled by a 10-stamp mill. P. B. Steifer is president and superintendent.

Work is progressing at the Magalia mine, near the Steifer M. Co. holdings.

Nimsbew, Feb. 24.

Oroville reports that the Feather river rose rapidly last week, owing to heavy rains. It is said there are 8 feet of snow in the mountains at La Porte, and that the rain which fell melted the snow rapidly. All the dredgers on the river shut down, the water being so high that it was not safe to continue dredging. At the Pennsylvania the water was up around the buildings. A portion of the Veatch tract, in the western part of Oroville, is covered with water to a depth of several feet. This is caused by the overflowing of the dredger pond at one of the boats.

Calaveras County.

It is reported a rich strike has been made in the Voinich mine, near Angels, being developed by Stockton men. The lead was struck at depth of 250 feet. G. Turner is president.

Del Norte County.

J. B. Crawford, manager of the Cleopatra group of copper mines in Diamond Creek district, near the Oregon-California line, south of Waldo, Or., reports work progressing. The district is reached by the Diamond Creek road from the Grant's Pass-Crescent City stage line. The development work at present is confined largely to the Ohio, at southern end of group. A tunnel that was driven in on the ledge is being retimbered. This tunnel taps the ledge at depth of 260 feet. It is a crosscut, and from this depth drifts are run both ways on the ledge. The Sidney, another claim of the Cleopatra group, is being developed by tunnel, which is in 400 feet, and will tap the main ore body at 250 feet farther.

El Dorado County.

At Omo Ranch (formerly Brownsville mining district) work is being done by the Alexander G. M. Co. on the Crystal group. They report last week having opened up another ore shoot in the main tunnel. The mill is running.——The Lady Edner will make a cleanup as soon as the weather permits.——G. Estey will resume work on the Whim mine this week.

Inyo County.

G. Montgomery et al. have started operations on the World Beater group of mines at Ballarat and will put in development and milling machinery.

Nevada County.

The old Badger mine at Grass Valley has been taken under option by U. P. Koenig for Milwaukee, Wis., men. The shaft will be cleaned out as well as the tunnels. The Badger has been idle for twenty years.

W. S. Gage, secretary of the Pesey G. M. Co., and Superintendent W. H. Bray are preparing to resume operations at the Posey mine, near Nevada City.

The mill at the Rose Hill mine, near Grass Valley, operating on the dump of ore, will be enlarged, says J. H. Spencer, part owner. This dump was regarded as waste rock when the mine was formerly worked.

Work has been started at the Seven-Thirty mine, near Grass Valley, clearing away the site for hoisting works and buildings for development of the mine, says Manager Root. The shaft has been cleaned out to the water level and while the buildings are being put up the shaft will be timbered from that point to the surface.

Placer County.

H. W. Morris, of San Francisco, has bought the Rawhide mine, near Shady Run, for $80,000, and will put in air compressors, drilling machines and other improvements.

At the Southern Cross mine in Humbug canyon, 4 miles from the Rawhide mine, near Shady Run, the 10-stamp mill, which is run by electricity, will be enlarged.

Plumas County.

Superintendent G. H. Goodhue, of the Five Bears M. Co., says he has bought the North Canyon cyanide plant of F. W. Day, and will move the same to Genesee valley, near Genesee, as soon as the condition of the roads permit. It will be put up at the site of the Centennial mill, owned by the Five Bears. The company will do its crushing in the present 10-stamp mill, but they are making arrangements to add a grinding mill. After the quartz has been passed through the stamp mill it will be delivered into the grinder and then cyanided. The tunnel of the Centennial, which is being driven to develop the Five Bears, is in 510 feet. It is being run on the hanging wall of the vein. Development of the quartz lode, southeast of the Shoofly bridge, is in progress. The tunnel is in 120 feet, and three shifts are driving. Goodhue says they are ready for resumption of cement crushing at Iron Bar as soon as spring opens.

It is reported work has begun on the Peter quartz mine in the north arm of Indian valley, near Genesee.

San Diego County.

Mining operations at the High Peak mine, near Julian, have been resumed under A. B. Hall, manager of the Julian Con. M. Co. The steam hoisting works at the new shaft of the Helvetia have been moved to the 165-foot shaft at the end of the 425-foot tunnel in the High Peak, to replace the gasoline plant damaged by fire. The management will put in heavier steam hoisting machinery.

W. Z. McDonald, of the Cleveland-Pittsburg mines, near Escondido, says he is preparing to put in heavier hoisting machinery and improved methods of handling the ore. Work will be resumed on the vertical shaft, which it is proposed to sink to depth of 500 feet.

Siskiyou County.

J. Johnston of New York City, of the Headwaters G. M. & M. Co., operating mine at head of main fork of Humbug creek, near Yreka, reports having made a strike 250 feet in on the Terror tunnel. It shows a 4-foot ledge of ore that assayed $10 per ton in free gold. Preparations will be made to open this mine on larger scale and ship the ore to the smelter at Keswick as soon as the roads will permit. The properties owned by the Headwaters M. & M. Co. comprise the Lucky Jack, Terror, Mabel, Kittens, Annie, Lucy, Major, 29th of April and 4th of July quartz mines.——The Van Brunt property, having river frontage of 4 miles, has a water right out of south fork of Indian creek, near Fort Jones, and can be worked early and late in the season, says M. L. Gordon, superintendent. Several improvements have been made. D. I. Jackson is manager.

J. C. Woods, operating the Minetta B, or Suspension Bridge claim, near Fort Jones, on a lease, reports making satisfactory cleanups.——The Gordon mine is in full operation. ——J. Wells of Happy Camp is operating the Doolittle property at Clear Creek.——The Portuguese Creek mines, which are owned by Wood & Cuddihy of Happy Camp, has been leased to Scott Valley parties, and they have put the sluices, ditches and pipe line in condition to work.——The Fort Gough group, owing to short time between sale and opening of the mining season, was not able to equip the plant to work their best ground and are working at the old diggings, which are said to be paying well. J. W. Martin is superintendent.

The heavy rain storms of the past ten days caused heavy freshets and floods in all the streams, which will clean them out, although causing much damage, says the Yreka Journal. In the mining streams all the accumulated tailings and debris have been swept away, leaving the miners a clear field for operations, but filled up many claims, besides washing out dams.

Trinity County.

J. Hughes, F. Farris and J. McDonald have bonded the Gambler mine at Hayfork. They intend running a tunnel in below the former workings.

Tuolumne County.

A strike of miners at the Rawhide and App mines, owned by W. A. Nevills, is reported to have practically tied up business at Jamestown. The strike at the App has been on for several months, but last week the miners walked out at the Rawbide. Most of the strikers are Austrians and but few of them understand English. They are armed and have posted pickets to prevent Nevills sending men to the mine to take their places.

Superintendent De Sallier of the American Exploration Co. says he has men at work at the Kanaka mine, near Groveland, and work preparatory to full operations is going ahead. There are 900 feet of track to be laid.——At the Galena mine, on the Phelan ranch, work is progressing in the tunnel.——Moody & Jones have the mill at Big Creek running on ore from the De Ferrari mine at Deer Flat. The mill is equipped with five stamps, and power is obtained by means of an overshot water wheel. The recent rains have provided an abundance of water and a steady run is expected.

While grading for the foundation for the air compressor at the Longfellow mine, near Groveland, a pocket of gold-bearing quartz was taken out from a few inches below the surface, says the Groveland Prospector. The compresser is in place and two drills will be put to work. An 8x12 Dodge rock breaker has been put in and a 6-foot Frue vanner is being set up. The 5-stamp mill is run by a distillate engine. A pumping plant is in operation at the dam on the flat below the mill. Superintendent Partington expects to start full operations by March 1st.

P. J. Port of Oakland has bought the Contention mine near Columbia, also the Bates millsite.

The Dresden G. M. Co., having headquarters at Jamestown, has been incorporated and is working at the New York tunnel at Table mountain. —— M. R. Clement, of San Francisco, has bought a two-thirds interest in the Toledo mine, 2 miles southwest of Tuttletown, also a two-thirds interest in the Big Indian quartz mine.

Yuba County.

Construction work is under way on two gold mining dredgers on the Hallett place, 10 miles east of Marysville, for the Hammon Co. J. D. Cameron is superintendent. The machinery and all the material is on the ground at the site of the dredgers and twenty-five carpenters are at work, making a total of sixty men. The excavation where the two dredgers are being built is 500 feet in length and 200 feet in width, with a depth sufficient to float them when finished. Three pumps are being run by steam power to keep the water from the excavation while the foundation is being laid.

COLORADO.

Chaffee County.

The damage done to the Buena Vista smelter at Buena Vista by the recent fire has been repaired and the plant resumed operations.

Clear Creek County.

Operations are in progress on Ida May group of the Saxon Mountain M. Dev. Co., near Georgetown. A contract has been let to drive a drift south in the lower workings.

The concentrating tables for the Con. Gem M. Co. mill, the Newton Annex, at Idaho Springs, are being set up. From the batteries the ore will run to ten tables, thence to six slimers, and thence to Frue vanners. The proliminary work of lining the ore chute in the Gem raise from the Newbouse tunnel has been completed, and 380 feet of the lining laid.—— A flat reduction of 50 cents per ton is announced from the scale of treatment charges in use in the Gilpin - Clear Creek section by the Chamberlain - Dillingham samplers.——The City Council of Idaho Springs has granted the K. R. S. Milling Co. a permit to build a plant for treating tailings below the Newton mill. The company has closed a deal for treatment of the tailings from the Renshaw mill. Strange Bros. have charge of the work.

Work is progressing on the Gold Belt tunnel, near Silver Plume. It is expected five lodes will be cut by this tunnel within the next 500 feet, cutting them at a depth of from 100 to 300 feet. As soon as the snow leaves the company will put in a plant of machinery. Men will be put to work in the upper workings of the Mary Etta mine.

Custer County.

The O. W. Murphy M. Co. of Florence, which owns several claims and the Rocky Mountain smelter in Custer county, will improve the smelting plant. A Corliss engine will be used in generating electricity for propelling machinery at the mine, furnishing light, water and power for operating a mill the company is to build at the mine, the capacity of which will be 200 tons a day.

Fremont County.

On Howard creek, in western portion of Fremont county, near Howard, the lime depesits, owned by the Colerado Fuel & Iron Co., are the scene of extensive operations, and machinery is being placed. Improvements to the extent of $75,000 are being added and shipments of lime rock will began this week, says the Times. Last summer, an extension of the Denver & Rio Grande was built to the quarries at Howard. Since the first of the year work has been under management of Superintendent Gerard of Denver. Machinery is being set up, buildings erected and preparations made to handle heavy output. The machinery being placed will have daily capacity of 1000 tons; 100 men will be employed. The lime will be shipped to the Pueblo smelters and steel works.

The United Oil Co. is preparing to drill

four more wells, near Florence. It is the plan of this company to keep four strings of tools in operation all the time.——The National Oil Co., which was organized, expects to begin drilling next week. It bas oil land 3 miles south of Florence.

Gilpin Couoty.

The Stacey group of seven claims between Rollinsville and Gamble gulch has been sold to F. Augustus and others of Centreville, Ia. The group has been developed by shafts and tunnel workings. They will start another tunnel, which will give additional depth.

Denver parties are reported arranging to take hold of the Procunieur mine at Wide Awake, near Central City, under lease and bond. It is equipped with a plant of machinery and top buildings and the main shaft is down 200 feet.——Lefevre & Co. are driving ahead the main tunnel of the Mountain Monarch M. Co., in Gamble gulch, near Rollinsville. The company will also drift on the two veins which they have cut. G. E. Churchill is superintendent and the company expects to start operations on the Colorado-Maurer group, on the opposite side of Gamble gulch.

Stewart & Co. of Denver have a lease and bond for two years for $10,000 on the Smuggler group, in Moon gulch, near Central City, and have started developments. The group will be developed by a tunnel wbich has been driven 150 feet.

Sinking has been resumed at the Shamrock mine, near Russell Gulch, whicb is operated by the Electric Spark G. M. Co. The shaft was 350 feet dcep and will be sunk an additional 100 feet. The shaft shows a 12-inch streak of smelting ore. Drifting is also being carried on in the 350-foot east and west levels. A 6x8 friction hoist has been set up. G. Rogers is superintendent.——The Town Topics G. M. Co. has 20 men at work on the leasing system and regular shipments are being kept up, production being altogether of smelting grade ore, says the Central City Register-Call.

On the Star of Gilpin mine, near Russell Gulch, local and Denver lessees are putting in machinery and will start sinking next week.

The Gauntlet G. M. Co. is extending levels at deptb of 350 feet and indications are said to be improving. They are hoisting copper, iron and lead ores and expect to make shipments next month. The ore carries values in gold and silver. Iowa parties are the owners and operators of this group, which is on the east end of Quartz hill, near Central City, and they are preparing to put in a boiler of 60 H. P. capacity. After the installment of the boiler it is expected arrangements will be made to sink the main shaft another 200 feet. The main shaft is down 375 feet and they are on the Matt France vein. L. D. Hobson is manager.

S. Roberts and T. P. Thomas of Russell Gulch, working in the west 400-foot level of the Old Town mine in Russell district, have received returns from a shipment of 198½ tons, which was sent to tbe Jackson mill at Idaho Springs, and which made 89 tons of concentrates. Tbe returns showed a net return of $9544.37. An addition is being made at the Old Town mine, which will be used for new hoist room and for the compressor and electric plant. The new hoist is of 100 H. P. capacity. The compressor will be 16x18 and will run eigbt drills. Sinking operations are still in effect, the sbaft being down 1480 feet, and it is expected the shaft will be down to 1500 feet by Marcb 1st. The shaft shows a vein 10 feet wide. When the new plant is in running shape the daily output is expected to be 200 tons. Tbe present daily product is 50 tons, which is being divided between the Hidden Treasure mill and the Rocky Mountain concentrator on North Clear creek at Black Hawk. Tbe working force, including leasers, is sixty men. The property, which includes the Old Town and Wautauga groups, is owned and operated by G. K. Kimball, Jr., of Idaho Springs, F. E. Himrod of New York City, and Pittsburg men, who formerly owned the Wautauga.

Gunnison County.

(Special Correspondence.)—The strike made by W. H. Hurley & Co. on the Camp Bird claim is being opened up, making at least four promising properties within a radius of 1 mile. The Camp Bird is 1 mile west of the Independent at Bowerman. The vein is a large one carrying free gold in quartz with copper pyrites, malachite, iron sulpbides and oxides. In running a drift and open cut 15 feet in length seven tons of shipping ore has been taken out, besides milling ore which is on the dump. One wall seems to be a soft diorite.

The I X L group is ½ mile south of the Camp Bird and owned by Morris & Ford.——The Copper Queen is near the Camp Bird.——Little depth has been gained by any properties in tbe district. The surface is broken by rolling hills, covered with growth of white pine and aspen with some white spruce and yellow pine. The country is covered quite deeply with talus and soil. Few veins outcrop and good float is not abundant. Much of the surface for 2 miles from the Independent in every direction is claimed and held by location stakes, the "slide" being from a few feet to more than 20 feet in depth.

The country is granitic, with gneiss, diorite, schists, various porphyrites and dykes of basalt cutting tbrough. To the south and east an area of quartzite prevails. Lime also occurs. This area is somewhat mineralized—containing gold, copper and some silver ores. The granitic area is gold bearing, with copper ores in several of the mines.

Bowerman, Feb. 21.

The Copper Sulphide group in Box Canyon district, near Pitkin, has been bonded to A. Hahnewalt et al. of Leadville. They will start development work this week.——The Golden Islet group is being operated under management of G. Brant, president of the Brant M. & M. Co. of Roosevelt, Idaho, under bond and lease.

Hinsdale County.

In the Pride of America claim, which adjoins the Big Casino, at Lake City, Gannon & Kranichfeld have opened up a body of lead, gray copper and zinc ore, which is 6 feet wide. Assays show values of 100 ounces in silver, 36% lead and some gold. They will sink on the ore body.

Lake County.

The low-grade ores handled at the A. Y. and Minnie mills, in California gulch, Leadville, are complex in character, says the Times, consisting of sulphides contaiuing lead, zinc and iron, with silica. As the ore comes from the mine it is dumped into bins holding 200 tons each, whicb form the upper part of the mill. From the bins, the ore goes through Dodge crushers, thence down a chute to automatic feeder, and into the Huntington mills, where it is ground tbrough a 35-mesh screen. The pulp from the Huntingtons passes through hydraulic sizers, thence onto concentrating tables. Tbe slimes are dried and shipped to Germany, where they are said to be used in manufacture of paint. The daily product of clean concentrates is 100 tons, which is sold to the smelters.——The Wallace mine, under lease to M. Starne, is shipping iron ore from the old workings. Development work is being carried on.

Pitkin County.

All the men are back to work in the Smuggler mine at Aspen, says the Aspen Democrat. Manager Hallett and Superintendent Carey have bulkheaded off the section where the fire started, and since doing so the air in the stopes is said to be better than it has been at any time since last summer. No more trouble is anticipated from this source.

Sao Juan County.

Work has been resumed on the Northern Light group on Boulder mountain, near Silverton, says Manager Sisson. He expects to tap the lead by the crosscut tunnel, which is now in 650 feet. Air drills will be put in.

The Esmeralda mine, in Minnie gulch, near Silverton, is sinking the main shaft with two machine drills and is down 195 feet. Tbis property has been a steady shipper during the past tbree years. Seventeen men are at work under Superintendent J. Glanville. Shipments from the mine the past year averaged twenty-three cars per month, of a value of $35 per ton. The mine is equipped with hoisting and compressor plants. W. R. Hollis is manager.——The lease on the Spotted Pup, on King Solomon mountain, near Silverton, is said to be improving, and tbey have eleven cars of ore broken down and sorted, ready for shipment, that will run $100 per ton. There is exposed in the main drift a shoot of sbipping ore 2 feet wide, from which samples were taken, and the lessees expect to have twenty cars of ore ready for shipment when the trail is opened.

The Lackawanna group, on Kendall mountain, at Silverton, which has been worked the past five years by the Four Metals Co., whose main offices are in Pueblo, has 2500 feet of work in drifts, tunnels, raises, etc., completed. Preparations are being made for a 50-ton concentrating mill to be put up on its millsito on the Animas river. The mill will be connected with the upper workings of the mine by a tramway until the lower crosscut tunnel is completed. This group consists of ten patented claims.

San Miguel County

The power used in the mill of the Double Eagle G. M. Co. in Bridal Veil basin, near Telluride, is water, but it is intended to install electricity in the summer. This will make it possible to continue operations without cessation during the dry period of the year when the water supply may be low. Electric drills will be put in this spring and tbe number of men in the mine increased, says Manager Litchfield.

Saguache County.

T. R. Harpel, president of the Steel Canon M., M. & I Co., operating near Villa Grove, says in sinking 30 feet from tbe breast of a 160-foot tunnel a vein of ore 17 feet wide was opened, carrying $16 in gold, silver, lead and copper. The company has 1000 tons of ore on the dump at another mine. A concentrator is being built.

Summit County.

The Gold Dust-Puzzle lease at Breckenridge, operated by Hoyle & Hoyle, has cut the Gold Dust vein in the crosscut. The crosscut was started from the main level of the Puzzle at 2200 feet from the mouth of the tunnel. It is in 300 feet.——Moon, Weaver & Kerse are driving ahead the lower tunnel of the Carbonate, on Mount Baldy, above timber lino. It is in 315 feet and is expected this week to cut the lead ore shoot which was cut in the upper tunnel. Assays show an increase in the gold values contained in the ore over similar ore taken from the upper tunnel.

Teller County.

The A. E. Carlton Leasing Co. has started up the Hull City placer property at Cripple Creek. The main shaft in the Hull City is down to deptb of 1250 feet. The water is in the shaft for 200 feet. It is thought the leasing company will extend the Hull City levels into tbe Findley, which adjoins on the north. The Hull City will put eighty men at work.

The Milwaukee Mutual G. M. Co. has been organized to operate a lease on the Hoosier claim on Tenderfoot hill, Cripple Creek, and has started operations. The company will sink tbe shaft from the 570-foot level 100 feet deeper, and later the shaft may be sunk to the 1000-foot point.

Lessee Wright, operating the Thompson claim of the Elkton mine, at Cripple Creek, is shipping at rate of 100 tons a day.——Tbe Midget mine on Gold hill, Cripple Creek, is making steady output of forty tons daily. All the ore is of smelting grade. The Midget is owned by F. G. Peck and J. F. Burns et al.

The work of unwatering the upper levels of the Hull City mine, at Cripple Creek, began last week by A. E. and L. G. Carlton, and when finished those levels will be cut up into blocks and leased. The shaft has been sunk to depth of 1250 feet, and tbe water stood at the 1050-foot level. Carlton Bros. and J. S. Murphy hold tbe lease on the Hull City, as well as on the Findley mine, adjoining. They have resumed operations on the Findley with fifty men and will double the number tbis week. The Findley was idle for two months, while a compressor and plant of hoisting machinery was being put in. M. Whelan is building a cyanide mill of 100 tons capacity on his lode claim on eastern slope of Ironclad bill, below tbe W. P. H. mine, at Cripple Creek. A new ore shoot has been cut on the Gregory lease of tbe Elkton Con. G. M. Co. by Lessees W. R. Hughes, G. Birtcber, D. Daniels and J. J. Ford. Returns of $152 per ton were received from a local sampler on a shipment of twenty-four and one-half tons.

The Vindicator mine on Bull bill, Cripple Creek, is sending out an average of forty tons of ore per day, ranging in values from one to three ounces per ton. The production will be increased after tbe trouble with water is overcome, as it is now impossible to work some of the lower levels. There are 200 feet of water in the shaft.——The Tunnel M. & L. Co., operating, under lease, the Abe Lincoln mine in Poverty gulch, is sending out a steady production of a car of ore per day, averaging $30 per ton.

Superintendent Judson, who has charge of driving the Hower tunnel into Trachyte mountain, near Cripple Creek, will put in a heavier plant of machinery, including an air compressor. The tunnel bas been driven from tbe east side of the hill for a distance of 1400 feet. It will require 600 feet more driving before the tunnel is under the crest of the mountain, where they expect to cut the ore body tbat outcropped at surface.

The Four Brothers claim, on the east side of Beacon hill, Cripple Creek, near the St. Thomas, has been leased to Baker, Pearce & Maynard. Work has begun.

The Big Twenty M. Co., which is driving a tunnel into Grouse mountain, near Cripple Creek, reports work progressing. The tunnel is expected to cut one of the water courses. Being 1800 feet below the level of the National Hotel in Cripple Creek, it will drain several mines in the district, says the Times. The company has one machine drill at work and more drills will be put on. The tunnel is in 430 feet from the portal on the south slope of the mountain.

IDAHO.

Ada County.

The Gold Ring and Joe Dandy mining claims, in Deer Creek mining district, have been bonded to W. McKinley of Boise for $45,000. The Comstock, Lucky Bill and Independence mining claims, in same district, have also been bonded to W. McKinley for $30,000. These properties are said to be extensions of the Big Ledge vein. Work will be begun tbis week.

Blaine Couoty.

The Queen of the Hills group of mines, adjoining the Minnie Moore mine, in Wood River district, near Hailey, has been sold to N. Trewoek of Salt Lake City, Utah, and Chicago, Ill., men for $250,000.

Boise County.

Manager Thorne has men at work putting up the mill at tbe English company's group of claims in Gambrinus district, near Idaho City.

The concentrator of the United M. Co. at Horseshoe Bend will be enlarged tbis spring. Two freighters are hauling concentrates from Horseshoe Bend to Emmett, and one car a week is shipped to the smelter at Mackay.

G. Leighton, superintendent of the Idaho G. M. D. Co., operating near Pearl, says he is putting in a steam plant to serve the company pending installation of electrical equipment. In the development of the group ho says he has driven on $20 ore for 350 feet, with an 8-foot breast exposed. A concentrator capable of treating 100 tons daily will be built this year.

Idaho County.

The Rescue mine, in Warren, is now owned by the Ontario M. & M. Co., composed of Ontario and New York men. The mine has been re-named the Pandora, and six otber claims added. A 5-stamp mill is said to be on the mine, with engines, boilers, hoist, etc., and 1000 feet of tunnel.

Lemhi County.

Tbe management of the Gold Dust mines, at Leesburg, proposes doubling the capacity of its mill.

Nez Perces County.

D. Laverty, manago• of the Pittsburg-Idaho M. Co., which owns a group of ten claims in Lolo district, near Kamiab, says tbe company's lower tunnel is in 560 feet, giving a vertical depth of 300 feet. The tunnel will be run in 40 feot farther, when crosscuts will be driven. Tbe workings in tbe lower tunnel are now beneath tbe shoot of gold-copper struck in the upper workings.

Shoshone County.

During the year 1903 the Cœur d'Alene lead-silver mines produced ore of gross value of $10,929,977, exceeding the output of 1902 by $2,600,000. The producing mines were:

Federal M. & S. Co. (four mines)	$4,993,423
Bunker Hill & Sullivan	1,788,344
Morning	1,671,510
Hercules	953,585
Hecia	733,585
Frisco	482,930
Hunter	158,625
Silver King	108,375
California Consolidated	39,600
	$10,929,977

The total tons of lead produced was 104,177 of gross value $7,500,744. The silver content was over 6,000,000 ounces, having market value of approximately $3,400,000, silver averaging a fraction above 53½ cents for the year.

Tho Alabama M. Co. has been incorporated to operate in Beaver mining district by W. Fablo, J. H. Scott, O. E. Trojanowski, R. Campbell, C. and J. Murphy and L. J. Columbus, all of Wallace.

Washington County.

The Mineral City smelter at Mineral City bas blown in. Improvements have been made in tbe motbod of handling ore and waste, and work is under way on a second furnace. In changing the way of handling slag the managoment has done away with six men on each shift. The alteration consists in carrying away the slag by means of water, which is made to pass beneath the furnace in sufficient volume, and with a current strong enough, to keep the slag moving to the waste pile.

MICHIGAN.

Houghton County.

At the Wolverine mine, near Calumet, the mill is stamping 1075 tons of rock daily and thirty power drills are in commission. The lower workings are reported in a good grade of ground. The Wolverino is adding to its ground reserves.

Tbe miners at the Champion mine of the Copper Range C. Co. at Painesdale went out on strike last week because of a cut in wages. They were offered reduced house rent and cheaper fuel by Manager Hubbard, but the men refused to go to work, and, going to the Trimountain and Baltic mines of tho same company, called the men out there, thus tying up the entire Copper Range Con. system and 2500 men are out.

Keweenaw County.

At the Allouez mino at Allouez No. 1 shaft has reached a depth of 430 feet and

sinking is progressing at the rate of 75 feet a month. The shaft is expected to cut the Kearsarge lode in October.

MISSOURI.

Jasper County.

The Waring Chemical Co. is reported building a plant at Joplin for carrying into practical operation experiments which have been made in the extraction or separation of zinc from water pumped from mineral-bearing ground. The company also expects to purify, by the use of chemicals, the zinc ore after it is washed and considered ready for market. The water will be pumped into a receptacle 20 feet above the surface, says Manager G. W. Waring, where the chemicals will be mixed with it, after which the compound will be allowed to flow into a sieve-like receptacle and fall in drops to a receiver at the surface. The separation of zinc particles is supposed to take place during the descent and will settle in the bottom of the receiver, and the water will run off through other receivers, where any remaining particles might settle. The quality of zinc thus produced will be the pure product.

MONTANA.

During month of January $212,161.78 worth of gold and silver passed through the United States Assay Office at Helena. Of that amount $180,710.56 was produced in Montana, against $130,899.63 for the same month last year. Of the total value there was but $1144.71 in silver, the balance being in gold. The report of Assayer B. H. Tatem shows this increase in the total production of the State is due largely to the increase of the gold output from Fergus county. The receipts for January from the counties of Montana were:

	1903.	1904.
Fergus	$52,670 35	$98,499 05
Granite	2,936 32	7,657 43
Lewis and Clarke	22,348 70	25,233 63
Madison	17,423 35	30,577 91
Park	21,498 49	12,147 05
Beaverhead, Jefferson, Broadwater, Deer Lodge, Powell and Silver Bow	14,022 42	5,595 49

The receipts hy States were:

	1903.	1904.
Montana	$130,899 63	$180,710 56
Idaho	6,754 64	3,821 69
British Columbia	18,904 72	22,936 43

Deer Lodge County.

The arsenic plant of the Washoe smelter at Anaconda is expected to be in operation by March 1st. It will operate in connection with the flue and smoke stack system built last year. Owing to a break in the hoist at the Diamond mine in Butte last week, the number of men at the Washoe smelters is temporarily reduced. In the mill the force has been reduced from seven to four crews. Repairs on the Diamond hoist are being made.

Jefferson County.

At Basin, the Basin R. Co. proposes to increase its concentrator of 1500 tons daily capacity to 2500 tons daily. Power is furnished by a 1000 H. P. boiler plant feeding an 800 H. P. cross-compound Corliss engine. Crushing and concentrating equipment consists of four 10x20 crushers, eight sets 16x30 Cornish rolls, ninety jigs, sixty-nine tables, eight Frue vauuers and one slimes table. Water for concentration is supplied by a flume 12,400 feet in length with capacity of 4000 inches, which is supplemented by one duplex power pump of capacity of 300 gallons per minute, one triple power pump of capacity of 800 gallons per minute, and a pump of 300 gallons per minute. An electric lighting plant is maintained at the mill consisting of three dynamos. The mill is on Boulder river, and in view of the large amount of tailings to be disposed of daily plans are being made for a series of dams extending a distance of 8 miles through the canyon below the mill, and the company is securing the land necessary for the construction of these dams.

The Grey Eagle mine, near Basin, is shipping a carload of ore to the smelter daily. The ore is a sulphide, carrying copper, gold and silver, says Superintendent Frecburg. He will increase the output to two cars per day.

J. B. McCabe of Helena has the Robert Emmett mine, near Wickes, under a $20,000 bond. The vein is 10 feet wide. McCahe has also bonded for $25,000 the Nonparoil claim on Granite creek, in Madison county, and placed men at development work.

Madison County.

The Alder M. Co., which owns the Kearsargo mine near Virginia City, has increased its holdings by huying the Rough Rider lode claim for $10,000, the Cora Locke claim for $1200 and the Roosevelt claim for $500. The Alder Co. started up the Kearsarge 60-stamp mill last week.

H. U. Foster, in charge of operations at Washington Bar, 20 miles from Pony, for the Blackhawk M. Co., says during the past two months work has heen in progress on the Bi-Metallic mine, which is hoing developed hy a tunnel now in 500 feet. In running the last 40 feet a shoot of ore was cut 3 feet in width of average value of $20. There are soventy-five tons of ore on the dump, takon out while driving the tunnel. More men are boing put on. It is intended to build a 15-stamp mill in tho spring. The values in tho ore are mostly gold, with some lead.

Park County.

G. R. Tuttle of Butte, president of the Precious Metals M. Co., which owns holdings in the New World mining district at Cooke City, states that two smelters will be built at that plaec in the coming summer. A sawmill is heing huilt at Cooke which will turn out material for the company's buildings. A large numher of men will be put to work in the spring. The smelters will treat custom ores as well as ores from their own mines.

NEVADA.

Esmeralda County.

(Special Correspondence.) — In Gold Mountain mining district tho Kelly's group is heing opened up with satisfactory results. Thoy are down nearly 300 feet on the St. Louis mine and are drifting in ore. L. E. Chiatovich, owner of tho Rattlesnake group of mines, is expected to return from an Eastern trip next month and will start operations on his mill and mines. V. M. Katuricb & Co., leasing on Corbett No. 1 mine, hy the first of April will have 150 tons of good grade free-milling ore ready to mill. This claim is one of the Rattlcsnake group and is 2 miles west of the St. Louis mine. At Tokop no one is working at present.

Camp Kelly (via Lida), Feb. 20.

The Anaconda-Tonopah M. Co. has heen organized at Salt Lake City, Utah, to develop a group of claims in Lone Mountain district, near Tonopah. The officers are H. P. Myton, D. S. Murray, J. W. Langley and E. D. Thompson.

The Goldfield-Vindicator M. Co. has been organized by W. H. King, E. H. Airis, L. H. Farnsworth, W. H. Tihbals, Jr., R. L. Colburn et al. of Salt Lake City, Utah, to operate at Goldfield, south of Tonopah. A. W. Tihbals of Salt Lake City, Utah, is superintendent.

Lincoln County.

Operations at the Bamberger De Lamar mines, at De Lamar, are progressing. The mill is now crushing ore at average of 300 tons daily. Amalgamation plates are heing put in and the quantity of ore treated will be increased.

The Bethel G. M. Co. has been incorporated at Salt Lake City, Utah, to operate a group of claims 70 miles west of Calientes, in an unorganized mining district. The officers are W. D. Colhath, R. E. Ross, W. D. Mathis and H. L. Berkey, the last named being manager.

Nye County.

O. B. Dawson, of Caldwell, N. J., has bought a group of claims south of and adjoining the Halifax, near Tonopah, and expects to begin development on them this week.

The Silver Star-Tonopah M. & M. Co. of Nevada has been organized in Washington, D. C., hy C. D. and F. E. Van Duzer and G. B. Ackerman. The mines are near Tonopah.

Storey County.

O. Belau, who has a lease on the Chollar croppings, near Virginia City, has bought the mill at the Alta mine, and is overhauling it preparatory to putting in electric power. It is reported the Justice, New York and Alta companies will put the shaft of the latter company in repair and prospect their mines from that point.

Drill hole No. 7 in the Occidental ground, near Virginia City, is down 715 feet, with the bottom in quartz and porphyry, the quartz showing some value hy assay.

Superintendent J. R. Ryan of the Ophir mine at Virginia City reports for week ending February 20: 1800 level, the northeast drift following ore vein was advanced 12 feet; total length 362 feet. The ore was too low in value to save for milling. In the stope over this drift they worked on the 2d, 3d, 4th and 5th floors and extracted ore of good quality. A break in the electric power line cut off the power for running hlowers and work was stopped for twenty-four hours.——1900 level, the east crosscut started 200 feet from tho south boundary line of mine was extended 13 feet in porphyry; total length, 30 feet.——On the 2000 level, advanced the northcast drift 14 feet; total length, 718 feet. Ore of good grade was extracted from this drift during its progress. The ore in the vein in the face of drift is second grade. ——Total extraction of ore for the week from the 1800 and 2000-foot levels, 221 mine cars assaying on basis of gold value $78.84 per ton. Shipped to Selby S. & L. Co., four railroad cars of ore in bulk.

NEW MEXICO.

Colfax County.

The Oro Dredge Co. at Elizahethtown is getting its dredger into shape to start operations next month, says the New Mexican. Machinery for the company has hoen shipped into the district, via Springer.

Grant County.

On tho White Pine group of four claims at Fierro, owned by W. D. Murray and J. W. Welch, there are four shafts from 40 to 45 feet deep, all in ore. Ore takon from shaft No. 1 is reported to have given assays of one-half ounce gold, eleven ounces silver and 5% copper: shaft No. 2 shows similar ore.

Otero County.

E. A. Hersporger is shipping ore from the Garnet mino at Jarilla. —— F. B. Schermerhorn, manager of the Three Bears group at Jarilla, is putting in hoisting machinory. The hoist is 20 H. P. Air drills and other equipment are also going in.

Rio Arriba County

A wagon road is heing built to the claims of La Grande Placer M. Co., says J. P. Rinker of Tros Piedras, superintendent. The company will put a dredger on the Rio Grande river.

The Franklin Placer Co. has men at work on its mines at Red Rivor under Manager J. A. Knowland.

The Keystone M. Co. and the Bromide M. Co., near Tres Piedras, have consolidated under name of the Keystone-Bromide M. Co., for running a tunnel from baso of mountain on Bromide claim to cut shaft of the Pay Roll mine. The distance to be covered is 6300 feet and tbe tunnel will crosscut tbe following claims: Hutchinson (formerly the Bromide), Silver Ground, Helen, Silver State, Camp Bird, Blucher, Big Four, 44-49, Central, Hawkeye, Arroya, Oversight and Pay Roll. At the Pay Roll shaft the tunnel will cut 680 feet helow tbe surface. The tunnel is to drain the properties and for development purposes. It will have double tracks. For some distance from its mouth it will follow the Bromide vein, passing under the present shaft workings. Then it will turn off and crosscut tho formation the rest of the distance. The Bromide shaft is down 150 feet and opening up shipping ore. This shaft will he connected with the tunnel by an incline of 65 feet. The mineral is said to he brittle silver and copper. The Pay Roll has been the principal working of the Keystone Co. The shaft is down 250 feet and is in a hody of ore carrying copper and gold. The tunnel will he known as the Dillon development tunnel. J. C. Dillon of Bloomsburg, Pa., is president of tbe Keystone M. Co. Men are putting up buildings and have started work on the tunnel. Machine drills will he used.

San Miguel County.

Las Vegas reports say the new mill of the Bonanza C. Co. started operations last week on ore that has accumulated on the dumps.

Sierra County.

The Prosper G. M. & M. Co. intends to resume operations on its mine near Hillsboro.——Eigbt dry washer claims are being worked in Pittsburg district in Apache canyon. The average yield is said to be eight ounces each day for the entire outfit. No quartz mines have yet been discovered nor any water developed.

The Empire G. M. & M. Co. is developing properties near Hillsboro. J. Churchill of Dodge City, Kans., is part owner. ——H. R. Taylor, manager of the South Percha G. M. & M. Co., says they propose to make improvements on the South Percha mines.

A. G. Brower of Utica, N. Y., president of the Hillshoro G. M. & M. Co., says they will resume operations near Hillsboro as soon as a water supply can be obtained. Surveys have been made for water rights. It is the intention of the company to build a water tank on the highest divide hetween the pumping station on the Percha and the mill on Ready Pay gulch.

Kingston reports say the Lady Franklin mine on Kentuck mountain, near Kingston, which has been in operation for the past two years under Manager Cuns, has closed down.

Socorro County.

E. Craig of Silver City, president of the Ernestine M. Co., operating the Last Chance mine near Mogollon, says his company will resume operations on the Last Chance mine and mill. The leaching plant will be increased from a capacity of 1200 tons a month to 2000 tons, and the output of the mine from 50 to 100 tons a day. Sixty men will be employed.

OREGON.

Baker County.

The Dixie Meadows mine, in Quartzburg district, near Sumpter, is steadily producing hullion. The mill is not of sufficient capacity to handle the quantity of ore being mined, and more machinery will be added to raise capacity to 100 tons daily.——The California mine, in Cahle Cove district, is again working. Repairs to the damaged shaft by an explosion have been made and the tramway is in full operation again transporting ore from mine to mill. Snow so far has not impeded the work.

Milling operations have started on the Cyclone mine, near Baker City. Manager Waddell laid off the men sinking in the shaft and says he will keep in the mine for the present hut fifteen men. Connections have been made for electrical power.

W. Cable has a bond on the Sheridan group at head of Wind creek, near the Porcupine group, near Sumpter. There are five claims in the Sheridan. Development work will start as soon as the snow leaves.

Tho Morning mine, near Greenhorn, has been sold to G. W. Beggs et al. of Tacoma, Wash., who also bought the Andorson group on Beaver creek. The ledge of the Morning group is covered hy ten claims. A crosscut tunnel has been driven 500 feet and will cut parallel ledges at a depth of 400 feet. The mino is equipped with a 5-foot roller mill and a 35 H. P. engine.

W. E. King, manager Portland Commercial M. Co., operating in Mormon Basin, near Baker City, says his company has eight properties in Mormon Basin, near the Morning Star group. Operations are being concentrated on the Rainhow group. A Chilean mill, having daily capacity of twonty tons, will be put up there in the spring.

Baker City reports say two large snow-slides on Rock creek last week passed over the Chloride, Geiser-Hendryx and Maxwell mines, destroying the shaft houses, mills and upper workings in their path. No one was killed. The full extent of the damage is not known. In the United Elkhorn district, 16 miles from Baker City, northwest, two slides occurred, says Foreman H. H. McGregor of the Chloride mine. The first slide startod high up on the mountain and came down directly over the Chloride mine, carrying away the motor and power houses, compressors and blacksmith shop and all tbe other buildings at the mine except the boarding house, which is some little distance away from the mine. He says it is supposed the Maxwell mine, a neighboring property, is also damaged, and the Geiser-Hendryx mine was buried under 30 feet of snow. All the telephone lines in that entire section were broken down.

E. F. Zinns of Houghton, Mich., president of the Merchants Placer M. Co., operating in Burnt River district, says he is putting in additional machinery, including a pump weighing 7500 pounds, with capacity of throwing 1200 gallons of water per minute. The boiler weighs 7½ tons. The placer grounds to be oporated by this company are on Pine creek. A ditch 7 miles long from Burnt river will carry the water which will be conserved in reservoirs for use during the season.

Jackson County.

At tbe Shorty-Hope mines, west of Ashland, the Golden Spike drift is in 440 feet. Since Feb. 1 it has been driven under contract. It will continue to the Shorty-Hope shaft, which will be sunk to connect. It is proposed to enlarge this shaft.

Men have been put to work on the Mountain Lion mine, near Applegate. The ledge averages 2 feet in width and is opened on seven lovels. It assays $15 per ton. This year the north end of the vein will be opened. The mine is equipped with a reduction plant using cyanide and amalgamation. The mine is owned by the Mountain Lion M. Co.——Burner & Gilkins have leased Caris creek, on Missouri flat, in lower Applegate section, and will begin placer mining operations next month.

Josephine County.

Tho Oak Flat hydraulic placer mine, on Illinois river, has been bought by Grant's Pass men, including F. Fetsch, T. B. Cornell and J. Moss. The Oak Flat placers are on lower Illinois river, 20 miles from Selma station, on the Grant's Pass-Crescent City stage road. They comprise several hundred acres of deep channel diggings and are equipped with hydraulic mining plant. Water is derived from Briggs creek, a tributary to the Illinois.

Development work on the Ingram-Ramsey copper mine, in Slate Creek district, will be resumed. It is under bond to S. Bowden. A shaft will be sunk on the ledge to depth of 150 feet. The mine is 17 miles southeast of Grant's Pass and near the Kerby road.

The Bone of Contention mine, Williams district, south of Grant's Pass, has been sold to Johnson, Catterline & Co. of Portland. The Bone of Contention is equipped with an 8-stamp mill and other machinery for development and operation. The new management proposes to complete a

crosscut tunnel to tap the main ore body at a depth of 350 feet.

Wallowa County.

The Great Northern C. & G. M. Co. has been organized to develop a mining group on west fork of the Wallowa river, 25 miles south of Lostino. It comprises ten full claims and two water rights. The claims have been worked three years and are said to show two ledges of copper ore. It carries some silver. W. H. Stalker of Baker City is manager. As soon as the snow disappears operations will begin, and the company expects to begin shipping ore the coming summer. The principal owners are A. Wurzeller, G. Mack, T. & G. Schuler and J. Dunn of Josepb and E. W. Rumble and A. E. Cray of Lostine.

Wheeler County.

T. J. Smith of Fossil says coal deposits are being opened up in Wheeler county. He says the coal is bituminous and of coking quality. The fields are 12 miles south of Fossil, on Rowe Creek mountain. The vein shows a thickness of 7 feet. The local fuel demand is being supplied and shipments to outside points will begin next montb.

SOUTH DAKOTA.

Custer County.

H. F. Ratte, in charge of operations of the Ivanhoe G. M. Co., 9 miles east from Custer, says he has equipped the mine for deep work. He has put in a steam hoist, boiler, air compressor, pump and drills. There are several openings on the ground of the Ivanhoe Co. in all of which ore is showing. The plant is being set up over the principal vein and the company expects to sink to depth of 500 feet. This vein carries values in free gold aud sulphides.

Lawrence County.

Manager H. Bischoff of the Lexington Hill G. M. Co., operating near Deadwood, says they will build a 40-stamp mill and convert the present 20-stamp mill into a concentrating plant, for treatment of the pyritic ore from the El Dorado, whose product will be shipped to a smelter. Pending completion of the new mill the 20-stamp mill will continue amalgamation, concentrating and cyaniding. The new mill will be a few rods from the present buildings and will embody amalgamation, concentration and cyaniding. In the meantime a tunnel is being driven from a point on the hillside a short distance above the mill, under the horizontal siliceous ore bodies, to facilitate delivery of ore direct to the mill. This tunnel is in 335 feet and has 50 feet to go. Raises will then be made to the ore bodies.

The Big Four G. M. Co. has material on the ground on Deadwood gulch, near Deadwood, for rebuilding its hoisting plant that was burned last month.

The Hidden Treasure G. M. Co. is preparing to put in machiuery at its property on Deadwood gulch, says Superintendent W. Lawler. The mine is 2 miles from Lead, near the Pennsylvania, Big Four and Hidden Fortune mines.

The Queen of the Hills G. M. Co. is putting in a steam hoist and other machinery on its group at head of Whistler gulch, near Pluma. Siuking will be resumed, and the shaft will go to 500 feet before drifting and stoping is started. J. W. McClure of Des Moines, Iowa, is president.

Work continues by the Ohio-Beaver Creek M., M. & Dev. Co. on Beaver creek, west of Spearfish, where it owns an area of 1000 acres. Manager D. Clark says the ore body is 25 feet wide, carrying $5 per ton gold. W. Watson is superintendent and T. C. Lentz of Columbus, Ohio, is president.

L. T. Wolle of Cambria, Wyo., secretary of the American M. Co., says the company will resume work on its Ragged Top and Spoarfish property. It is reported this company proposes building a power plant at Spearfish Falls and transmission by electricity of power to various parts of the Black Hills. The company will sink a shaft at or near the Dacy shaft.

Pennington County.

A strike is reported made by the Clara Belle M. Co., near Hill City, at depth of 225 feet. In a drift on this level following course of vein the ore has widened out to several feet, says F. Hebert, prosident and principal owner. There is a 2-stamp mill on the ground, and Hobert expects to begin milling ore again in the spring.

The Black Hills C. Co. is continuing operations on its property west of Rochford at Copper Reef mountain, after an idleness of a few months, during which time the mine was permitted to fill with water. The water has been removed and crosscutting is again under way ou the 800-foot level. J. B. Taylor is superintendent.

The Gopher M. Co. is working two shifts at the Lena mine, near Hill City. The destruction of this company's hoisting plant by fire has not interrupted its work.

UTAH.

Box Elder County.

The Great Northern C. M. Co. has been organized at Ogden to develop properties in the Sierra Madre mining district. The officers of the company are: A. W. Agee, president; D. Conway, vice-president; S. H. Browne, secretary and treasurer.

Iron County.

A heavier pump is being set up at the Johnny mines, at Stateline, and will be followed by opening up the ore bodies on the 300-foot level, says Director Clift.

Juab County.

The Mammoth M. Co. of Tintic district, near Eureka, during the past year marketed 13,573 tons of ore, for which it received $145,452.91, with its earnings from all sources aggregating $156,040.02, according to its annual report. During the same period disbursements reached a total of $130,460.31, of which $64,918.80 was for labor, $21,679.41 for supplies, with accidents incurring an expense of $12,-279.07. The report of underground operations by Superintendent S. McIntyre Jr. shows an opening of 5 feet of $50 copper ore on the 500-foot level, which has been followed for 18 feet on its strike. Associated with it are 8 feet of high-grade copper-bearing quartz. On the 700-foot level 5 feet of ore valued at $20 per ton, in addition to the second-class ore, are shown. On the 1000-foot level, 240 feet north of the shaft, in the Spar stope, the report shows ore, while 10 feet north of the stope is a streak of quartz which yields gold. This is being followed and 100 sacks that average $380 gold per ton have been collected. In the winze which has been sunk 200 feet below the 1900-foot level high-grade ore has occurred along with the second-class. S. McIntyre of Salt Lake City is president and manager.

The Raymond M. Co. and the Illinois M. Co. are preparing to consolidate their holdings near Eureka, Tintic district. The main workings of the Raymond having been put down to depth of 1500 feet from a collar near Gemini ground, further exploration of the zone will be made, says Manager J. C. Sullivan of the Raymond.

Piute County.

P. A. H. Franklin of Salt Lake City, manager of the Log Cabin and other mining properties in Marysvale section, says Superintendent Larsen will let a 300-foot contract on the L. & N. mine, near Marysvale. Franklin & Co. have a bond on the L. & N. group of claims. He intends to run a 2000-foot tunnel the coming summer.

P. A. H. Franklin, president of the Gold Dev. Co., operating in Gold mountain section, near Marysvale, says in the Log Cabin tunnel the strike is being developed. A crosscut showed a width of 80 feet, with $5 per ton in gold. The Franklin tunnel has advanced into the hill 700 feet, and is expected to go to 1000 feet. The tunnel on the Elephant group has attained a length of 500 feet and will continue to the 1000-foot station under the present contract.

Salt Lake County.

Ores are again passing over the Old Jordan division of the United States tramway at Bingham to the smelter in the valley.

The Copper Princc Con. M. Co. has been incorporated by T. Jacobson, C. K. McCornick, C. H. Post, H. A. McCornick and M. Badger. The property consists of the Copper Prince and Silver King groups of eighteen claims in all, adjoining the Continental-Alta mines at Alta on the south. It is intended to clean out the old workings and increase development.

To complete its equipment in Salt Lake valley, the United States S. Co., at Bingham, will follow up its installation of lead blast furnaces with a refinery, says the Tribune.

The King Standard Oil Co. has been organized at Salt Lake. The company owns forty-eight placer mining claims. The officers are W. H. King, J. T. Hammond, J. Watson and E. A. Smith. They will start operations in the oil field this week.

On No. 2 level of the Red Wing Extension mine, near Bingham, milling ore is opened up, showing values in lead, copper, gold and silver. A thousand feet of work has been done, in tunnel, drifts, lifts and winzes. Water is increasing in the incline. The company proposes to build a mill.

The Butler-Liberal mine, at Bingham, is being equipped with machine drills, says Manager Jacobs. The lower tunnel is expected to reach its objective point in July.

The Utah C. Co.'s mill in Bingbam canyon, near Bingham, began reduction of ores this week, says Managing Director Jackling.

Summit Conuty.

Additional water with which to supply the Kearns-Keith mill at Park city is being developed by Manager Dailey and the tonnage at the plant will be increased.

The management of the Daly West M. Co., Park City, produced and marketed ores and concentrates of value of $2,382,-257.52, and paid dividends aggregating $1,332,000 during the past year. The annual report shows there was marketed from Daly Wost ground proper 44,476 tons of ore, for which $2,373,103.30 was received, the metallic contents averaging 58.5 ounces silver, 20.5% lead, 2.1% copper and 76 cents gold, with 15.6% zinc. From Quincy ground, during same period, there was forwarded to tbe smelter 17,870 tons of ore, that brought $416,-737.37, the average contents being 49.6 ounces of silver, 17.25% lead, 1.6% copper, and 86 cents gold, with 7.7% zinc. Of concentrates from the mill there were sent out 16,580 tons, valued at $592,416.87, with contents of 53.8 ounces silver, 31.4% lead, 2% copper, and 80 cents gold, with 17.7% zinc. The shipping ore from Daly West proper netted $30.88 per ton and that from Quincy ground $23.32, while the concentrates afforded profit of $35.73. During same period the Daly West expended for labor and on items connected directly with operations underground $461,579.76; for transportation of its output, sampling, etc., of same, $105,721.62. In exploratory work and opening up of new sources of ore $100,135.10 was paid, while in operation and maintenance of the concentrator $79,002.37 was paid, with the general expense amounting to $51,301.37; for improvements in the mine $14,903.44, and at the mill $17,406.78, while during same period $17,456.75 was applied to adjustment of claims arising from the explosion of July, 1902, with miscellaneous disbursements amounting to $9144.05. The report of Superintendent J. A. Kirby shows that during the year, in extraction of ores and prospecting of territory, 13,203 feet were driven, while the shaft is now sinking from the 1400-foot level to depth of 1700 feet.——F. W. Sherman, superintendent of the mill, after reporting its operations, advises that with the additional power being installed the mill will be able to reduce 10,-000 tons of ore per month, and with completion of the tailings plant under construction the earnings from those sources will have been increased $250,000 per annum.——The metals produced from the ores mined with comparisons with the production of 1902 are summed up as follows:

COPPER.

	Pounds.
1903	3,160,824
1902	2,403,670

LEAD.

	Pounds.
1903	34,742,791
1902	29,806,000

GOLD.

	Ounces.
1903	3,195.28
1902	2,943.96

SILVER.

	Ounces.
1903	4,382,222
1902	3,575,796

ZINC.

	Pounds.
1903	22,573,355
1902	19,477,443

Tooele County.

The new concentrator of the Honerine Co. at Stockton has commenced operation, says Superintendent Raddatz. The plant includes a "slimer," and will handle 450 tons of ore daily. The mill and its equipment has cost about $85,000.

Utah County.

The Oriental M. & M. Co., of Scofield, has been incorporated by J. S. McNeal, T. Kelter, H. C. Lee and N. M. Madsen. The company owns thirteen claims in Nebo Basin mining district.

WASHINGTON.

Ferry County.

Tho lessees of the Nob Hill mine, near Republic, will open the property at greater depth. A tunnel will be driven from a point down the hill, from which the railroad can be reached by an easy grade, and an additional vertical depth of 120 feet attained, which will give 160 feet more depth on the dip of the vein. A 2-drill compressor has been set up. A boiler will be removed from the Little Cove mine and used to furnish power. Drills will be operated on the north drift on the upper tunnel level.

The Nantucket M. Co. will resume work on the Louverne and Sentry claims, 2 miles south of Laurier. The claims cover a contact vein, traceable by iron croppings 12 feet wido, says the Spokesman-Review. A shaft was sunk 60 feet, from the bottom of which a crosscut was driven 50 feet. An incline shaft was sunk on tho vein 81 feet and a drift 12 feet along the vein, from which assays showed $5 per ton in gold, silver and copper. The vein at the bottom of tho shaft is 16 feet wide.

The Orient mine, on Toulon mountain, 2½ miles southeast of Orient, is again in operation. It is equipped with a 3-drill air compressor, and a steam boiler, which have been used to drivo a tunnel 800 feet. The tunnel is said to havo cut four blind veins. A winze was sunk 30 feet deep and showed ore which ran $15 a ton in gold. It is proposod to drive the tunnol ahead to cut the main vein.

Snohomish County.

It is stated that the Everett smelter will be blown in about March 1st. Manager E. B. Braden says he has arranged to take all the ore that the Continental mine, near Porthill, Idaho, will send. The Continental has already shipped fourteen or fifteen cars to the East Helena, Mont., plant. Tho Monte Cristo mine, near Everett, is snowed under and nothing is being done. There is a large amount of Monte Cristo oro at the smelter and it is boing treated in the arsenic plant. Tho arsenic is being shipped by the carload from Pittsburg, Pa., for use in making plate glass. It sells for 3½ cents a pound laid down in the East, and tho freight is 70 cents per 100 pounds. The product is said to be chemically pure arsenic. Mr. Braden is in charge of the East Helena plant of the American Smelting & Refining Co. and will manage that, as well as the Everett works.

Stevens County.

The Little Giant mino, in Pierce lake district, near Northport, has been prospected with a diamoud drill, which showed ore in a 6-foot quartz vein, which runs $30 a ton in copper, gold and silvor. In addition to several open cuts and small shafts on the vein, it has been opened by a shaft which was sunk 80 feot. The mine is equippod with a steam hoist.

WYOMING.

Carbon County.

A strike has been made in the Congo properties, near Dillon, showing bornite and galena, with values also in gold and silver. The Congo group consists of eight claims, ½ mile below head of Jack creek. The vein is 25 feet wide in the shaft. The group is 40 miles from the Union Pacific railroad and the ore teams will have a downhill haul all the way. Arrangements are beiug made to begin shipments of high-grade ore. It is reported R. Ferris has secured control of the Honchen & Flamme discoveries on Jack creek. They have also organized a company for development of the Congo group. On the Honchen & Flamme work will be started this week.

The North American C. Co. of Encampment is increasing operations. Several hundred men have been employed to develop the Ferris-Haggerty mine, to reconstruct the Southern Wyoming tramway and to remodel its reduction works. The works are expected to produce 200 tons of matte copper per day.

Fremont County.

The International Mining Association has been organized in Paris, France, to co-operate with the Belgo-American Oil Drilling Co. in building a railroad to the Lander oil fields and in the development of the Lander, Popo Agie, Salt Creek, Salt Wells and other oil fields in the State in which the Belgo Co. has holdings. Work on the railroad will be started as soon as contracts can be let. It is thought that the railroad will be run from Casper to Lander via the coal, iron, gold and soda districts in the Platte river and Sweetwater river sections. M. Landeur of Paris is a director and Governor Chatterton and J. Knight at Cheyenne are the American directors of the company.

FOREIGN.

AUSTRALIA.

Queensland

During December, 1903, in the Mount Morgan mine development work was carried forward at the 750 level. A drive running west at this level from the Crown shaft, several hundred feet, passed through a large body of copper ore of payable grade; and from the face of this drive cousiderable prospecting has been done by diamond drills. A bore has been put in westerly 527 feet, and another northwesterly 300 feet. A little copper ore was met, but its value and extent are not yet ascertained. The ore bodies in this property do not appear to have any defined continuity or strike, but occur in irregular masses in a haphazard manner, and it is never safe to assume that a body of payable ore discovered in one level will extend to the next level, either above or below, although in some instances these bodies prove of considerablo thickness. The mass of copper ore in the western drive was met 130 feet from the Crown shaft, and it has been proved of sufficient magnitude to yield 60,000 tons of payable stone for every 10 feet of depth it is mined. In the stopes above the 750-foot level some large faces of siliceous ores are being opened, one face, 35 feet wido,

yielding payable stone, which is treated for gold, in the course of which treatment the copper contents are leached out and subsequently precipitated. Gold ores are still being obtained from the 650 level, and from several faces in the 574 and Linda levels, and from the upper or oxidized zone of the mine. The steam shovel, which was for some time operating on the overburden above the 196 level, has finished its work at that part of the mine, and the engineer in charge is preparing to lower this machine to the 225 level, where it will work for a considerable time. The returns for the month of December, 1902, from the Mount Morgan mine showed 20,420 tons of stone treated for a yield of 11,878 ounces of gold, while these for the period under review give 19,834 tons for 9323.75 ounces, a falling off in value of stone treated of 8s 9d per ton. The copper precipitated by the company for the months of November and December aggregate 22 tons. These precipitates are valued at 75% of metallic copper.

In the Chartors Towers field, says the mine commissioner for that district, an instance of the work that can be done in shaft sinking occurred during the month of December, 1903, in the Queen Central Block mine. The shaft has four compartments, 3½ feet by 4 feet each. The country sunk through was grey granite. Twenty miners were employed in three shifts; and in four weeks they sank 140 feet and timbered 31 feet. This is a record for this field, if not for Australia.

Western Australia.

At Boodalyerrie, in Pilbarra section, the owner of a small windmill battery has recently crushed sixteen tons of quartz yielding sixty ounces of gold per ton, says the W. A. Journal. For the purpose of testing lodes the windmill battery is applicable, as well as for making returns from claims, and under certain conditions this form of battery can be advantageously employed. The question of fuel being a serious item, and heavy freights for cartage prohibiting removal of ore to the nearest available battory, the windmill battery may be used. It is reported that the battery referred to has already treated 100 tons for a total yield of 800 ounces of gold.

AFRICA.

Cape Colony.

The De Beers Con. M., Ltd., operating the De Beers, Kimberley, Premier, Bultfontein and Dutoitspan diamond mines, at and near Kimberley, has issued its report for year ending June 30, 1903. Following are details of receipts and expenses:

Diamonds recovered	£5,241,173
Mining expenses	£ 907,145
Floor (treatment) expenses	524,723
Charge of lands	20,813
General and office expenses	133,513
Total expenses	£1,586,194
Net mine earnings	£3,654,979
Interest, rents, etc	134,031
Balance from previous year	798,686
Total credits	£4,587,696
War expenditures, balance	£ 30,542
Interest paid	316,075
Life Governors' interest purchase	100,000
Debentures redeemed	167,900
Depreciation accounts	751,415
Added to insurance fund	100,000
Reserved for investment	200,000
Total charges	£1,665,932
Balance	£2,921,764
Dividends paid	2,175,000

The statement of operations shows:

	De Beers and Kimberley.	Premier.	Bultfontein.
Loads, blue hoisted	2,370,503	1,987,543	318,410
Loads, blue washed	2,561,940	1,989,598	317,185
Loads on floor	2,135,283	1,571,859	482,159
Diamonds recovered, carats	1,574,190	594,890	76,573
Carats per load	0.61	0.30	0.24
Value	£3,819,651	£1,021,277	£118,102

To this must be added diamonds, aggregating 227,477 carats, valued at £281,434, recovered from 1,347,115 loads of tailings and debris washed; and 2672 carats, valued at £706, recovered from old concentrates. This makes total recovery of 2,475,802 carats, valued at £5,241,173 (or $25,419,689).——In the De Beers mine development work included 24,858 feet tunnels and 722 feet passes; Kimberley mine, 12,894 feet tunnels and 1165 feet passes; Premior mine, 2130 feet tunnels and 91 feet passes; Bultfontein mine, 4703 feet tunnels and 147 feet passes. The Dutoitspan mine is being developed and provided with machinery. The main shaft was sunk 65 feet, to depth of 785 feet, while 1493 feet tunnels were driven. The acting manager's report says: At the De Beers mine mud-rushes have continued to be of frequent occurrence, but although there were twenty-nine rushes, only on two occasions have they been attended with fatal results—two natives being killed in each. The total length of tunnels filled was 15,344 feet, as compared with 6989 feet for the previous year. The cost of clearing away the mud and retimbering the tunnels amounts to 20s per foot. However, the greatest loss thus caused was in shutting down of the filled places, and by the blue ground being mixed with the mud. Frequent occurrence of mud during the year reduced output of the De Beers mine. A new drain tunnel is being driven around the mine in the hard rock below the black shales. It is exected this will take up some of the water, which now finds its way into the mine and causes the mud. Judging from the appearance of the open mine, it should not be long before the hard rock is exposed; and it is hoped that when this does appear they will be able to collect all the water, and thus end the mud-rusbes, as in the case of the Kimberley mine. The central electric power station has capacity for delivering 3000 H. P., which will soon be utilized to extent of 1300 H. P., and by end of next fiscal year 2500 H. P. will be required.——The directors' report shows that since the close of the fiscal year, the De Beers explosive works, at Somerset West, have been completed and are producing dynamite, supplying present requirements at Kimberley. Contracts have also been made with the principal mining groups in the Transvaal, whereby they will buy from De Beers works, half their monthly requirements for period of seven years from September 1 last. The company's account against the Imperial Government was settled. A claim of £54,641 was made, and the government paid £30,000.

BRITISH COLUMBIA.

Boundary District.

The Canadian Pacific Railway has made a reduction in freight rates on ore in the Boundary. It has reduced the price of haulage of ores from Phœnix to the smelters at Grand Fork and Greenwood from 37½ cents per ton to 30 cents. H. E. Macdonell, general freigbt agent of the Kootenay lines, states the company is hauling an average of between 14,000 and 15,000 tons weekly. It is expected the Boundary ore tonnage, which last year was 686,614 tons, will reach 1,000,000 tons for 1904.

East Kootenay District.

J. P. Larsen & Co. are developing a deep placer mine on Wild Horse creek, near Fort Steele, by means of a drift running several hundred feet into the gravel banks on the west side of the creek.

Under the provisions of the lead bounty act there is $75,000 coming to the owners of Kootenay shipping mines from the Dominion government, says G. O. Buchanan of Kaslo, disbursement agent for the federal government.

During month of January 76,000 tons of coal were mined at the three collieries of the Crow's Nest Pass Coal Co. This is the largest monthly output in the history of the company, says the Rossland Miner. Coal Creek gained 4000 tons over December. The largest day's output at each colliery was: Coal Creek 1513, Michel 1489 and Morrissey 889. The operations at Michel were hampered by the explosion in No. 3 mine. The coke production for the month was 23,000 tons.

Rossland District.

The White Bear mine, at Rossland, is again making ore shipments.

Vancouver Island.

At Texada island, the Copper Queen shaft is down vertically 600 feet into the vein. The Marble Bay mine is down 460 feet and the ore body is showing up satisfactorily. The Cornell is down 500 feet and is shipping copper ore to the smelters regularly. There are two freighters carrying ore to the smelters and three passenger steamers weekly from Vancouver to the docks at Texada.

H. E. Young, of Atlin, and associates have taken over the mines of the Mounts Sicker & Brenton M., Ltd., near Mount Sicker. They will increase development work and make shipments of ore. The property comprises seven crown-granted claims, crossing the Chemainus river and extending east and west on both Mounts Sicker and Brenton sides. The claims are in the schist. There is a compressor plant and hoisting machinery at the mine. J. H. Brownlee, of Atlin, is manager.

West Kootenay District.

A quarter interest in the Spyglass group at Poplar Creek has been sold to J. A. Magee of Seattle, Wash.

Yale District.

At Kamloops the result of the last year's work on the Iron Mask mine, on Coal hill, is reported satisfactory. Preparations are being made to put up a smelter and other equipment. The other metalliferous mine of importance on which operations were carried in 1903 was the Copper King, which started shipments of ore to the smelters in November. On Tranquille creek, a tributary of Thompson river, a drodger was steadily operated during entire season, working with two 12-hour shifts. The channel was dredged to depth of 18 feet, the best values being found, however, in a streak of clay at 15 feet.

E. H. Thomas of Whatcom, Wash., secretary of the company, says they are putting up a 40-stamp mill on the Mount Baker Yale M. Co.'s claim on Siwash creek, 4 miles above Yale, on Fraser river.

MEXICO.

Chihuahua.

(Special Correspondence).—The Moctezuma M. Co. of Santa Barbara is enlarging its works at the mines.

The American S. & R. Co. of Chihuahua proposes to establish in this State a smelter to cost not less than $1,500,000.

Chihuahua, Feb. 20.

The Los Angeles, Cal., men who bought the Navaganties and Santa Maria properties have merged them into the Parral & Santa Maria M. Co. They have prepared to sink the shaft another 100 feet on the Navaganties and to run a tunnel to strike the ledge on the Santa Maria. This tunnel will strike the ledge 300 feet from the surface. W. Faust is president and A. Reverall vice-president and manager.

The output of Santa Eulalia camp is estimated at 20,000 tons per month, says the Chihuahua Enterprise, and this promises to be greatly increased in the near future. The advent of two California companies has infused new life into the camp. Diamond drills are at work on numerous properties, and the amount of ore to be shipped from now on is a question of transportation facilities, the car capacity of the mineral road being taxed to its utmost.

Queretaro.

(Special Correspondence).—The mines of O. Y. Braniff & Co. in the Maconi district, northeast of Queretaro, has been taken over by the United M. & Dev. Co. of 666 Broadway, New York City, N. Y. E. G. Spillsbury, part owner in the company, has also closed a deal which includes several mines adjoining the Braniff & Co. mines. The United M. & Dev. Co. has a total of forty-six mines, all of which are in operation, four smelting and refining works and a tract of timbered land 20 miles square, which assures a supply of charcoal. In addition to the 400-ton electrically driven plant now in operation another 300-ton plant will be built in the summer. Concentrating plants will be built and plans are being drawn for the first of these, which will have a capacity of 150 tons of ore per day. The company's mines and smelters will be connected by a railroad system aggregating 38 kilometers. E. A. Tays of Queretaro has been appointed manager.

Queretaro, Feb. 20.

Sonora.

(Special Correspondence).—N. Thomas et al. of Chicago, Ill., have bought the Cerro Pocito mining properties in Magdalena district. They will put up machinery, including a 5-stamp mill.

Hermosillo, Feb. 20.

Cananea reports say M. P. Wright et al. have bought the Los Amigos group of mines (formerly the Realito), in Ures district, near Minas Prietas. There are twenty pertenencias in the claim and a gold-bearing ledge 14 feet wide. The mines are antiguas and along the ledge are a number of open cuts from which ore was taken. This was treated by arrastras. The old workings will be cleaned out and shafts sunk below them. It is also intended to build a quartz mill. In addition to this property, Wright has also denounced forty-eight more pertenencias of mining ground adjoining the Los Amigos.

NEW ZEALAND.

The gold dredgers operating at Otago and Southland during year 1903 recovered a total of 87,130 ounces of gold, with an average of sixty and a minimum of seventy-seven dredgers in operation each week of the year. Same district in 1902 yielded 106,369 ounces. In West Coast district an average of twenty dredgers produced 30,619 ounces in 1903, against 30,416 ounces in 1902. During almost the whole of the winter months the river fluctuated so much that steady dredging was difficult in the Molyneux river, says the Otago Times, and for a period of several weeks in July and August, after the heavy fall of snow, the cold was so intense that operations were almost completely at a standstill. The gerge dredgers had a hard year, and were only able to work intermittently, with the result that a considerable portion of the actual working time was occupied in treating the traveling drift. This, combined with the heavy cost of coaling, has made working very expensive. A number of companies worked out their ground and closed up during 1903; but, on the other hand, a few new ones were floated, the most attention in this connection being devoted to the Waikaia and Upper Clutha districts.

The bullion production of the gold fields of Auckland district of northern New Zealand for year 1903 amounted to £959,665 4s 5d, against £803,094 15s 3d for 1902, distributed as follows:

	£	s.	d.
Ohinemuri	859,739	8	1
Thames	54,589	12	8
Coromandel	35,336	3	8
Total	959,665	4	5

Personal.

T. CLARK of Placerville, Cal., is in San Francisco, Cal., on mining business.

F. W. WILLIAMS of Seattle, Wash., is in San Francisco, Cal., on mining business.

C. WEBB of French Gulch, Cal., is in San Francisco, Cal., on mining business.

W. C. RALSTON has returned from Washington, D. C., to San Francisco, Cal.

N. TREWEEK of Salt Lake City, Utah, returned there last week from an extended trip East.

F. X. PELLIER is superintendent of the Minola mine at Park City, Utah, vice G. C. Carlton, resigned.

H. K. MASTERS has resigned as smelter superintendent of the United States M. Co. at Bingham, Utah.

J. A. YERINGTON of Carsen, Nev., interested in Nevada mines, is in San Francisco, Cal., on business.

V. P. STRANGE of Salt Lake City, Utah, is in Nevada examining mines at Tonopah and Goldfield.

P. J. DONOHUE of Salt Lake City, Utah, returned there last week from examining mines in Mexico.

P. N. NISSEN is manager of the Gold Tunnel M. Co., operating near Nevada City, Cal., vice G. Lezinsky.

H. BISCHOFF of Deadwood, South Dakota, is manager of the Lexington Hill G. M. Co, vice E. F. Woodward.

T. DERBY, superintendent of the New Almaden quicksilver mines at New Almaden, Cal., is in San Francisco, Cal.

F. B. COOK of Salt Lake City, Utah, of the Columbia group of mines at Bingham, Utah, is examining mines in Nevada.

E. W. GARRETSON returned to Denver, Colo., last week, after two years operating in the Loon creek section of Idaho.

WM. WEIGELE of the Weigele Pipe Works Co., Denver, Colo., is in Chicago on business connected with the company.

C. F. RAHT, who has been in Mexico in charge of a mine for a Seattle, Wash., company, returned to Sumpter, Or., last week.

E. A. TAYS of Querotaro, Mexico, is manager of the United M. & Dev. Co., operating mines at Maconi, State of Queretaro, Mexico.

H. R. TAYLOR, manager of the South Percha G. M. & M. Co., near Hillshoro, New Mexico, is in Cincinnati, O., on company business.

C. C. DERBY of Mt. Bullion, Cal., manager of the mines of the Mariposa C. & M. Co. in Mariposa county, Cal., is in San Francisco, Cal.

F. H. LATHROP of Salt Lake City, Utah, is in Chicago, Ill., on company business for the Belcher group of mines of Tonopah, Nev.

A. W. TIBBALS of Salt Lake City, Utah, is superintendent of the Goldfield-Vindicator M. Co. at Goldfield, south of Tonopah, Nev.

J. J. CASE, for the past five years superintendent of the Lake Superior Smelting Co. plant at Dollar Bay and Hancock, Mich., has resigned.

R. BOWEN of Cleveland, Ohio, is with the Mine & Smelter Supply Co., Denver, Colo., as special representative of Laidlaw-Dunn-Gordon Co.

J. H. BROWNLEE of Atlin, B. C., is manager of the Mounts Sicker & Brenton M. Co., Ltd., operating at Mount Sicker, Vancouver Island, B. C.

P. B. STEIFER, president and superintendent of the Steifer M. Co. at Nimshew, Butte county, Cal., has returned from a business trip to San Francisco, Cal.

G. R. TELLER of Buffalo, N. Y., secretary of the Con. Esmeralda mine in Nevada, and T. H. Fearey of Quincy, Ill., a director in same company, are in San Francisco, Cal.

W. F. DETERT, president of the Argonaut M. Co. and superintendent of the

Zeila mine, has returned to Jackson, Cal., from San Francisco, Cal.

C. E. GRUNSKY of San Francisco, Cal., is considered the final choice of President Roosevelt for the position of engineer of the Panama Canal Commission.

F. L. SIZER, who has been at Sandon, B. C., is now at Nelson, B. C., as a witness in the case of the Star M. & M. Co. vs. the Byron M. White M. Co., an extra lateral right controversy.

Obituary.

I. DERRICK, a pioneer miner of Montana and California, died at Divide, Mont., at the age of 75 years.

GEORGE GARNICK, superintendent of the May Day mine in Tintic district, Utah, died on the 20th inst, at Salt Lake City, Utah.

J. SHERIDAN, a pioneer miner of Sierra county, Cal., and formerly part owner in the Keystone gravel mine at Monte Cristo and the Keystone quartz mine near Sierra City, died at Downieville, Cal., on the 8th inst. Deceased was born in London, Eng., March, 1821.

H. D. SPAULDING, superintendent of the Big Chunk mine near Atlanta, Elmore county, Idaho, was killed on the 14th inst. by a snowslide, which swept away the cabin in which he was sleeping. The slide carried the cabin 250 feet down the side of the mountain. Deceased was a native of Milton, Mass., and a graduate of Harvard University. Prior to going to Idaho, Spaulding operated mining properties near Baker City, Or.

E. MCCLELLAN, a pioneer miner of Clear Creek county, Colo., died at Georgetown, Colo., on the 10th inst., aged 84 years. Deceased was horn in Alleghany county, Pa. Besides the Blackbawk mill at Blackhawk, the Lexington, Faivre & Kipp and Buell mills in Gilpin county, and the South Clear Creek, Mahany and Federal Union mills in Clear Creek county were built under superintendence of deceased. He was formerly interested in the Colorado Central mine.

THEODORE BRUBACK, a railroad and mining man of Salt Lake City, Utah, was accidentally killed on the 18th inst. He went to Park City to inspect the workings of the Daly-Judge and was accompanied through the tunnel by Superintendent McSorley. While ascending a ladder Bruback lost his hold and fell a distance of 20 feet, striking on his head. Deceased was president of the San Pete Valley Railroad and was interested in copper, coal, gold and silver mining properties. He also owned large stone quarries. He was 45 years old.

Commercial Paragraphs.

JESSE J. MACDONALD is now located at 1025 So. Flower street, Los Angeles, Cal.

CHAS. L. TURNER, of C. C. Moore & Co., San Francisco, Cal., has returned to San Francisco from a southern trip.

THE Mine & Smelter Supply Co., Denver, Colo., report a good trade in Cincinnati air compressors, having recently sold two 8-drill compressors for shipment to South Dakota and two 30-drill compressors to Old Mexico.

THE Vulcan Iron Works Co., Toledo, O., will pay full time to any employe who is a member of the Ohio National Guard, when out on parade with their company, at rifle practice, at camp duty, or when serving under the Governor or Sheriff to put down a riot.

THE Allis-Chalmers Co. announce their entrance into the electrical field and that they will take up immediately the manufacture of heavy electrical generators for the largest class of work. Supplementary to their well-known reciprocating engines, they propose, after two years of research, to supply a steam turbine in efficiency equal to the best known in Europe. They have also taken up the manufacture of the Nurnberg gas engine, and have secured from the firm of Escher, Wyss & Co. exclusive rights for the manufacture of their hydraulic turbine. They are now creating their electrical department, at the head of which will be J. F. Kelly, well known in connection with the Stanley interests. He will be the electrical director; associated with him in an advisory and consulting capacity will be W. Stanley, Jr.

THE American Concentrator Co. of Joplin, Mo., report the following shipments recently made: New Century differential motion jigs, Palacios & Trevino Arreola, Monterey, Mex., F. E. Crawford, West Ossipee, N. H.; complete equipments for entire concentrating plants, Washington Zinc Co., Arlington, Wash., Bear Top M. Co., Murray, Idaho: New Century Blake crusher, 12x20 inches, Rossland Power Co., Rossland, B. C.; New Century belt-driven rolls, Maryland High Grade Flint Co., Finksburg, Md.; two-compartment anthracite coal washing jig, Scranton Coal Co., Scranton, Pa.; Knowles' New Century magnetic separator, Payne Con. M. Co., Sandon, B. C.; New Century disintegrating screen, Catherine Lead Co., Fredericktown, Mo.; New Century differential motion jigs and New Century ore feeder to the Denver Ore Testing & Sampling Co., Denver, Colo.

Latest Market Reports.

SAN FRANCISCO, February 26, 1904.

METALS.

SILVER.—Per oz., Troy: London, 26 1/16d (standard ounce, 925 fine); New York, bar silver, 58 1/2c, refined (1000 fine); San Francisco, 58 1/4c; Mexican dollars, 47@48c San Francisco, 45 3/4c New York.

COPPER. — New York: Standard, $12.50; Lake, 1 to 3 casks, $12.50; Electrolytic, 1 to 3 casks, $12.37 1/2; Casting, 1 to 3 casks, $12.37 1/2; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £57 7s 6d spot per ton.

Following are the figures of German consumption of foreign copper for the months January-December, 1903, compared with the same period of 1901-1902:

	1903.	1902.	1901.
	Tons.	Tons.	Tons.
Imports	88,792	80,417	63,155
Exports	9,999	8,903	10,277
Consumption	78,793	71,514	52,878

LEAD. — New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4 3/4c 1000 to 4000 lbs.; pipe 6 1/2, sheet 7, bar 5 3/4c; pig, $4.85. London: £11 5s ℔ long ton.

SPELTER.—New York, $5.10; St. Louis, $5.00; London, £21 15s ℔ ton; San Francisco, ton lots, 6 3/4c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.10@28.40; San Francisco, ton lots, 30 1/2c; 500 lbs., 31c; 200 lbs., 31 1/2c; less, 32 1/2c; bar tin, ℔ lb., 35@37 1/2c. London, £124 17s 6d spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76 1/2 lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 1/2c; extra, 17 1/2c; genuine, 31 1/2c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ hhl.

CEMENT.—Imported, $2.15@2.40 ℔ hhl.; California carload lots, $2.00 f. o. h. at works; small lots, $2.25 ℔ hhl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.60@13.85; gray forge, $12.60; San Francisco, bar, 3c ℔ lb., 3 1/2c in small quantities.

STEEL. — Bessemer hillets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 25@14 75
Northern 2	13 75@14 25
Northern 3	13 25@13 75
Southern 1	14 10@14 60
Southern 2	13 60@14 10
Southern 3	13 10@13 60
Forge	12 35@12 85
Charcoal	18 00@19 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 40@ 1 45
Bars, steel	1 46@ 1 46
Rails, standard	28 00@30 00
Rails, light	24 00@30 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 00@13 00
No. 1 cast, net ton	11 00@12 00
Iron rails	15 50@16 50
Car wheels	13 50@14 50
Cast borings	4 00@ 5 00
Turnings	8 00@ 9 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6 1/2c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8 1/2c; 100-lb. lots, 10 1/2c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 1/2c; less than one ton, 17 1/2c. No. 1*, 60%, carload lots, 13 1/2c; less than one ton, 15 1/2c. No. 1** 50%, carload lots, 11 1/2c; less than one ton, 13 1/2c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9 1/2c; less than one ton, 11 1/2c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11 1/2c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23 1/2c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3 1/2c per lb.; caustic soda, in drums, 3@3 1/2c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bhls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2 1/2@2 3/4c; powdered sulphur, 2@3c; flour sulphur, French, 3 1/2@3 1/2c; alum, $2.00@2.25; California refined, 1 3/4@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5 1/4@5 3/4c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1 3/4@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymho, $7.50; Pennsylvania, hd., $14.00; Scoteh, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, hhl., 47c; cs., 52c; Lucol oil hoiled, bhl., 44c; cs., 49c; raw, bhl., 42c; cs., 47c. Kerosene—Pearl, per gal., 21 1/2c; Astral, 21 1/2c; Star, 21 1/2c; Extra Star, 25 1/2c; Eocene, 24 1/2c; Elaine, 27 1/2c; Water White, in bulk, 15c; Mineral Seal, iron hbls., 19c; wooden bbls., 21 1/2c; cs., 25c; Mineral Sperm, cs., 26 1/2c.; Deodorized Stove Gasoline, hulk, 17c; do., cs., 23 1/2c; 86° Gasoline, hulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19 1/2c; Lard Oil, E W. S., hbl., 85c; cs., 90c; Neats-foot Oil, pure, hhl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6 1/2c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1/2c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, 1/2c. per lb. above keg price. Dry Lead—In hhls., 1 ton and over, 6 1/2c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 6 1/2c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., $1.00.

BISMUTH.—Suhuitrate, ℔ lb., $2.00.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—$2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 75c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittshurg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING FEBRUARY 16, 1904.

752,193—OIL BURNER—E. B. Badlam, S. F.
752,507.—RAILWAY TIE—A. W. Bascom, Spokane, Wash.
752,195.—OIL BURNER—W. N. Best, Los Angeles, Cal.
752,146—CLEANING FILTER BEDS—H. W. Blaisdel, Los Angeles, Cal.
752,026.—DRILL SHARPENER—J. L. Bryson, S. F.
752,027.—SEPARATOR—H. J. Burroughs, Los Angeles, Cal.
752,614.—CLOSURE—E. E. Chapman, Los Angeles, Cal.
752,524.—TURNBUCKLE—E. H. Cowart, Pleasanton, Cal.
752,525.—STORE FIXTURE—E. S. Coy, Wilhur, Wash.
752,146.—BLOTTING PAD—I. Csik, Stockton, Cal.
752,440.—SAWMILL—E. T. Davies, Portland, Or.
752,616.—INDENTIFICATION DEVICE—F. H. De Pue, S. F.
752,529.—ATOMIZER—A. S. Dixon, Los Angeles, Cal.
752,334.—MAIL BAG CATCHER—O. P. W. Ehrhardt, Seattle, Wash.
752,538.—WATER WHEEL—O. H. Ensign, Los Angeles, Cal.
752,541.—CABINET—W. J. Funk, Enterprise, Or.
752,151.—CLOTHES DRIER—C. W. Gies, Seattle, Wash.
752,159.—BOX—E. D. Hamilton, Vancouver, Wash.
752,621.—WIRE STRETCHER—Huerth & Olson, Oregon City, Or.
752,170.—JOINT PROTECTOR—F. W. Krogh, S. F.
752,349.—BATTERY STEM GUIDE—Martin & McComhie, Nevada City, Cal.
752,241.—VALVE—J. W. Master, Los Angeles, Cal.
752,245.—DISK HARROW—P. H. McVicar, Livermore, Cal.
752,095.—MOWING MACHINE—G. W. Newton, Camhria, Cal.
752,355.—WEATHER STRIP—G. L. Parker, Bremerton, Wash.
752,686.—POMADE CAN—E. L. Pitts, Jerome, A. T.
752,587.—CUFF HOLDER—E. L. Pitts, Jerome, A. T.
752,263.—NUT LOCK—W. R. Rose, Auherry, Cal.
752 593.—OIL BURNER—A. C. Rush, Los Angeles, Cal.
752,474.—PIPE—E. Semple, Seattle, Wash.
752,364.—SAW HANDLE—D. W. Solomon, Arlington, Wash.
752,307.—VOTING MACHINE—St. Louis & Jackson, Colusa, Cal.
752,119.—BREAD MAKING MACHINE—S. R. Stearns, Redlands, Cal.
752,481.—SPARK ARRESTER—M. H. Thode, Riparia, Wash.
752,367.—GRAIN LIFTER—H. E. Titamore, Agenda, Cal.
752,270.—FEED WATER HEATER—J. P. Urhanek, Seattle, Wash.

Notices of Recent Patents.

Among the patents recently ohtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

HYDROCARBON BURNER.—No. 752,193. Feh. 16, 1904. E. B. Badlam, San Francisco, Cal. This apparatus is especially designed for the combustion of liquid hydrocarhons of any description—such as gasoline, naphtha, coal oil, etc.—so as to vaporize and hurn them without the formation of carhon deposit in retort or coils. In order to effect this result the liquid hydrocarbon should not he vaporized in long uniformly-heated coils or in spacious heated retorts, the inlets or outlets of which are virtually of the same degree of heat. By this apparatus the temperature of the fluid is gradually raised during its progress from the point of admission to a point where it is finally subjected to the highest degree of heat just before being delivered to the hurner injector in the form of a dry highly-heated gas.

GRAIN LIFTERS.—No. 752,367. Feh. 16, 1904. H. E. Titamore, Agenda, Cal. This invention consists in a novel construction of lifters which are fixed to the finger har at intervals hetween the ends, these lifters heing comhined with the sickle guards at points where the two coincide in such a manner that the guards serve as braces to prevent side motion of the lifters, and the lifters themselves are so constructed as to have two separate points of attachment, whereby they are braced against vertical movement.

BATTERY STEM GUIDE.—No. 752,349. Feh. 16, 1904. W. H. Martin of Nevada City, and A. McComhie of Grass Valley, Cal. This invention relates to an improved guide for stamp stems of crushing mills. Its ohject is to provide a simple adjustahle guide wherein will he done away with the usual holts and like securing means, and a key arrangement provided for locking and for take up.

Books Received.

"Facts Ahout Peat, Peat Fuel and Peat Coke." How to make it, how to use it; what it costs, what it is wortb; its use and value. Illustrated. T. H. Leavitt. Postpaid, $1.10. Publisbed by Lee & Shepard, 202 Devonshire street, Boston, Mass.

"Alternating Currents, Their Generation, Distribution and Utilization," is the title of a new hook on this interesting and important suhject, hy George T. Hanchett, M. E. In view of the fact that there are many who bave a comprehensive knowledge of direct current work, but have only limited information concerning, or experience with alternating currents, this little work is timely. The book is devoted to a simple explanation of the phenomena as well as the apparatus of alternating currents of electricity in their practical phases. 180 pages fully illustrated with half tones and drawings. Price, cloth, $1 net. John Wiley & Sons, New York. Chapman & Hall (Limited), London.

MINING AND SCIENTIFIC PRESS.

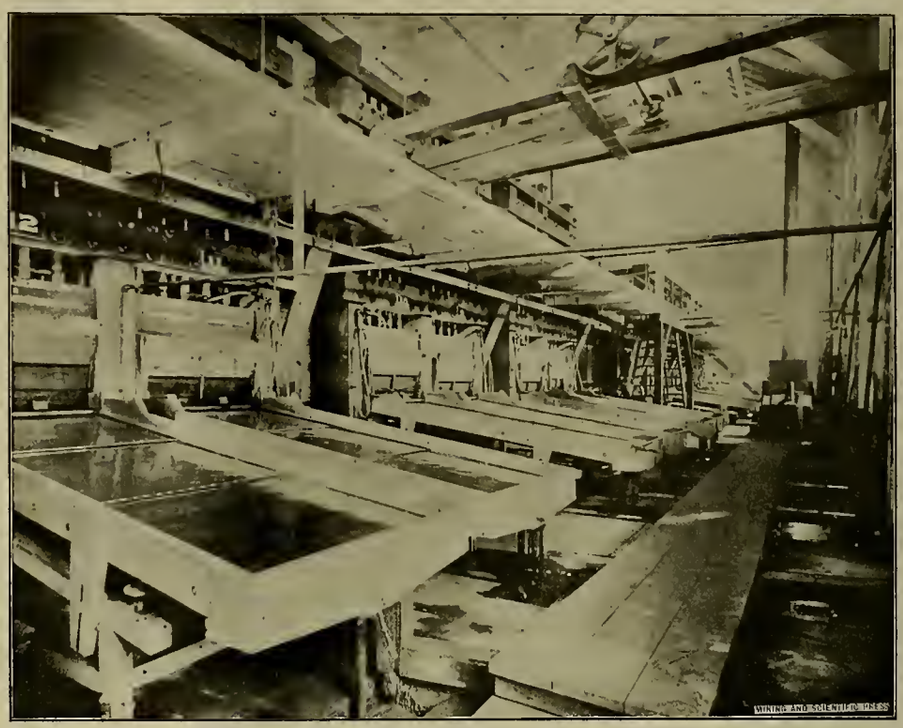
Whole No. 2276.—VOLUME LXXXVIII. Number 10. SAN FRANCISCO, CAL., SATURDAY, MARCH 5, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Grade of Plates in Stamp Mills.

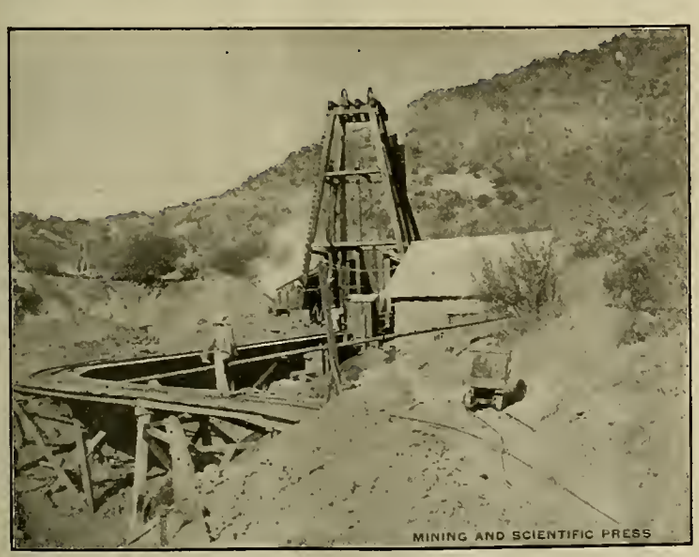
A question of some importance in stamp mill construction is the grade of the mill plates. In most mills the plates are laid on solidly constructed tables, and no means is provided for changeable adjustment. They remain as they were built, at a uniform grade. Over these plates the soft oxidized, more or less clayey pulp from the surface portion of the vein passes. Later, the semi-oxidized ores of the intermediate zone, and still later, the hard, undecomposed ores, containing more or less sulphurets, flow over the same plates at the same angle. It is possible with an ore easy of treatment that this practice may give continuously satisfactory results, but in most cases it will be found that it is good mill practice to change the grade to suit the character of the ore passing over them. A few mills have devices for adjusting the plates at any desired angle, at any time. The accompanying engraving shows the interior of a mill, the Big Indian, near Helena, Mont., where provision has been made to set the plates at any grade which the character of the ore may require. In considering this matter, the quantity of ore crushed per stamp, and the amount of water used or required, are of importance. The usual grade given mill plates is about 1¾ inches per running foot. Within the past few years a novelty has been introduced in some mills, giving plates an increasingly lesser grade as they leave the mortar lip. That is, a plate having a grade of 1¾ inches just below the lip has but 1½-inch grade in the middle section of the plate, and still less at the lower end. This causes the pulp to be retarded somewhat in its flow at the lower end, instead of being slightly accelerated, as is the case where plates have a uniform grade. Practically the same result is accomplished by arranging the plates in a series of steps, giving each section a drop of ½ inch, and all set at uniform grade. The drop causes the pulp to start anew from each step, and no appreciable acceleration of flow occurs. It has also been demonstrated that a drop is an advantage, if not over an inch in height, and amalgam collects under the several drops. This suggests that if the plates be made in narrow strips, and that there be ten, twelve or more drops of ½ inch in length of 12 feet, instead of two or three drops, as is the usual practice, better amalgamation would result.

The grade of mill plates must always be sufficient to permit a free flow of the pulp, and to secure this a sufficient quantity of water must be provided. Heavily sulphureted ores require more grade and more water than those which contain little or no sulphurets. Ores which contain considerable of any mineral of high specific gravity other than sulphurets, such as heavy spar, also require heavy grade of plates and considerable water. In many mills the plates are divided by a strip of wood placed longitudinally along the center of the plate, making two narrow instead of one wide section. The advantage claimed for this is in the fact that, when dressing of plates is necessary, all the pulp from a battery can be turned onto one of the sections while the other is washed with clean water and dressed. Those who do not believe in this practice claim that the overloading of the half section scours off more value from the amalgam already accumulated than is saved by not hanging up the stamps. The preponderance of opinion is against the practice of divided plates, for, if any loss occurs while overloading the plates, it is more difficult to save below on the concentrators, and, while the battery is hung up, no ore is being crushed and no loss is sustained, as the mill simply is somewhat reduced in capacity, though this might be considered a loss by some, where very large capital is invested, and where it is figured that any stoppage of the mill is a loss.

There are those who contend that the amalgamation plates of a mill should in no way be attached to either the mortar or the mortar blocks, for the reason that the constant vibration of the mortar, due to the falling stamps, is imparted to the plate, and, as a result, amalgam is disturbed, loosened and washed down by the force of the flow of pulp. This is in decided contrast to the ideas of those who place an amalgamated copper plate on a percussion table, for the purpose of catching the gold, which, they claim, would otherwise escape. This latter practice has been fruitful of satisfactory results in a number of mills, and it is unlikely that gold is lost on the outside plates of a mill merely from the jar imparted by the stamps. Any such loss would probably only occur where the amalgam on the plates was abnormally hard and when any disturbing element would cause it to crack and crumble, with the loss which is likely to follow.



Big Indian Mill, Helena, Montana.



Head Frame, Main Shaft Zubiate Mine, Sonora, Mexico.

(See Page 163.)

Forty-Stamp Pan Mill, Zubiate Silver Mine, Sonora, Mexico.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MARCH 5, 1904.

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THE arrastra and patio in Mexico are rapidly being displaced by the stamp mill and smelter. For several centuries the simple, but effective, arrastra and patio have been employed in developing the mineral resources of Mexico, but the demand is now for a more rapid and economical means of reduction of ores. Mexico abounds in mineral deposits, but not all of them are easy of treatment, and, in some instances, the highest chemical and metallurgical skill will be required. At present, however, the ores are being mostly milled, amalgamated and cyanided, or sent to the smelters, but there is an abundance of ore which will not pay the excessive cost of transportation and treatment, which, later, will become available by reason of railroad construction and cheaper and more satisfactory methods of reduction, in which electricity may be expected to take an important part.

WHEN deciding upon a site for a smelter there are many important questions to be decided. Among these are, first, an abundant supply of ore sufficient to justify the expense of building the reduction works. Next a supply of proper fluxing material—silica, lime and iron. These are all important, for no matter what the grade of ore, if it is not available in sufficient quantity, the investment will prove a loss, and unless the ore be self-fluxing—a rare occnrrence—it is useless iu the smelter without fluxes. Another importaut factor is cheap transportation, which will enable ores to be shipped to the smelter at a minimum expense. Fuel must be of good quality and as inexpensive as possible. When there is reasonable assurance that these esseutials can be had, theu, and not till theu, may a smelting project be viewed as an assured success if there is pleuty of money on hand, and expert management be provided.

Mineral or Agricultural Land?

Recently the Government has thrown open to entry and settlement several large tracts of land in California which had formerly been included in the forest reserves. In northern California three of these tracts include portions of the Mount Shasta, Lassen peak and Feather river forest reserves. This is done on the information of forestry experts who have decided that these particular tracts, aggregating 558,000 acres, are better suited to agricultural than forestry purposes. In Mariposa county, in the vicinity of Bear valley, 40,000 acres are also withdrawn from the Yosemite forest reserve and opened to settlement. This latter area is in the heart of the mineral section of Mariposa county, and while certain portions are undoubtedly valuable as agricultural land, unless extreme care is taken by the intending settler he is likely to have his filing contested by mineral claimants. The time to determine the character of land is before filing is made by the agricultural applicant. The law excepts all land "known" to be mineral from agricultural entry, when such "land is more valuable for mineral than for agricultnral purposes." This is, in the very nature of things, while not ambiguous, an uncertain quantity, for the mineral vein or deposit which is unprofitable to-day may be the paying mine of the near future. In the area included in the Mariposa lands which have been thrown open to settlement, arc numerous gold-bearing veins and pocket mines, the value of many of which can only be determined by time. Of course, many of these are known, but it is improbable that all of the veins or deposits have becn located or discovered, and the experience of the past has shown that in snch a region the mineral industry is of greater value to the country than the product of agricultural pursuits. Indeed, in that particular region the farms increase or decrease in value with the rise and fall of success in mining, for the eutire conuty is dependent upon the mines for support—farmers aud townspeople alike—for mining is the only support of the region, which is too far removed from other markets to make agriculturc profitable. It is to be hoped that when applications are made at the land office the uecessary steps will be taken to determine the character of the land before the applicatiou is filed, and in this way expensive and unnecessary litigation averted.

THE Mexican tariff has been chauged recently with a view to protecting the new manufacturing industries of that Republic. The duty on machinery imported into that country has been raised somewhat, which may influence importation of mining machinery to a slight degree. Mining and other machinery are now being made in Mexico, and it is the desire of the Mexican Government to protect their home industries. The duties on wagons, household articles, etc., will have but a small effect on the mining industry. Some months ago a duty on nitro powder was announced to take effect; but this is as yet inoperative, as no powder has yet been made in Mexico.

FROM every section of the mining West comes the news of new finds aud the successful reopeniug of old mines. Although we are still early in the year 1904, the outlook for a prosperous year in the mining industry is very promising. There is little heard at present of labor troubles, though with the coming of summer the fight is likely to be renewed iu several sections. On the whole, the outlook for 1904 is much more promising thau would have been supposed six months ago. The greatest activity is noticeable in the gold and copper producing regions, though other metals are by no means being ueglected.

ACCIDENTS in mines are usually of a novel or unexpected character. It is strange, but a fact, that in performiug extra hazardous work about a mine few men are hurt. This is duc to the fact that the danger is imminent and the necessary precautions arc taken to avert it. Mcn fall into shafts aud are hurt in a great variety of ways that are unanticipated, but when working iu bad grouud every one is alert and on their guard, protecting themselves from falls of rock, or other danger.

Still Room for Improvement.

There is a wide range iu the wages paid miners in the United States, varying from $1.25 or $1.50 per day of ten hours in Tennessee and some of the Atlantic States to $3 and $4 for eight hours in most of the Western States. This difference does not wholly represent the variable efficiency of the labor, for in some of the poorly paid districts the workmen are quite as industrious and as capable as those of the West. The difference in the cost of living, however, in the various sectious goes far toward equalizing the wage rate. In Central America and Mexico native miners are paid $1 to $1.50 per day silver coin of the country, and generally speaking the labor is inferior — that is, what is usually considered skilled labor, such as drilling, timbering, etc. The lower class of unskilled workers are probably as efficient as are fouud elsewhere. While there is no probability of an immediate increase in wages in the metal mines in the Eastern and Southern States, it is not more likely that there will be a material decrease in wages paid labor in the mines of the West. To lower the cost of mining it will be necessary, as in the past, to practice rigid economy, improve existing methods of miniug aud reduction of ores, and to adopt mechanical means to the performance of the work now done by men, as far as economically possible. In this age of advancement, innovation and discovery, it is useless to say that this is no longer possible, as having reached the limit of improvement. There is no more reason to reach such conclusion than there was twenty or even ten years ago. Electricity is one of the most important factors to which we must look for much in the way of reduced expense in both mining and metallurgy, and ten years hence we will doubtless have in successful operation many electric devices iu mining that to-day are unknown and perhaps unthought of.

WHAT the limitation of head will eventually be in hydraulic power plants remains to be determined. In the early days of hydraulic mining, in the desire to reduce the expense of flume and ditch construction, the so-called inverted siphon was introduced whereby water is conveyed from a ditch, flume or reservoir on a hillside across a canyon by means of a pipe, the water having a tendency to rise in the pipe on the opposite side of the canyon, according to the well known principle of physics. At first these siphons were constructed so that the maximum head at the lowest portion of the line did not exceed 250 feet. In 1870 the Spring Valley Water Co. built a siphon in Butte county, Cal., on which the maximum head was 1000 feet. The pipe line supplying Virginia City, Nev., with water had a head of 1720 feet. The Standard Electric Co. of California has a head of 1900 feet at its power house at Electra in Amador county, and now an electric power company in the State of Washington is constructing a pipe line where the head will be 2500 feet, although there is one in Switzerland said to have a head of 3400 feet—equal to a static pressure of 100 atmospheres, or 1500 ponnds per square inch of surface of the pipe. Such installations develop a very high efficiency, but they are also extremely dangerous if a large factor for safety be not provided. Some years ago an engineer making an examination of a pipe line near Sonora, Cal., where the head did not exceed 500 feet, was instantly killed by the bursting of the pipe, from what cause was never known, other than it was too weak to stand the pressure. The danger of streams of water under high head are understood by hydraulic miners.

IT is as important that the mine owner should know the actual value of his mine as the engineer who examiues it with a view to purchase. Guess work and extravagant estimate is no longer permissible with experienced men. It is necessary that facts be submitted, and if no facts are obtainable, then the mine must be developed so that the uecessary information may be had.

ACCORDING to the sworn statements of the several mine managers of the Cœur d'Alene region in Idaho, the lead-silver mines there producecd in 1903 a uet profit of nearly $1,500,000. These statements arc made, as required by the law, to the assessor of Shoshone county, and form the basis of mine taxation, and indicate that the mining industry in that section is prospering.

CONCENTRATES.

A MILLSITE may bo located which has no connection with a mining location. Such a site may bo used for the location of a custom mill.

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DACITE is a quartz-bearing varioty of andosito. In it, as woll as in andesite, gold and silver boaring veins occur. Rocks of this typo have mostly been intruded in Tertiary time.

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WHEN about to pour molten metal into a mould from a crucible, it is not advisable to have the mould too hot. An overheated mould causes large air vesicles in the lowor portion of the bar.

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THE mineral specimen from Copporopolis, Cal., is bituminous rock, probably shale, or clayey matter saturated with bitumen. The bituminous matter is readily soluble in chloroform, but not in water.

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BISMUTH (metal) is quotod at $2.10 por pound, subnitrate at $2 por pound and sub-carbonate at $2.25 per pound, Now York City. Bismuth is often accompanied by tin oros, and somotimos by gold and silver.

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SOME mines which have made a good record of profitable production so long as they could be worked through modium of a series of tunnols or open cuts cease paying upon the work being carried below the level of the lowest adit.

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IN numerous regions laccoliths are accompanied by valuable ore deposits. Noted examples are found at Leadville, at Aspen and in tho San Juan region of Colorado, at Eureka, Nev., and in tho Black Hills, S. D. Laccoliths occur, however, elsewhere, which, as far as known, are not associated with ore deposits.

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A MINING PARTNERSHIP is formed when two or more men who own or acquire a mine for the purpose of working it, and extracting the mineral therefrom, actually ongage in such mining operations. Persons jointly conducting a mining enterprise are partners, though there may be no express agreement for such partnership.

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THE idea that a fissure vein cannot traverse two adjoining formations (slate and diorite), for the reason that one is of sedimentary origin and the other eruptive, is without foundation. Fissures exist in rocks of all kinds and of all ages, the relative age of adjoining rock masses having no influence on the formation of fissures.

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HOISTING ROPES should be examined frequently, and it is a good idea to have a new rope on hand to replace one that is worn. No rope should he used longer than it is known to be absolutely safe. The maximum load does not represent the maximum strain upon a rope. The greatest strain is caused by sudden starting and stopping.

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DIFFERENT KINDS of ore require different kinds of screens. A flinty ore which has a tendency to crush into flakes rather than granules requires a slotted screen, not one woven or needle-punched. Granular ore, on the other hand, when crushed will pass more readily through a woven or needle-punched screen than through a slotted one.

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ALIENS may locate and hold mining claims under the laws of the United States. The peaceable relocation of a claim taken by an alien (for the reason that such prior locator is an alien) will not inure to tho benefit of the relocator, but it will force the Government to institute the proceedings known as "inquest of office." No one but the Government can set aside an alien's claim.

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THERE are a few mincral deposits, but no "veins," in the Hawaiian Islands. The only minerals found there of commercial value are kaolin, sulphur, gypsum and building stone (tuff). Pumice is also found in large quantity in some localities. The kaolin and gypsum are the result of alteration of the volcanic rocks. The sulphur has been and is still being deposited about fumaroles and vents. The mining laws of the United States do not apply on the Hawaiian Islands.

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WHERE timbers are scarce or expensive a vein of moderate size with good standing walls may be stoped "on the run" by putting up raises at proper distances and stoping out from the raises, leaving a solid block of ore over the back of the drift. When working up by tbis method only enough ore is drawn out through the mill hole to permit the miners to keep within easy reach of the back of the stope. When the block has been exhausted and the ore all drawn off, the strip of ore over the back of the level may be removed also.

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THE rock samples from "W.," Nevada are: No. 1 is trachyte, containing hornblende and mica (biotite); No. 2 is a fine-grained granite rock; No. 3 is felsitic dike rock, in which feldspar is the principal constituent. It contains fine needle-like crystals of mineral, having a metallic luster, which are apparently silver sulphide—the quantity is too small for accurate determination. No. 4 is an amygdaloidal rhyolite, in which the air vesicles are now filled with silica. The silica present is secondary. It contains an abundance of microscopic crystals of magnetito.

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THE owner of a mine situated above or at a higher levol than his neighbor may at any time discontinuc work which may result in causing tho water in the idle mine to flood tho lower property. This is the misfortune of tho lower owner, who has no rccourse in such ovont. Whilo operating, mine owners kcep their mincs as free from water as possible, or as free as necessary to the operation of the mine, and this may result in the lower mine having practically no water to handle. The sudden cessation of raising water at the upper mine he cannot prevent, even if it result in also closing his mine.

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IF a slag dump contains the ossential elements for forming a suitable fluid slag it has no particular value as a flux, unless the ore charged with the slag also contains the necessary eloments, iron, silica and limo in proper proportion, for if the ore be siliceous theu the slag will be too siliceous. If the ore be calcareous, tben the slag contains too much lime, and if tbe ore be high in iron, the slag will contain too much iron, and in any of these cases an unsuitable slag will result. The slag may be resmelted, however, with a small amount of copper ore and, the copper acting as a carrier, will take up a large percentage of tho gold and silver in the slag.

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WHAT is known as the "Dhiel process" in the treatment of gold ores consists of a variety of operations, but is essentially that of sliming the ore, and treating the pulp by a solution of potassium cyande and bromo-cyanide by agitation and filter pressing the sludge, and then precipitating the gold from the solution on zinc shavings. It also includes amalgamation, which may be accomplished before or after the fine grinding of the ore. It is wholly a mechanical and chemical process, the ore being treated raw. It resemblos the Sulman-Teed process, the essential difference being in the precipitation of what is known as zinc "fume" instead of on zinc shavings.

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CARNOTITE, which contains uranium oxide, is one of the interesting radium minerals. It is yellowish green in color. That this mineral possesses actinic properties may be demonstrated by placing a piece of metal, such as a coin or key, on a sensitized photographic plate and covering the plate and metal with the powder of carnotite. In twenty-four hours the plate may be developed and a distinct image of the metal will appear on the plate. Carnotite shows no sign of light in the most intense darkness. A large number of minerals contain uranium, but, as far as known, carnotite and pitchblende or uranite are the only ones of commercial importance.

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MANY minerals have a tendency upon fine crushing in water to separate from the accompanying minerals and float upon the surface of the water. Graphite, molybdenite, tellurides, gray copper, arsenical iron sulphide, gold, copper and silver minerals are notable examples of this. Often this floating scum is high in gold and silver. It is frequently observed floating on the surface of the water in the settling boxes under concentrating machines. Wherever possible this floating scum should be carried off through a pipe, the lower end of which discharges under water. In some instances it may be necessary to repeat the process several times, a portion being saved from each box.

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THE capacity of crushing rolls to reduce rock to fine material depends to a great extent upon the evenness of the faces of the rolls. When the faces become worn unevenly the capacity is greatly reduced. The character of the ore is also important. Rolls should be fed to their full capacity, there being no economy in slack feeding. The modern high-speed roll requires careful attention, and when properly adjusted will give large capacity for power employed, but, it must be remembered, rolls are for pulverizing and are not a rock-breaking device. All rock fed to rolls should be reduced by breakers to small size. No rolls are expected to give high efficiency or satisfaction on coarse rock.

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SOME fossils (fisb, wood, etc.) turn to copper, silver-copper and sulphide iron ores, under proper conditions. The most noted instances of this kind are the copper-silver-bearing fish and wood of the permian age, found in Russia, Kansas, Texas and in some other regions where this formation occurs. Sulphide of iron filling casts of fossils is not uncommon in several formations, but rarely, if ever, contain gold or silver in appreciable amount. In the silver mines of Silver Reef, southern Utah, fossilized wood sometimes contained silver. In these mines the silver occurred chiefly in the form of chloride, or as native metal in sandstones and shales. Thero are intrusive rocks in the vicinity.

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QUARTZ TAILINGS woigh when dry about 100 pounds per cubic foot (20 cubic feet per ton). Screened tailings, where the grains are approximately the same size, weigh less than where they are of variable size. Where tailings beds are firm, they may be sampled by means of a posthole auger. If they are very dry and run readily, it will be necessary to dig pits and handle larger quantities. The dump should he divided into blocks of regular size and several samples taken in each block, keeping a record of each block separately. As the tailings are removed from the pile in car or wagon, small samples may bo taken of each load by means of a tryor, such as is used in sampling concentrates in sacks. It is made of Russia iron and resembles a buttor tryer.

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IN grinding sulphurets for treatmont by the cyanide process, it is considered good practice by some to introduce the cyanide solutions into the barrel where the grinding is being done, as, if subsequontly discharged into an agitating tank, tho sulphides will "pack" almost instantly should any stoppage of tbe machinery occur. Cyaniding in the barrel obviates this contingency. Probably a better practice would bo to crush the ore dry and cyanide in a separato barrel. This would permit the continuous operation of the pulverizing mill and admit of the cyanide barrel being rotated auy desired length of time.

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A MINING LOCATION, not patented, is property in the strictest sense of the term and as such is taxablo and subject to sale under execution. In regard to this the Supremo Court of California said, in the case of Meritt vs. Judd: 14 Cal., 60: "From an early period in our State jurisprudence, we have regarded these claims to public mincral lands as titlos. They are so practically. * * * Our courts have given them the recognition of legal estates of freehold; and so, for all practical purposes, if we except some doctrine of abandonmont not perhaps applicable to such estates, unquestionably they are, and we think it would be in harmony with the general judicial system to deny to them the incidents of freehold estates in respect to this matter."

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NO PORTION of the Grand Canyon of the Colorado river is in the State of Colorado. The Colorado river is formed by the union of the Green and Grand rivers. The confluence of these streams is in Utah, at tho southernmost point of Grand county. Tbe Grand Canyon begins below the junction of the Rio San Juan with the Colorado. It is 217 miles long and from 3000 to 6000 feet deep. There are mineral deposits in the limestones and quartzites of the Cambrian in tho lower portion of the gorge. These ores are mostly lead, with silver. Gold in the older crystallino rocks is also reported, but none of these deposits are being worked further tban the assessment work necessary to hold them. This is due to their inaccessibility, and it will probably be a long time before the condition will be improved.

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WHERE ores are to be sorted by hand almost the only guide to the sorter is the color and luster of the several minerals. In an ore containing copper pyrites, pyrite, zinc blende and galena in a quartz gangue, each man working at the table or traveling belt selects pieces of the same kind of mineral and throws them into a separate box or heap. One is guided by the brassy-yellow of chalcopyrite, another by the bright metallic lead color of the galena, a third by the black or brownish hue of the blende, while the iron and the finely crushed material of all kinds passes along with the belt to be recrushed and concentrated mechanically. By this means several separate products are obtained, and pay received for each according to its value. The zinc is not wanted with either the lead or the copper, and each alone brings a higher price.

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IN the development of a mine, crosscuts should always be run into both hanging and foot walls, to ascertain if parallel veins exist. Particularly is this advisable if the rocks adjacent to the vein are soft or show any sign of mineralization. When the crosscut passes from slaty or schistose rocks into hard, granular and unmineralized ground it is usually safe to stop the crosscut, for there is then little hope of finding a vein in the immediate vicinity which is in any way related to the vein upon which the main work is being dono. There are many veins in hard, firm rock showing neither slaty nor schistose structure, even adjoining the vein, and often the ore is "frozen" to the rocks. There then appears no inducement to crosscut. Still, even under these conditions, it is advisable to run drill holes into the walls occasionally to ascertain what the condition in the adjacent walls really is. Neglect to do this has lost valuable ore shoots to the one failing to take this inexpensive precaution.

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MANGANESE ORE, occurring in dolomite and containing five ounces silver, could constitute a suitable flux at smelters and might be valuable for that purpose, the silver being paid for separately; but, if no smelter is convenient, it is doubtful if any attempt at concentration would result in commercial success. The various ores of manganese—alabandite (tbe sulphide), pyrolusite and psilomelane (the oxides)—all have a higher specific gravity than dolomite, and, by care after crushing, the ore could he concentrated on tables or belts; but, unless transportation be very low, the ore would have no commercial value for steel making, and, if employed in that industry, the silvor values would be lost. The idea suggests itself that, as the vein is in a region of rich silver-bearing veins, possibly by sinking upon the vein, a better grade of silver ore and less manganese might be found. Many important silver mines contain large amounts of manganese, usually in the form of black oxide at the surface, but as rhodonite (silicate) and rhodochrosite (carbonate) in depth. Alabandite (the sulphide) is rare. High-grade pyrolusite or psilomelane (oxides of manganese) are worth about $20 per ton after being ground fine. It is used in chlorination of gold ores, in glass making and other manufactures.

Schists and Slates as Ore Carriers.

Written for the MINING AND SCIENTIFIC PRESS by ARTHUR LAKES.

I have read with interest the article on "Mica Schist as an Ore Carrier" in the issue of the MINING AND SCIENTIFIC PRESS of February 8, and would like to add my quota derived from experiences principally in Colorado, Wyoming, Arizona, Nevada and North Carolina. It appears to me that some distinction is to be made as to the probable continuity or richness of veins according largely to their particular mode of occurrence and surrounding geological circumstances in schists and slates, some of which, I think, have not been fully brought out in the excellent article referred to.

In entering a region of schists traversed by quartz veins, lenses or ore deposits, it is of primary importance to observe whether, first, the quartz veins or lenses conform exactly both in strike and dip to the bedding or stratification planes of the slates and schists; or, second, whether, though appearing to so conform, they may not really cut the formations at a slight and scarcely perceptible angle differing from that of the strike and dip—i. e., diagonally to them; or, third, whether the quartz bodies or lenses occupy an undoubted true fissure at a large or right angle to the dip and strike of the strata, cutting decidedly across them. In the first case the string of lenses may be strictly of a segregative type, occupying no true fissure, but simply the lenticular openings caused by a gentle corrugation of the strata. Such lenses would, we think, be more uncertain in continuity or ore-bearing than classes number two and three, which occupy true fissures or zones of parting and slipping of the rocks, and come strictly under the definition of true fissure veins. But little difference may appear to the ordinary observer between the outcrops of numbers one and two; but in developing and working downward on lenses containing ore in number two there will be distinct signs of movement and fissuring observed on the walls of the lenses, such as slickensides, brecciated rock, striæ, and other well-known signs of fissuring and faulting movements.

A close examination of the results of deep development and greater experience with these sorts of deposits will show that the lenses, which at the surface may have appeared to exactly conform to the dip and strike of the formation, did not in reality do so, but in extension along the surface diagonally deviated from the true line of strike and correspondingly, or still more so, diagonally in the degree of dip with that of the true dip of the strata or schists. A good example of this is in the Minnie Moore mine at Bellevue, Idaho. A series of quartz lenses carrying large bodies of very rich silver-lead ore occupy a definite zone not far from the contact of a great, overlying mass of intrusive diorite. This mineralized zone can be traced for some miles along the so-called "contact zone," and was assumed by some to conform in dip and strike to the slates along a particular horizon or zone; but by following along the outcrop, and pursuing the vein down in depth, we find the ore-bearing zone materially deviating from both dip and strike of the strata, sometimes the fissure being partly in slates and sometimes partly in limestone intervening between the slates and the diorite, showing clearly that the quartz-zone-lenses occupied a true fissure or true line of movement and parting in the formations, and the ore bodies were not, as some had assumed, "bedded veins" at contact of an intrusive diorite sheet.

Depth in the mine showed ample signs of movement apparently both before and after the vein filling. The ore was usually associated with much brecciated country rock, which, with secondary quartz, it cemented together.

The walls of the ore-bearing lenses were intensely slickensided, and torsional striæ, sometimes in opposite directions, suggested more than one movement having taken place during or after the vein filling. The lenses appeared to be formed (in some cases, at least) by lateral compression and corrugation, as shown at one particular point in the mine known locally as "Cape Horn," where the strata was intensely corrugated into a round, bow-shaped lens.

On the wide space opened by this corrugation there was a notably large body of rich ore found, and in each level where this structure occurred and continued down ore was abundant.

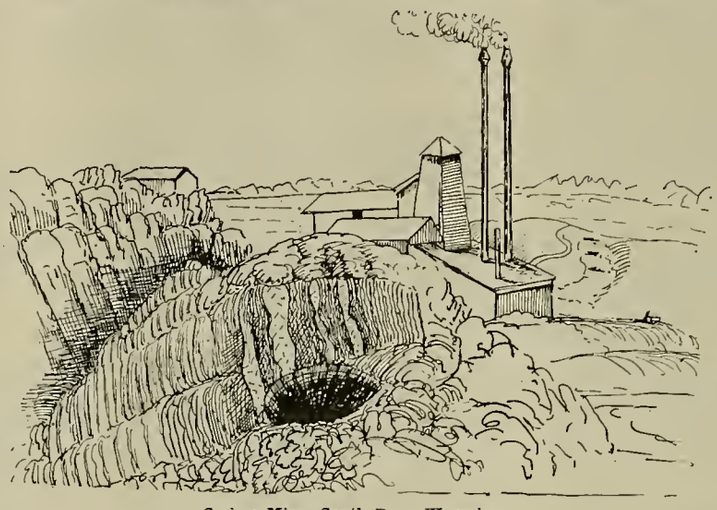
It was worthy of note that immediately after or close to the abrupt end of this corrugation there was a sharp fault indicated by a gulch on the hillside, and by a true fault line and breccia zone in the workings of the mine.

Lens followed lens in depth, and at intervals. At one point and period in the mine's history they seemed temporarily to have lost their cue for discovering the line of lenses by a supposed fault, and, as an illustration of what the article stated, the mine was given up for lost, and abandoned for many years, until other parties took a fresh hold and with a little scientific, common sense development came onto the successive lenses again laterally and in depth.

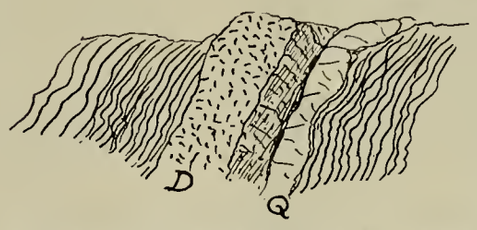
Experience with this and other mines shows that lenses in slate or schistose formations may occupy true fissures, and in such conditions there is as much reasonable expectation for the vein and ore to keep down in depth as is usually attributed and allowed to so-called "true fissure" veins.

In North Carolina the multitude of ore-bearing lenses that constitute the zones worked there by great open quarries and cuts, while appearing to be

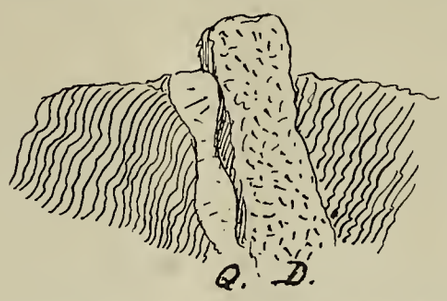
Pegmatite Dikes and Veins in Slates on Sweetwater River, at Base of Wind River Mountains, Wyoming.



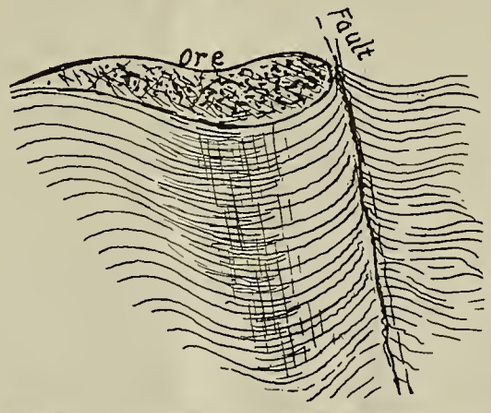
Carissa Mine, South Pass, Wyoming.



Quartz Vein at Contact of Porphyry Dike, Both Conformable With Schists.

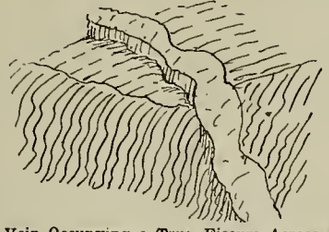


Quartz Vein at Contact with Dike Unconformable with Schists.

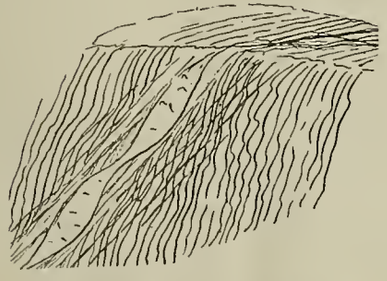


Lens Full of Ore Caused by Corrugation and Followed by a Fault as at Minnie Moore Mine.

Segregative Quartz Lenses Conformable with Schists.



Quartz Vein Occupying a True Fissure Across Schists.



Lenses Cutting Diagonally Across Schists.

segregative lenses lying conformably with the strata, are found, on close examination, to occupy true slipping or fissure planes, cutting the dip of the strata diagonally at an acute angle, and we believe generally that where these zones of quartz lenses are truly ore-bearing to any important degree they will be often found to occupy true fissured zones, or zone of "discission," parting and slipping.

When schists or slates are violently uptilted, as they commonly are along or in a mountain range, their uptilted condition almost insures actual slipping or fissuring movement or the sliding of one uptilting plane of strata upon one similarly uptilting. Slickensides, even in unaltered sandstone strata, are almost invariably found between the stratification or lamination planes of rocks in such positions, consequently lenses of quartz, either barren or ore-bearing, may reasonably be assumed to occupy true fissures in such formations and under such conditions.

At South Pass City, Wyoming, at the base of the Wind River mountains, there are vast bodies of tilted slates and schists. These are traversed in some places by great, irregular bodies of pegmatite, consisting of coarse, crystalline, orthoclase feldspar, and quartz with comparatively little mica. The greater masses may cut clearly across the dip and strike of the slates and schists, while the smaller, lenticular veins and bodies may conform, or appear to conform, with them. In both conditions near the surface, at least, these veins carry ore.

The Carissa mine at South Pass is on a zone 50 to 100 feet or more wide of vertically tilted schists, the ore occurring in the schists themselves, but more especially in the quartz lenses at intervals between them down in the mine. In some of these lenses there are open "vughs" or cavities containing beautiful, perfect crystals of quartz 8 to 10 inches long by 4 inches wide. Such cavities and such crystals are certainly suggestive of a vein formed in a true fissure and line of slipping and parting that alone could open and keep open cavities large enough for such crystals to gradually form and exist.

In some parts of Arizona, as on Humbug creek, south of Prescott, the country is mostly of evenly bedded schistose rocks and the lenses of quartz lie, to all appearances, in parallel lines, evenly and conformably between the strata. These lenses, like many of the pockets in the California slate region, have proven quite rich to a depth of a few feet, and have been trenched or "chlorided" with profit by the first prospectors. How far the lenses of quartz and the unoxidized ore may keep down remains to be shown by deeper development. It is probable that if in the walls the dip and strike of these veins were carefully noted or followed down they would be found to not strictly conform to the bedding planes or dip or strike of the country, but to occupy true fissuring or parting zones, or, as some have called it, zones of "discission."

In going over a schistose country occupied by these lenticular bodies, a lens of quartz may appear much wider and thicker on the surface than it will be found in depth. Care, also, is to be taken lest by a prominent quartz vein or lens outcropping on the surface, falling over on its side along the strike, its closely parallel ruins may suggest a much wider vein than really exists. We remember a case of such a big quartz vein in the slate region of North Carolina that, measured on the surface, was estimated at 50 feet width. At a few feet in depth it proved to be only 10 feet thick.

Again, an important consideration is as to whether the quartz lenses occur in a region wholly composed of slates or schists, or whether that region is also more or less traversed by eruptive dikes or intrusive sheets, and whether or not there are evidences of more or less disturbance or of intense metamorphic action.

Lenses occurring in a region composed wholly of conformable slates or schists are likely to be lenses of segregation, usually of hard, white, barren quartz, and not liable to be very productive of ore, or, if ore occurs at all, liable to be superficial, pockety and unreliable. There are cases, however, to the contrary.

When these slate regions are traversed by igneous rocks and show signs of great local metamorphic action, such as that changing the slates into sheets of novaculite, or porcellanite, or quartzite, coating the rocks with green epidote, or giving rise to garnets, staurolites and other minerals indicative of strong metamorphic action, when this is also accompanied by abundant signs of faulting and disturbances, we may consider that the geological conditions are favorable for ore occurrences. In such a district, too, it has been observed that the lenticular veins are generally more reliable in character, mineral, size and depth if they are at close contact with the eruptive rocks, than if they are wholly within the slates. Many good mines in Arizona have been developed to considerable depth in veins located at contact of slates and igneous dikes.

In Colorado the schistose or slate element is not so characteristic as in some other regions. In the Gunnison district we have great areas of uptilted schists, probably of Algonkian age. In these there appear to be two or more kinds of ore-bearing quartz veins, some occupying true fissures, like that of the Vulcan mine, in sericite or "silvery mica schists," producing both tellurium, free gold, and gold-bearing pyrite in a gangue of novaculite schists, jasper and chalcedonic quartz. Others, simulating—fissure veins and traversing the country for miles, lying conformably with the strata—appear to be quartzite ledges rather than veins, and are rarely productive.

The white mica (sericite), "silvery" looking schists of this region are often found rich in gold near the vein, and when pounded up "horn spoon" well in free gold.

A remarkable feature of some slates near Wadsworth, Nevada, is that when rubbed together in the dark they emit a strong yellowish glow, resembling phosphorescence. In the Gunnison region numerous large dikes of igneous rock traverse the slate formations.

At the head of Ule creek, in the same region, north of Crested Butte, Treasury mountain is composed of marine Cretaceous shales, metamorphosed into slates. These slates are locally traversed by fissure veins of quartz carrying some ore, but, as is common in fissure veins in such formations, when they cut across the strike and dip they are apt to split up and be scattering both in quartz and ore.

These Gunnison mountains are intensely penetrated by eruptive rocks and evidences of metamorphism are on every side, such as sandstones changed to quartzites, limestones to marble, and shales to slates. It is not surprising, therefore, that ore-bearing veins should occur under such conditions.

A System of Fusing Ores for Assaying.*

Written by Arthur Lachman.

The problem of finding a suitable flux for the ordinary ores met in the practice of assaying is often solved by the assayer upon the "hit-or-miss" principle. The text-books devote scant attention to the subject, or else present such a mass of detail as to be utterly useless. As a usual result, each practicing assayer has his own special "system" of fluxing his ores, which system he guards as a great secret; and to his system he attributes all his own successes, and to the want of it all the failures of his competitors.

Several years ago I was called upon to face a problem more difficult than the fusion of ores, viz., the problem of teaching students to fuse them. For while it is comparatively easy for the instructor to indicate the proper fluxes for each ore, it is a question of months before the student acquires the same facility, and the manipulation of the fire assay becomes an art rather than a science. Under these conditions I developed a scheme for calculating in advance the best flux for any given ore. This scheme was tested in my laboratory with three successive classes, and, as the results were uniformly satisfactory, I feel justified in publishing them herewith.

The General Composition of Ores.—The relative proportions of mineral to matrix may vary enormously; but in the case of ores of gold and silver, which are being considered here, the mineral constitutes but a very small percentage of the ore as brought to light. It is evident, therefore, that in fusing ores of gold and silver we must devote our attention chiefly to the matrix. The matrix is almost always siliceous, often of nearly pure quartz, and may contain, besides the minerals of the precious metals, minerals of other metals as well. The volatile elements of these accompanying minerals are usually removed by roasting, previous to the assay proper. The non-volatile elements in the accompanying minerals are discussed hereafter.

The chemical character of the matrix determines the nature of the flux to be added. Mineralogists are accustomed to classify rocks and minerals as "acid" or "basic," chiefly with reference to the amount of silicic acid present. Thus, granite is an acid rock, basalt a basic rock. This chemical classification is the usual foundation of all fluxing methods and is worked out very simply: An acid rock requires a basic flux, e. g., soda, and a basic rock requires an acid flux, e. g, silica or borax.

The General Composition of Slags.—The object of fusing ores with fluxes is to produce a suitable slag. A slag is a glassy mass, usually and preferably brittle, whose chief virtue is easy fusibility. By proper attention to the composition of the ore, these properties can be readily secured. A fusible slag may be had, first, by adding the necessary elements in suitable proportions; and, second, by providing for the presence of as great a variety of compounds as may be convenient. This latter provision finds its basis in the fact that the melting point of any solid is lowered by the presence of any other substance. It is seldom necessary to make special provision for this, as ores usually contain a considerable variety of elements. The selection of a suitable flux is much more important and is best arrived at by appropriating the experiences of the metallurgist.

Metallurgy performs on a large scale what the assayer endeavors to do in his little crucible, viz., to fuse and slag the worthless matrix or gangue and save the valuable metal. Metallurgists have learned by long and expensive experience to flux their ores with the utmost regard to economy of both fuel and fluxing materials. The silicates showing the best behavior as slags have the following general composition:

Subsilicates	$4M_2O\ SiO_2$	$4NO\ SiO_2$	$4R_2O_3\ SiO_2$
Monosilicates	$2M_2O\ SiO_2$	$2NO\ SiO_2$	$2R_2O_3\ SiO_2$
Bisilicates	$M_2O\ SiO_2$	$NO\ SiO_2$	

where M is a univalent metal, N bivalent, R trivalent. All of the subsilicates are easily fusible; of the monosilicates, those of the alkalies and lead are most fusible; then follow the silicates of iron, calcium, magnesium and aluminum; of the bisilicates, only those of the alkalies and lead fuse readily.

The Calculation of Fluxing Charges.—From the formulæ of the above silicates it will be seen that all siliceous rocks may be assumed to consist of two portions: A fusible silicate and an infusible residue. It is this infusible residue that needs the addition of a flux. For example, trachytes usually average about 60% of silica; they also usually contain sufficient alumina, lime, oxide of iron, soda and potash to form a fusible mass with one-third of the silica; we may, therefore, readily find a flux for trachyte by assuming 60% of it to be fusible, the remaining 40% to consist only of silica.

To make similar calculations for other rocks, it is only necessary to reduce their composition to their "silica equivalent." That this is not a matter of much difficulty will be shown by the following data. In order to fuse pure silica, it is sufficient to form the bisilicate:

$$SiO_2 + Na_2CO_3 = Na_2SiO_3 + CO_2$$
$$SiO_2 + PbO = PbSiO_3.$$

From these equations, one assay-ton of silica will require, in round numbers, the following quantities of flux: Either carbonate of soda, 50 grams; or, oxide of lead, 100 grams. On the principle of having the greatest variety of substances present, the flux for silica (per assay-ton) would consist of 25 grams soda and 50 grams litharge. On applying this principle to trachyte, for example, we find that we may assume it to consist of 40% infusible silica and 60% fusible silicates. Then 40% of an assay-ton of silica would require only 40% of the flux just given. The crucible charge would be: Trachyte, 1 A. T.; soda (40% of 25 grams), 10 grams; litharge (40% of 50 grams), 20 grams.

From this example it will be seen that for each per cent of "infusible" silica it may contain, an assay-ton of ore requires either one-half gram soda or one gram litharge, or any desired proportionate amount of both.

Flux for Limestone.—Limestone, or carbonate of calcium, is the only common rock that calls for the addition of silica in order to fuse it. To form a subsilicate each assay-ton requires four grams silica; for the monosilicate eight grams are required. It is usually preferable to form the subsilicate, as it is much more fusible; but in very complex mixtures the monosilicate will suffice. For lime (CaO) combined in silicates, each per cent per assay-ton calls for 0.08 gram silica to form the subsilicate and for 0.15 gram to form the monosilicate.

Percentage base.	Percentage silica.
One per cent alumina.	0.43 per cent silica.
" " lime.	0.27 " "
" " iron oxide.	0.57 " "
" " sodium oxide.	1.0 " "
" " potassium oxide.	0.67 " "
" " magnesia.	0.36 " "

The application of these figures will be best seen from the detailed calculations below:

Silica equivalent of quartzite.				Silica equivalent of granite.			
Composition—				Composition—			
Silica			77.0	Silica			72.0
Alumina	13.0	equiv'l't to	5.6	Alumina	15.0	equiv'l't to	7.0
Lime	0.7	"	0.2	Lime	1.6	"	0.5
Iron	1.1	"	0.3	Iron	2.2	"	1.1
Potash	4.3	"	3.0	Potash	5.1	"	3.4
Soda	0.7	"	0.7	Soda	2.8	"	2.8
Magnesia	1.0	"	0.4 10.4	Magnesia	0.3	"	0.1 14.9
Silica equivalent			67%	Silica equivalent			57%

Silica equivalent of syenite.				Silica equivalent of trachyte.			
Composition—				Composition—			
Silica			60.0	Silica			60.0
Alumina	17.0	equiv'l't to	7.3	Alumina	17.0	equiv'l't to	7.3
Lime	4.4	"	1.2	Lime	3.5	"	1.0
Iron	7.0	"	4.0	Iron	8.0	"	2.5
Potash	6.6	"	4.4	Potash	5.0	"	2.5
Soda	2.4	"	2.4	Soda	4.0	"	4.0
Magnesia	2.6	"	0.9 20.2	Magnesia	1.0	"	0.4 12.7
Silica equivalent			40%	Silica equivalent			40%

Silica equivalent of porphyries.				Silica equivalent of basalt.			
Composition—				Composition—			
Silica			53.0	Silica			45.0
Alumina	16.0	equiv'l't to	7.0	Alumina	14.5	equiv'l't to	6.2
Lime	6.3	"	1.7	Lime	14.0	"	3.5
Iron	14.0	"	8.0	Iron	15.0	"	8.5
Potash	1.3	"	0.9	Potash	1.5	"	1.0
Soda	2.2	"	2.2	Soda	2.5	"	2.5
Magnesia	6.0	"	2.1 21.9	Magnesia	6.5	"	2.4 25.3
Silica equivalent			31%	Silica equivalent			20%

Summarizing the silica equivalents ascertained above, we have:

	Per Cent.
Clay	23
Quartzite	67
Granite	57
Syenite	40
Trachyte	40
Porphyries	31
Basalt	19
Serpentine	36

Flux for Clay.—The average composition of clay

* Abstract Cal. Journ. Tech.

is 40% silica, 40% alumina and the balauce either fusible or volatile. In forming a fusible subsilicate the alumina takes up 17% silica, leaviug 23% as the "silica equivalent" of clay. In other words, enough flux is added to combine with a weight of silica equivalent to 23% of one assay-ton. This would be either 12 grams soda or 25 grams litharge.

FLUXES FOR IGNEOUS ROCKS.—At this point the fact should be emphasized that it is not necessary to make a full quantitative analysis of an ore before proceeding to fuse it. All of the data give here are based upon the average composition of American rocks as published by the Geological Survey; and, as explained above, the only important item in the composition of a rock is what I have called its "silica equivalent." This factor is calculated below and is quite accurate enough for all the purposes in question.

The flux for any of the above rocks or gangues is ascertained by the simple rule: Multiply the "silica equivalent" by 0.25 gram soda and by 0.50 gram litharge for each assay-ton of ore takeu. It is understood, of course, that fractional parts of a gram may be ignored.

THE USE OF BORAX.—The addition of borax to an assay charge has an important effect ou the fusibility. Not only are the borates quite fusible, but they seem to exert considerable solvent power upon the silicates as well. On the other haud, borax behaves as an acid flux. One gram of borax glass per assay-ton has almost exactly the same effect as 1% of silica; so that if the flux is calculated according to the preceding principles, and borax be added subsequently, the result is likely to be a decrease of fusibility. The best results are obtained by adding a fixed amount of borax, say, 5 or 10 grams per assay-ton, and then using sufficient soda or litharge to neutralize it. Each gram of borax requires ½ gram of soda or 1 gram of litharge.

THE LEAD BUTTON.—The above calculations took no account of the fact that a certain amount of litharge is required to produce a lead button. For my owu work I usually obtain a 20-gram button; this calls for about 25 grams of litharge, which is taken in addition to the amount required for fluxing.

THE FINAL CALCULATION OF ASSAY CHARGES.—The final calculation of fluxes for any given ore is by no meaus as complicated as might appear from the detailed account given above. Multiply the silica equivalent by ½ gram soda and by ½ gram litharge. Add 25 grams litharge for the button; take 10 grams borax and add 2½ grams soda and 5 grams litharge to neutralize it; add a reducing agent, if necessary (starch, flour, charcoal). Charges made in this way may be melted dowu completely in ten or fifteen minutes; the crucible shows no tendeucy whatever to boil over; the crucible walls are uot corroded, so that the same crucible may be used iudefinitely; aud the slag is fluid, usually clear, and always brittle when cold. The use of a salt cover is necessary.

In the event that ores contain more thau one variety of gangue stuff, say, clay and porphyry, it suffices to estimate the ingredients roughly, say, to halves or thirds, to average thc silica equivalent accordingly, aud then proceed as above.

The chief advantage of the above system lies in the saving of time and materials. The charge not only fuses quickly, but a repetition of the fusion becomes unnecessary. The saviug in materials can be best seen by an example: Oue assay-ton of basalt, commonly regarded as difficult to fuse, requires 8 grams soda, 40 grams litharge aud 10 grams borax. According to ordinary methods, at least three times as much flux would be called for. A further advantagc lies in the possibility of using much smallcr crucibles; this increases the furnace capacity and decreases the cost of each assay considerably.

The Zubiate Mines of Mexico.

About 32 miles northeasterly from Hermosillo, Sonora, Mexico, is thc Zubiate mine, which for many years was a producer of silver ore. After years of idleuess it passed into the hands of Americans, who have reopened the mine and equipped it with modern hoisting and reduction machinery. Three and a half years ago the plant burned, but has since been replaced by larger works, better adapted to the treatment of ores which are difficult of treatment by ordinary methods. At present the property is equipped with a large hoist. The 40-stamp mill was rebuilt. It contains also ten pans and five settlers. Beside this there are two rotary dryers, and four rotary roasting furnaces are being put in place. Two dry pulverizers will be added. When fully equipped with the new machinery the mill will have all the essentials of a moderu silver mill. Engravings of the head frame at the main shaft and of the mill are shown on the front page. The shaft has three compartments and is 650 feet deep, being 250 feet lower than the old workings. It is stated that the vein has been drifted for 1000 feet, showing a vein 7 to 8 feet wide. The ore carries lead and silver, with base mineral, which has rendered the ore difficult to amalgamate by the more simple processes of silver milling. D. R. Oliver of San Francisco, Cal., is president.

Mill Screens.

Written by W. H. INCE.*

"For what reason have screens of such mesh been adopted?" is a question which may be very frequently asked, without eliciting a reply. Gold in different gangues requires different methods of treatment, not only with respect to the weight and size of stamps, but also to the mesh of the screen, and it is obvious that the same conditions do not equally apply to quartz, schist, dolomitic feldspar, or other varieties of ore.

The importance of ascertaining whether the mill (wet or dry crushing) is producing the maximum amount of efficient work is self-evident, yet in the majority of cases ignored. The points under discussion may be summed up as follows:

1. In what state does the gold exist in the ore?
(a) Free milling quartz, etc.
(b) Free milling and associated with pyrite.
(c) Free milling and associated with tellurides, sulphides, etc.
(d) Non-free milling.
2. When milled where do the values lie—in the tailrace after passing the plates and conceutrate ores, in the vat sands and residues after treatment, or in the slimes?
3. Practical tests with stamps and screens, guided by preliminary laboratory experiments.

LABORATORY EXPERIMENTS.—Having noted carefully the various grades of pulp from hydraulic classifiers, I have come to the conclusion that ordinary sieve grading is practically useless. With sieving, only account is taken of the actual size of the particles, irrespective of their physical characteristics. Hence, on examining a pulp from mica schist, a considerable quantity of comparatively large mica and quartzose plates passes away in slimes, whereas fine particles (passing through a 100-mesh screen), which in ordinary sieve grading would be counted as slimes, readily settle iu the vats.

The reason is to be found in the varying specific gravities and shape of the particles. Mica in flakes, of specific gravity of 2.6 to 2.9, floats off easily to the settlers, while the small angular grains of pyrites or ironstone (specific gravity 4.9 to 5.2) settle in the classifiers and are caught in the treatment vats.

Some heavier particles, however, are mechanically carried over with the slimes proper, the amount depeuding on the quantity of water, size aud iuclination of the launders, and other influences. Irregular masses of ironstone produced by stamps settle much more rapidly than rounded particles of identical size produced by ball mills or grinding pans. I, therefore, suggest in the examination of battery pulp hydraulic grading as a preliminary, the sands being afterward sieve graded as usual.

THE HYDRAULIC SEPARATOR.—I have found the various forms of apparatus for hydraulic grading used for clay, kaolin and other substances iu the state of fine division adoped in china, porcelain aud allied industries quite inadequate for grading pulp. The well-known Schone's schlammapparatus is clumsy and difficult to regulate. The modifications are expeusive and cumbrous aud unfitted for the requirements of a mine laboratory. The following picce of apparatus I have devised has giveu good constaut results, aud has the advantage of being easily and cheaply coustructed with materials everywhere at hand. The references in the diagram are as follows:

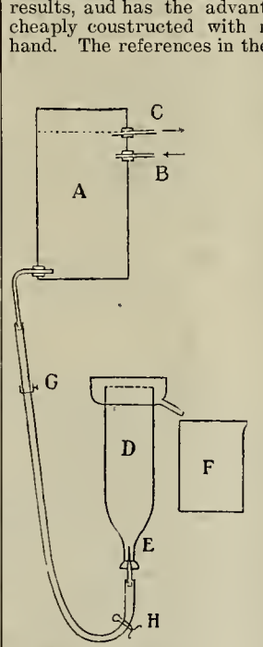


Fig. 1.—Hydraulic Separator.

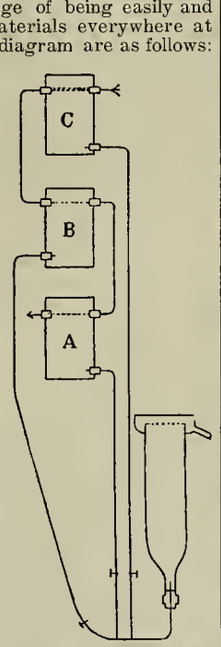


Fig. 2.—Experimental Hydraulic Classifier.

Fig. 1—A. Constant level water tank. B. Water supply from main. C. Overflow. D. Vessel where hydraulic separation takes place. E. Glass tube narrowed to a fine point, leading to reservoir by means of a rubber tube. F. Vessel to catch overflow of slimes. G. Screw clip for adjustment of flow. H. Clip or tap.

The important part of the hydraulic separator is D. It is constructed of a conical glass vessel, which may be made by neatly cutting off the bottom of a white glass bottle which has no shoulder, but sloping sides. Some beer and spirit bottles admirably fulfill these requirements. An arrangement of tin is fixed to the top with white lead to carry off the overflow. In the neck is fitted a cork, through which is passed a glass tube drawn to a fine point to form an upcast in the bottle. The other open end outside the cork is fastened to a piece of rubber tubing connected with the constant level tank. The receptacle F (an 80-ounce beaker) may be provided with an apron in the same way as a settling spitzkasten, but wben workiug on 100–250 grams of pulp this is not necessary, as before the vessel is full the water runs clear from the separator, which indicates the completion of the experiment.

The tank A with constant level may be constructed out of a clean oil drum. It is necessary for comparative experiments always to have the same pressure and volume of water for separation. Under the conditions this is impossible, and no reliance can be placed on results obtained with varying flow and pressure of water. The velocity of flow must be adjusted to the quality of the ore treated and the method employed on the works for separating sands and slimes. I found that with a 3-foot level of water a flow obtained by adjusting the clip G so that 250 c.c. of water passed through a ½-inch orifice of E in the hydraulic separator per minute was sufficicnt. Where hydraulic separation on the works obtain, this quantity would probably have to be increased.

A comparison by careful panning of the slimes from the mill (after separatiou) with the slimes from the experimental separator will determine the required flow of water. Constant flow is of the greatest importance for the same series, and should be determined so that, if through accident or negligence the screw clip has been altered, the original flow may be rcascertained. Increased flow results in decreased percentage of sands.

Having constructed and adjusted the apparatus, the experiment consists in allowing the water to rise in the hydraulic separator till it is about half full, and thcn adding 100 grams of the dried pulp, which bas been broken up, to avoid lumps of slime, by passing through a 20-mesh sieve and the water allowed to run till clear, with partially slime-free samples, such as vat sands. The quantity may be increased to 250 grams. The residual sand is theu washed on a vacuum filter, dried and weighed. The slime is treatcd in the same way. It is not advisable to take the slime by difference, but by actual weight, to check results.

RESULTS OBTAINED.—After obtaining a series of results from a battcry employing a 28 screen, ten head were set apart fitted with a 32 screen for experimental purposes. For the sake of comparison and conciseness both series are placed together.

A. TAILRACE SAMPLES.—The total pulp, after passing the plates and the concentrators, was subjected to the ordinary sieve grading, for the sake of comparison, with the following results:

		28 SCREEN— %	28 SCREEN— Assay.	32 SCREEN— %	32 SCREEN— Assay.
Remaining on..	60	19.4	7.12	12.2	6.12
	80	19.5	6.12	22.4	6.12
	100	33.7	4.12	19.0	4.12
Passing through.	100	26.2	4.8	46.2	4.6

The apparent rise of slimes (portion passing through 100-mesh) and the high assay value may here be noted. As the ordinary sieve grading does not represent the sand and slimes as separated in the vats, a preliminary hydraulic grading in my apparatus detailed above was undertaken.

HYDRAULIC GRADING.

28 SCREEN.

	%	%	%	%	Assay.
*Sands	33.5	34.4	48.5	41.0	9.12
Slimes	66.5	65.6	51.5	59.0	2.6

32 SCREEN.

	%	%	%	%	Assay		
Sands	40.0	43.5	42.5	43.0	9.12	11.0	6.12
Slime	60.0	56.5	57.5	57.0	2.12	2.0	2.6

As the process does not admit of absolute accuracy and only represents a near approximation, it has not been deemed advisable to express the results nearer than 0.5%. The following figures show the limit of accuracy obtained, working on the same sample:

	%	%	%
Sand	33.25	33.44	33.08
Slime	66.62	66.22	66.63

The separated sands were then graded by passing through a series of sieves, each grade being separately assayed.

28 SCREEN.

		%	%	%	%	Assay		
Remaining on	60	23.8	27.9	24.1	28.1	9.12	9.12	9.0
	80	16.2	24.7	21.4	18.2	10.0	9.0	9.0
	100	10.4	9.4	16.3	9.5	9.0	10.0	6.12
Passing through	100	49.3	37.9	37.0	45.2	9.0	9.12	6.12

32 SCREEN.

		%	%	Assay	
Remaining on	60	21.3	24.1	10.0	11.0
	80	21.2	16.2	8.12	0.0
	100	12.1	11.2	6.0	6.6
Passing through	100	45.1	46.2	6.6	6.6

It will be noticed that the values tend to increase

*Mining Journal.

* The figures represent averages of different samples taken on different occasions, such representing a 24-hours' run.

with the coarseness of the sand, with one exception, where the values were evenly distributed. As might be expected, the alteration of screen has little influence on the percentage of slimes proper (i. e., hydraulicly separated, as distinct from mechanical sieve-graded slimes).

Fine gritty quartz, pyrites, or diorite, though passing with ease through a 100-mesh screen, leach readily, and by employing adequate separators, preferably graded spitzluten (hydraulic separators) may be retained in the vats. The slimes eliminated consist of clay, talcose and kaolin-like substances, and should be free from gritty particles. Where imperfect separation obtains, canvas tables may supply the deficiency. It may be here noted the slimes separated on the works averaged 2 dwts., those obtained from sieve grading about 4 dwts., and those from the experimental hydraulic grading 2 dwts.

The general distribution of the gold throughout the various grades having been ascertained, it became a matter of some importance to determine whether the gold was in the quartz (quartzose shale) or the pyrites gangue, and if in the latter, whether it was enclosed or disseminated. To this end the sulphurt in the sulphides was estimated in the various grades, and assay sample ground to pass an 80-mesh sieve, and panned off in the ordinary manner. This invariably resulted in showing considerable quantities of free gold but little pyrites in the coarser sand, the proportion of the constituents beiug reversed as the sands become finer; the finest saud, passing through the 100-mesh sieve, showed comparatively large quantities of pyrites and no free gold.

This confirmed the results of the sulphur estimations, the percentage of active sulphur in FeS_2, increasing with the decrease of the size of the particles. The sand passing through the 100-mesh screen consistently showed double the percentage of active sulphur than the sample remaiuing ou the 60-mesh sieve.

ESTIMATES OF ACTIVE SULPHUR.

With the 28-Battery Screen.

		Remaining on 60	80	100	Passing 100
(a) Tail Race—					
Per cent S		0.234	0.313	0.711	1.480
Assay		10. 12	9. 0	10. 0	10. 6
Per cent S		0.6202	0.638	0.5061	1.144
Assay		9. 12	9. 12	7. 0	7. 0
(b) Vat Sands—					
Charge	Per cent S	0.832	1.198	1.380	1.400
	Assay	14. 0	12. 0	9. 0	0. 0
Residue	Per cent S	0.436	0.494	0.658	0.686
	Assay	6. 12	3. 0	1. 12	1. 9

With the 32-Battery Screen.

(a) Tail Race—					
Per cent S		0.1458	0.3329	0.4428	0.8256
Assay		11. 0	9. 0	6. 0	6. 12
Per cent S		0.6064	0.6185	0.6765	1.321
Assay		12. 0	10. 0	6. 12	7. 0
(b) Vat Sands—					
Charge	Per cent S	0.7742	0.8333	0.6101	1.606
	Assay	14. 0	11. 6	7 6	7. 12
Residue	Per cent S	0.6284	0.6876	0.7907	1.523
	Assay	4. 18	2. 18	1. 12	1. 12
Charge	Per cent S	0.8443	0.8058	1.144	1.514
	Assay	9. 0	7. 0	7. 0	7. 12
Residue	Per cent S	0.6326	0.6064	0.6298	1.197
	Assay	5. 0	4. 6	1. 6	2. 0
Charge	Per cent S	0.4951	0.6738	0.5041	1.593
	Assay	13. 12	11. 12	7. 12	7. 12

From these figures we may safely conclude that in the coarser sand the gold is present enclosed in quartz or similar matrix, where in the fiuer sand it is associated with pyrites. In the particular ore under discussion, owing to its action with cyanide and its microscopical character, the gold was probably disseminated through the pyrites, and not simply enclosed. Estimations of iron threw no light on the location of gold in the ore, though they confirmed the gradual decrease of non-ferruginous gangue with the increase of size, but bore no direct ratio to the sulphur.

ESTIMATION OF IRON AS FE_2O_3.

Remaining on	60	5.544	2.38	3.782
	80	6.664	3.64	3 933
	100	6.412	3.178	4.321
Passing through	100	6.888	4.018	5.731

The figures of the sulphur results can only he accepted as approximations, as the barium sulphate results are never, except by chance, absolutely accurate. The large variations observable in one sample from another are due to the greater or less oxidized ore passing through the mill. In all cases a sample represents an average of twenty-four hours. The percentage of sulphur multiplied by two gives roughly the percentage of pyrites.

‡B. Vat Sands.—The same procedure was adopted with the vat sands as with the pulp from the tailrace. Teu head of battery were fitted with 32-mesh screens. The tonuage of ore, percentage of extraction from the plates, and sands were carefully compared and noted. The following figures represent the comparison of results obtained with the 28 and 32 screens from vat sands before and after treatment:

28 SCREEN.

		%	%	Assay—	
Charge				8.6	
Sand		80.0	78.0	10.12	6.12
Slimes		20.0	22.0	3.0	2.6
Remaining on	60	28.8	38.3	12.12	8.6
	80	15.5	18.5	11.0	6.12
	100	11.6	8.7	8.6	6.12
Passing through	100	42.5	35.0	8.6	7.0

† It is quite useless to determine the total sulphur, as frequently (especially in the Kalgoorlie belt) sulphates in the form of gypsum and heavy spar are present in the ores, and do not usually form a matrix for the gold particles. Vide my paper on "Notes on the Cyanide Process for Extracting Gold," Chamber of Mines of Western Australia, July, 1902.

‡ These results were all obtained from 150 tons of sand before and after treatment, not from small lots cyanided in the laboratory.

Residue						2 12	2 0
Sand			70.0	81 0		3.12	
Slimes			30.0	16 6		2 6	
Remaining on	60	36 2	33.8	32 8	30.0	4 12	4 0
	80	17 0	17 4	16 8	17.6	3 0	3 12
	100	7 1	12 0	10 0	12.4	1.12	1 6
Passing through	100	36 0	38 0	40 4	40.0	1 9	2.0

32 SCREEN.

Charge							8 0	8 0
Sand		77 8	79 0	77 4	73.3	71.0	9 12	10 0
Slimes		22 2	20 4	22 6	26 7	29.0	4 0	5.0
Remaining on	60	28 2	27 1	29 0	25.0	27.1	12 0	11 12
	80	18 2	19 3	17 3	20.4	19.5	10.6	10.12
	100	12.0	12 5	11 0	12 6	11 3	7 0	7 0
Passing through	100	41.2	41 0	41.4	41 6	40.2	7.6	7 0
Residue							2.0	
Sand		74 2	72 4				9 12	
Slimes		25 8	27 1				0.9	
Remaining on	60	28.6	28 4				4.18	
	80	20 4	18 8				2 18	
	100	8 8	9 8				1.12	
Passing through	100	41 6	44 0				1 12	

It will be noted that with finer crushing the percentage of fine sand passing through the 100-mesh is slightly increased, but the general extractiou remains practically unaffected. The loss of sulphur in the treated residue after cyaniding is marked, and may throw some light on the cyanicide action of pyrites. Probably the occasional presence of thiocyanate may be due to this cause, and not, as originally supposed, from the reduction of sulphates.

Conclusion.—By the foregoing series of experiments, carried out on the small scale in the laboratory, and subsequently with a 10-head battery, it has been shown that the values lie in the coarser particles of ore both in the pulp, vat sands and residues. One would naturally anticipate that with finer crushing a greater extractiou would result, especially as in the heavier masses of quartz the gold was shown to be free milling, and probably a higher extraction in the cyauide vats would be obtained.

Unfortuuately, the figures representing the results of the cyanide extraction remain practically the same for both screeus:

Assays—	Charge.	Residue.	Average Ore Milled.
28-Screen	7.3	2.2	18.5
32-Screen	7.2	2.1	19.8

The plate extraction showed only a slight increase—approximately, 1 dwt. per ton. It is not advisable, however, to increase the extraction by a small percentage when the amount milled is decreased in such proportion as to uegative the appareut better results. The decrease of tonnage milled in this particular instance came to over 100 tons for an average month (fifty stamps), which the extra gain in amalgam did not compensate. The figures, however, were useful as a guide to future treatment. A glance at some of the averages already quoted shows that the high values in the cyanide residues lie always in the coarser sand.

	Assay Values. 60.	80.	100.	Passing 100.
Charge	12.12	11. 0	8. 6	8.6
Residue	4 12	3. 0	1.12	1.9
Charge	8. 6	0.12	6.12	7.0
Residue	4. 0	3.12	1. 6	2.0

These could be arrested before they come to the vats by a more efficient method of concentration. If it were found impracticable to catch them on a vanner or other mechanical concentrator, they could be easily separated in a hydraulic classifier; in fact, I am of opinion the most satisfactory method of cyaniding sands seems to be careful classificatiou, the coarsest particles beiug returned to some sort of grinding or amalgamating pan and the rest of the pulp distributed according to size in separate vats and receiving separate treatment. Why should sand which will extract and leach in a few days be mixed with pulp which takes weeks to satisfactorily treat? To couclude, although in this particular instance the original screens were adhered to, it was, nevertheless, satisfactory to kuow from actual experimeut that, as far as the milling was concerned, the screens adopted were the most advantageous, and the data obtained pointed out the necessary modifications conuected with the treatment of the pulp after leaving the plates.

The work in connection with this paper was carried out in the laboratory of the Sons of Gwalia gold mine, and I have to thank the courtesy of W. J. Loring for the permission to use the figures quoted.

Appendix.—The same apparatus may be used for experimenting with the hydraulic classifier. For this either varying volumes or pressures are required, but so arranged that at each stage a definite volume or pressure is obtained. This may be accomplished by keeping the screw clip G always the same, but varying the pressure by means of three or more constant level tanks at various levels, say, 3, 6, and 9 feet from the level of the liquid in D (Fig. 1). In this way the pulp would be separated into four grades. The apparatus modified to serve as a hydraulic classifier is shown in Fig. 2. A, the lowest level, turned on would give slime at the discharge, B turned on would wash out the next lighter particles, whilst the residue iu the separator, after the third carries nothing more away, would consist of the coarsest gold-bearing sand fit for a grinding pan. It must be borne in mind that the pressure of water is dependent, not on its bulk, but on the difference of level.

No tunnel or other mine excavation may lawfully be run under the surface of land belonging to another without his consent, except in the case of the privileges granted by the extralateral right law.

The Limitations of the Cyanide Process.*

Written by H. T. Durant.

Speaking geuerally it may be stated that it has almost become an axiom that the surface equipmeut of a gold or gold-silver mine is not complete without a cyanide plant.

This is no doubt, in part, due to the success attending the Witwatersrand plants, and these have been extensively copied in various places, where sometimes at least local couditions and the varying natures of the ores hardly permit such, or any, cyanide plant to be profitable.

It may be very broadly stated that ores which are amenable to auy method of cyanide treatment fall naturally into two classes:

(1) Those iu which the gold is carried mainly in the mineralized portion of the ore.

(2) Those in which the gold is carried free in quartz or other gangue.

The first class includes all ores in which payable values are carried in iron, copper, or arsenical pyrites, tellurides, etc., or the oxidization products of one or more of these minerals, and this class permits of a wide range of treatment, varying according to special circumstances.

There may also be ores intermediate between these two classes, such as the Witwatersrand ores.

It is, however, principally with ores of the second class that the few remarks in these notes deal.

There are, in Rhodesia, several properties in which the ore is a fairly clean quartz, very slightly mineralized, the mineralized portion being poor in values and represeuting considerably less than 1% by weight of the ore.

Such ores when milled yield values to the plates which are proportional to the fineness of the product from the mill.

If the gold in the ore is fairly coarse the values in the mill tailings are usually such that, after milling with, say, a 700 screen, apparently the mill tailings might at first sight be neglected as regards further treatment, at least on small propositions.

On the other hand, if the gold is very fine, even by increasing the battery screen up to even 1600, the tailings will still be found to be a valuable asset.

But whatever values may be in the tailings, it is found that the values extracted by cyanide are such as would in all cases entail an unsatisfactory residue, and in most cases would mean that the cyanide plaut would be run at a very small profit, and this would especially be the case on small properties, where the working expenses per ton would naturally be relatively high.

There is fairly conclusive evidence that the unsatisfactory extractions by cyanide mentioned above are due to the fact that the major portion of the gold passing the plates is locked up in the gangue, and therefore not accessible to cyanide solutions, or conversely, that when the ore is crushed fine enough to expose or free the gold that very nearly all the values are caught on the plates; in other words, such ores are free milling propositions in the fullest sense of the term.

The following tables show the results of actual work in the mill of the Guinea Fowl mine; these results were obtained, for confirmatory purposes, soon after the starting of the mill, practically identical results having been obtained experimentally before the starting of the mill:

TABLE I.—WET CLASSIFICATION OF TAILINGS FROM GUINEA FOWL MILL.

Size of Material.	Percentage	Assay value dwts. fine gold per ton.	Representing dwts. fine gold per ton of tailings
Staying on 3600 screen (square measure)	22.5	11.00	2.475
Passing 3600 screen (square measure), staying on 6400 screen (square measure)	12.0	6.00	.720
Passing 6400 screen (square measure)	65.5	1.50	.982
Assay value of tailings by calculation from constituents			4.177 dwts.

The tailings under consideration in the preceding table, when assayed as a whole, were found to carry 4 dwts. of fine gold per ton (short).

It is seen that while slightly over 4 dwts. of fine gold are in each ton of tailings that 3.195 dwts., or nearly 80% of the total values, are carried in less than 35% of the total tonnage.

In other words, it is in this case merely necessary to take out by any simple sizing arrangement that portion of the tailings which fails to pass a 6400 square measure screen, and one will then have obtained from each 100 tons of 4 dwt. tailings 34.5 tons of tailings going 9.2 dwts. fine gold per ton, leaving 65.5 tons of tailings carrying 1.5 dwts. gold per ton, and these are more or less valueless according to local conditions.

The table below shows wet classification of tailings from another mill. The tailings, though very low in

* Jour. Chem., Met. and Min. Soc., S. A.

value, still well illustrate the values of the various sizes in the mill product.

TABLE II.

Size and Description of Material.	Percentage	Assay value dwts. fine gold per ton.	Representing dwts. fine gold per ton of tailings .....
Finer concentrates panned from portion of tailings passing 2500 screen (square measure)	4.13	4.00	.165
Coarse sand (including coarser concentrates (staying on 2500 screen (square measure).....	25.90	2.80	.725
Fine sands and slimes passing 2500 screen (square measure).....	69.80	.85	.594
Experimental error	.17	.....	.....
Assay value of tailings by calculation from constituents			.1.484 dwts.

NOTES ON TABLE II. — These tailings, assaying practically 1.50 dwts. fine gold per ton, are seen to carry .89 dwt. or 60% of their total values in 30% of their total tonnage; that is to say, that every 100 tons of 1.5 dwts. tailings will yield thirty tons tailings, assaying slightly less than 3 dwts. per ton.

It has been stated before that the total tailings mentioned either in Table I or Table II, or any of the constituents of either tailings, yield unsatisfactory extraction by cyanide; similarly it has beeu proved that any of the constituents on crushing finer, yield to plate amalgamation and also to cyanide solutions gold in proportion to the fineness of the crushing.

In the case of tailings mentioned in Table II it is clear that it would be good procedure to mill with a coarser screen, so that, while increasing the stamp duty, the oversize taken out from the tailings for recrushing and further amalgamation should be of a higher gold value.

The writer is acquainted with at least one case in which fine crushing of the whole ore followed by amalgamation yields exactly the same results, as regards recovery of gold, as coarser crushing with amalgamation followed by cyanide plant for the sands. Iu such case it is merely a question of capital expenditure and total working costs to determine which method to adopt; on the other hand, in the case of ores mentioned in preceding tables there could be no question of cyanide plant unless after fine crushing it were cheaper to treat by cyanide thau to run over plates.

Instances of this kind could, if necessary, be multiplied. It would appear that when an ore, after crushing and amalgamation, yields slimes which do not pay to treat, it is good practice to increase the percentage of these slimes as much as possible while still keeping the value of the slimes below the paying point; such procedure is co-related to the well-known milling practice of Califoruia and Gilpin county, Colorado.

Without intending to discuss iu these few uotes the question of milling in its most modern aspects, it may be taken for grauted that any exceptionally fine crushing would not usually be carried out in a stamp battery.

The Silver City, Idaho, Geologic Folio.

Precious metals and opals are sufficient to make almost any area attractive to man. They are the most important mineral resources of Silver City quadrangle, which has recently been topographically and geologically surveyed by the United States Geological Survey. A geologic folio (No. 104) descriptive of the quadrangle, which is the work of W. Lindgren, N. F. Drake and F. C. Schrader, is now available and may be procured for 25 cents on application to the Director of the United States Geological Survey, Washington, D. C.

The Silver City quadrangle is situated in the southwestern part of Idaho, south of the Snake River plains, close to the Oregon boundary line. It includes the northern end of Owyhee range and a part of the sloping high plains bordering it on the east and west.

Silver City, the county seat of Owyhee county, is located in the southern part of the quadrangle and has a population of about 600. A few miles west of Silver City is the town of De Lamar, and a small place, Dewey, is located about half way between them.

The principal industry of the district is gold and silver mining, which has been carried on successfully since 1863 in the vicinity of Silver City and De Lamar.

The larger part of the rocks of this quadrangle do not contain fissure veins or other metalliferous deposits of any kind. As indicated by the placer gold found in Succor creek, a gold-bearing area occurs somewhere near its head, but the primary deposits have not thus far beeu located.

Along the southern boundary of the quadrangle there is a mining district of small extent, but of great importance. The deposits are located on both sides of Jordan creek, on War Eagle mountain, Florida mountain and near De Lamar. They were discovered in 1863, and have yielded a total of over $30,000,000, of which amount approximately $12,000,000 is in gold and $18,000,000 in silver. The output of the War Eagle veins from 1863 to 1878 was about $15,000,000. After an interval of twelve years the De Lamar veins came into bonanza in 1890, and in seven years produced $6,000,000, mostly in gold. About 1892 the deposits on Florida mountain began to be exploited and now overshadow the De Lamar mines in output. The production in 1900 was nearly $776,000 in gold and 1,000,000 ounces in silver. The process used to recover the gold and silver from the ores is ordinarily that of pau amalgamation. In late years the cyanide process has also been used to treat low-grade ores and tailings.

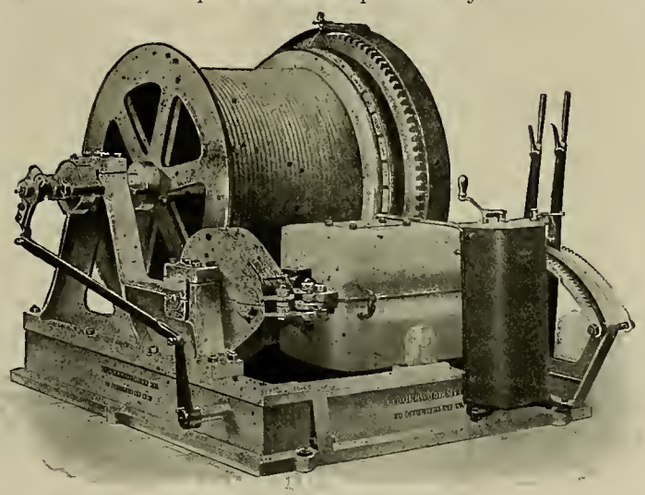
Snake river contains, in this quadrangle, as it does all through the Snake River valley, a considerable amount of gold in its sandy gravel bars. The gold is extremely fine and flaky, containg about 1000 colors to the cent. During many years from several hundred to $1000 worth of fine gold was annually washed from the streams in this quadrangle, but at present very little work is done and then only at intervals.

Opals have been found at various places in the uorthern end of the Owyhee range. They are usually in the abundant vesicular cavities of the eruptive basalts and rhyolites. Some good fire opals have been reported, but by far the larger quantity is the common opal, of no value.

Direct Current Electric Mining Hoist.

Herewith is illustrated a direct current electric mining hoist built by the Lidgerwood Mfg. Co., 96 Liberty St., New York City. This hoist is designed for use with a direct current of 500 or 250 volts.

The drum motor and controller are mounted complete on a bedplate. The resistauce boxes are usually separate from the hoist, being conveniently located so that the heat generated may not be annoying to the operator. In smaller sizes it is sometimes desired to have the machine completely self-contained and portable, in which case the resistances are of special form and attached to the inside of the bedplate. The friction drum is of the standard Lidgerwood form. The motor, which is made by the General Electric Co., is of the armored type and especially designed for hoisting purposes; the moving parts protected from dust and moisture by suitable casing; the gearing from the motor to intermediate shaft is cut, and enclosed in an oiltight gear case. The drum gearing is cast from standard patterns and is protected by means of the usual guard band. The coutroller, which is of the railway type, is provided with a reversing switch and mounted so as to be most convenient for the operator. The friction and brake levers are mounted in a rack with notched quadrants and are fitted with thumb latches.



Direct Current Electric Mining Hoist.

A New Metal.

Another uew metal is reported, which in many of its properties is similar to aluminum, but still of lesser weight. It was discovered by the French engineer, Albert Nodon, and is called "nodium," after him, says Uuited States Consul Guenther of Frankfort, Germany. It is manufactured by electric process. In color, luster and structure it is like steel. Its specific gravity when molten is 2.4. Its resistance against breaking is given as about 20 pounds per square of 0.04 inch. Its constancy in the air is higher than that of aluminum. Its ductility is between 6 and 8 inches; the malleability can be compared to that of bronze. It melts at about 600° C. It is suitable for being cast into forms. The conductibility for the electric current is said to be as high as that of copper of equal weight. If natural power—especially water power—can be used for its manufacture, the cost in round figures is about 15 cents per pound. The discoverer predicts numerous uses of nodium in the near future, especially for electric wires and cables, for light but strong parts of motor cars, torpedo boats, men-of-war, street cars, military outfits, airships, etc., and for castings in plate bronze, German silver and similar metals.

Some Features of Mining Operations in the Homestake Mine, Lead, South Dakota.

NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by BRUCE C. YATES, E. M.*

STOPING.—During the year from June, 1902, to June, 1903, 1,279,000 tons of ore were milled by the Homestake Milling Co. Approximately 80% of this was mined on the different levels from the 100-foot to the 1100-foot. The remainder came from open cuts and from "draw raises," by means of which, as will be explained later, the ore left in the roof of old stopes is drawn out.

OPEN CUTS.—The ore obtained from the open cuts is broken down from the sides into openings that connect with the regular levels of the mine. These openings or raises are provided with chutes on the different levels from which the cars are loaded. The loaded cars are made up into trains of from four to eight cars, according to the grade of track, and hauled to the shaft by horses.

The ore taken from open cuts is mined very cheaply. Two miners, whose wages are $3.50 per day, will break, on the average, 200 tons in one shift. Two men are employed at the chutes, oue to break the rock at the grizzlies and one to load the car. The grizzlies are located two or three floors above the chute. If the haul is long two horses with two drivers are required to haul the ore to the shaft. The cost per ton of mining and delivering to the shaft is as follows:

Two miners at $3.50	$ 7 00
One grizzly man at $3.50	3 50
One chute drawer at $3	3 00
Two drivers at $3	6 00
Two horses at 90 cents	1 80
Blacksmith labor	50
Explosives, $0.026 per ton	5 20
Total	$27 00
Cost per ton	13½

Ore and waste are blasted down together and the waste is sorted at the chute and used for filling.

In one of the open cuts now being worked the process of mining is much like the work of making a very deep cut through a hill some 300 feet high. Tracks are laid from the crushers to one end of the cut and the rock is blasted down, loaded into cars and trammed directly to the crushers.

ROBBING OLD WORKINGS.—The pillars aud backs of old stopes which were left in place in the older workings of the mine are now being removed by a system of draw raises. A description of the method of attack may be of interest to many who are face to face with the problem of robbing old workings in vertical formations.

It is very important to know the exact location of these pillars and roofs before starting this system. If the maps and stope records have been faithfully kept this becomes an easy matter; otherwise the memory of some old employe must be depended upon to give the necessary iuformation.

Having located the ore, a "nine-post raise," which consists of four regular stope sets arranged in a square, is put up either on the foot wall or on the hanging wall side, preferably the foot wall. This raise is carried up a sufficient height to reach the ore above the waste filling. Grizzlies are put in on the floor next to the top and the sides of the raise are carefully lagged to protect the men. The run of ore is then started by ablast or by barring. A man stationed at the grizzly breaks the rock so that it will pass through into the chute which is located on the sill floor.

The timber required to make a nine-post raise four floors high is—36 posts, 24 caps, 24 ties, about 150 lagging, 4 stope ladders, and one ordinary board chute. The grizzlies are made by placing two or three 12-inch timbers, spaced 12 inches apart, over oue set of timbers and protecting these by pieces of sheet iron curved to fit. The posts on the top floor may be protected in a similar manuer from the blasts and from running rocks. (See Fig. 16.)

Sixteen thousand tons of ore were taken from one raise in six months; and this was done in a place where vain attempts had been made to reach the ore by carrying up timbered stopes through the old fill.

Should the ore be too solid to run the raise will serve as a manway to a timbered stope started on top of the fill.

Whenever a run of waste is encountered it is drawn down and used for filling in other parts of the mine, and the ore from upper levels will follow the waste down.

TERRA CAVING SYSTEM.—Stoping without timbers

*Copyrighted.

was carried on in the Deadwood-Terra mine, which is now a part of the consolidated Homestake, for a number of years prior to the time when the Homestake assumed control.

A crosscut from the shaft cuts the ledge which was opened from wall to wall throughout the entire length. All the ore was removed from the sill floor excavation. As soon as the ledge was sufficiently developed a drift was driven in the footwall approximately parallel and about 20 feet from the ore, and openings made from the drift into the ore chamber at convenient intervals. The ore was then broken down and the surplus removed through these openings. As the miners used the broken ore as a staging to work on, only about 40% of the ore could be removed until the stope was finished.

The stopes worked by this method are from 30 feet to 50 feet wide and the dip of the ledge is 75%.

Stoping may be carried on on several levels at the same time, provided sufficient back is left in between levels. When the level above is finished this back may be caved and all the rock removed on the level below.

No timber is required other than a few lagging for staging, but the method is not applicable to wide ledges.

Fig. 17 shows a cross-section of several levels and a part plan of one level showing the method of operation.

Square Set Timbering.—Until within the last two years all stopes in the Homestake and Highland mines were timbered by the square set method. An enormous amount of timber was required to timber the excavations, and the work of handling the timber through the shafts made it difficult to hoist sufficient ore to supply 900 stamps.

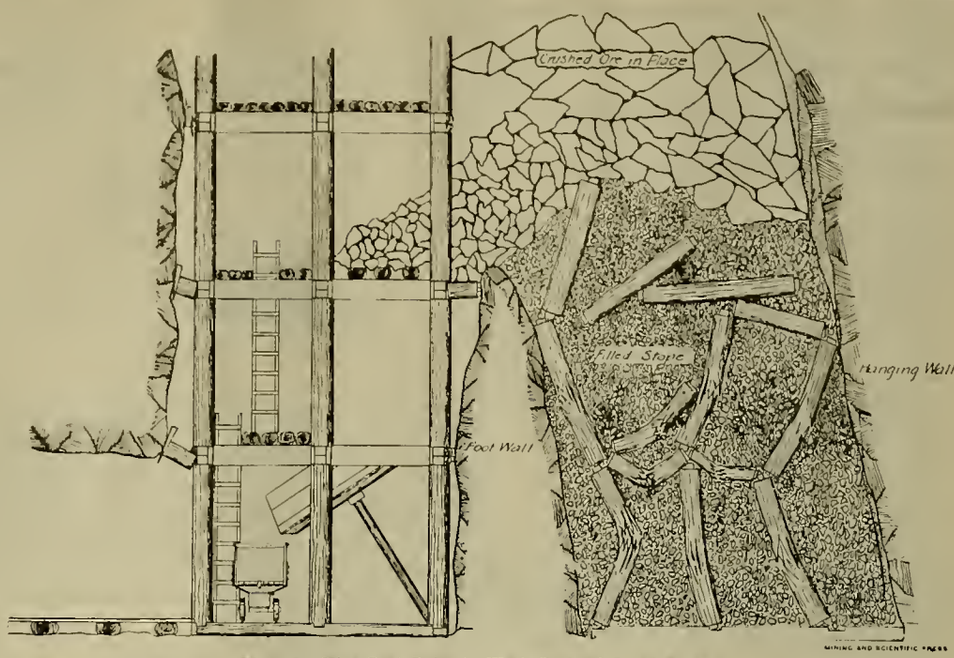
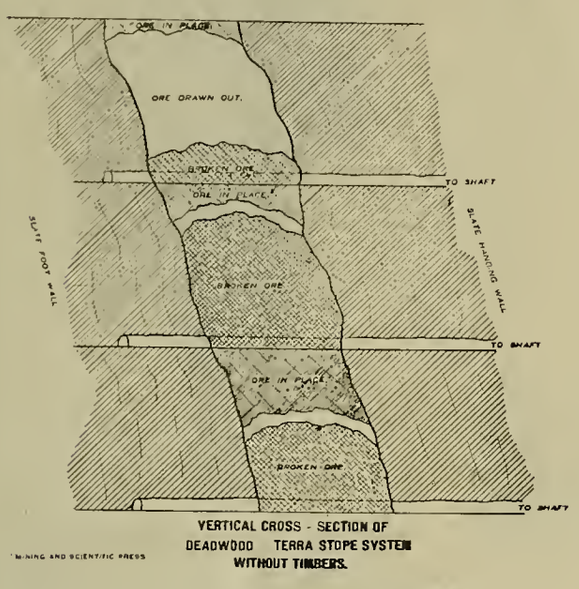
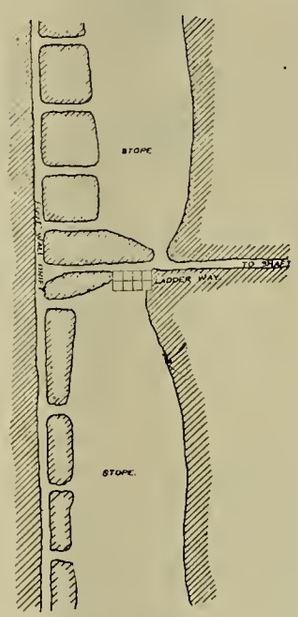


Fig. 16.—Nine Post Raise to Work Back of Caved Stope.



VERTICAL CROSS - SECTION OF DEADWOOD TERRA STOPE SYSTEM WITHOUT TIMBERS.



HORIZONTAL SECTION.

Fig. 17.

No unusual features are introduced in this method of timbering, so that no detailed description will be given. The sets are 6 feet square, sill floors are 9 feet high, and all upper floor sets 8 feet 5½ inches. A sill floor set contains 324 cubic feet, or about 32 tons, and an upper floor set 304.5 cubic feet, or 30 tons.*

All stope timbers are shipped in convenient lengths to the company's sawmill, which is located at the Golden Prospect shaft. Here they are sawed and framed as needed. Most of the timber used is native, although some Oregon timber is used for caps and ties.

With labor at $3 per day, it has been found that the framing of what is termed a set of timbers (a post, a cap and a tie), costs 60 cents, and the cost for sawing lagging is 5 cents per running foot.

Two timbermen, whose wages are $3.50 and $3, working one shift, will stand timbers, build chutes and do all necessary repairing in a stope which furnishes 100 tons of ore in twenty-four hours. This makes the cost of labor for standing the timbers 6½ cents per ton.

All chutes are the ordinary board type, with bottoms made of lagging and sides of 2-inch plank. The rock is held back by two boards, one above, but not directly above the other. Fig. 18 is an isometric drawing of a stope chute.

On the upper levels of the mine, where the ledge was broken and comparatively narrow, the sill floor excavation was made from wall to wall and sometimes for the entire length. The sill floor timbers were then put in and stopes worked where convenient. When the ledge began to widen this method proved disastrous and thousands of feet of lumber were used to make bulkheads in a vain endeavor to keep the stopes open.

*It is usually estimated that 13 cubic feet of rock in place equal one ton. This would make about 23 tons per upper set.—Ed.

A new method was inaugurated on the 600-foot level under the supervision of W. S. O'Brien, mine foreman, which is being used on all new levels. The plan is as follows: A crosscut is driven through the ledge from the central shaft which is called the main crosscut. The ore body is then developed by driving a 24-foot drift along the foot wall. From this drift rooms 60 feet wide are opened across the ledge with 60-foot pillars between each stope. Beginning with the main crosscut a pillar is left on each side, then a 60-foot room, a 60-foot pillar, and so on to the end of the ore body. These rooms and pillars are numbered north and south of the main crosscut. No. 3 stope north would be the third stope north of the crosscut, and No. 4 stope south the fourth stope south of the crosscut.

Some difficulty was experienced in keeping the sides of the rooms straight while the sill floor was being opened. To overcome this sills were laid in the foot wall drift to lines given by the surveyor, and the miners took their lines from these. Each stope contains eleven lines of sills. When the system once became established no difficulty was experienced in keeping the room of uniform width and the sides comparatively straight.

When a stope has been worked and filled the pillar may be attacked and by lacing the sides next the fil all the pillar may be removed.

(To be continued.)

An adverse claim to be effectual for the purposes contemplated by law must be filed prior to the expiration of the sixty-day period of publication of the application notice. Such publication is simply a notice that such application has been made.

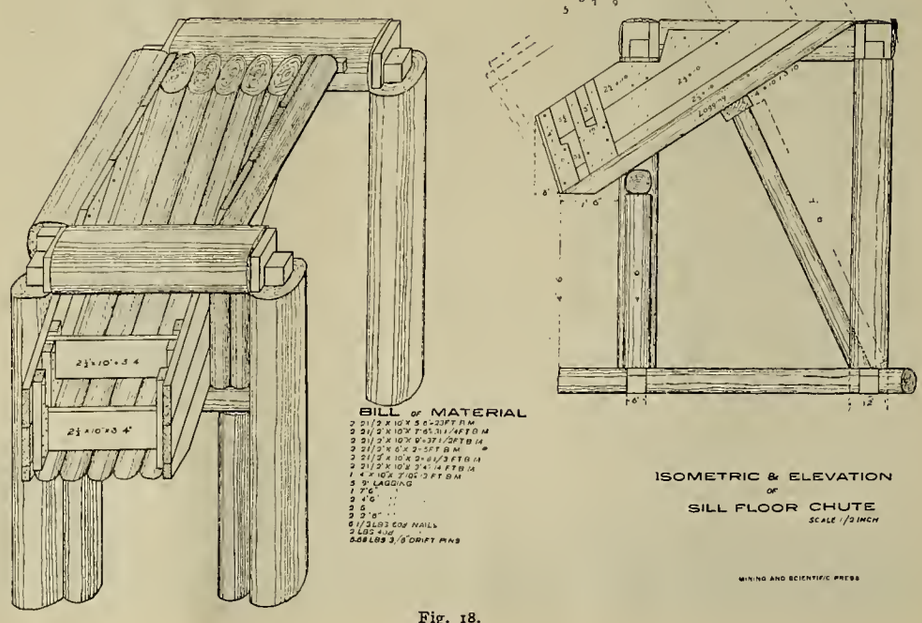


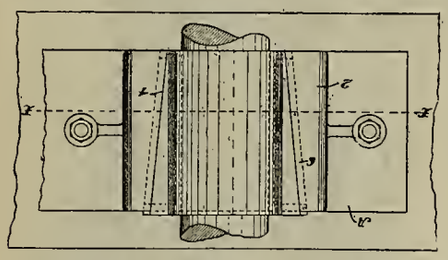
Fig. 18.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 23, 1904.

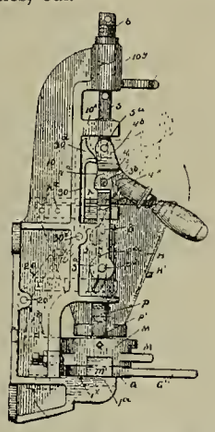
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

BATTERY STEM GUIDE.—No. 752,349; W. H. Martin, Nevada City, and A. McCombie, Grass Valley, Cal.



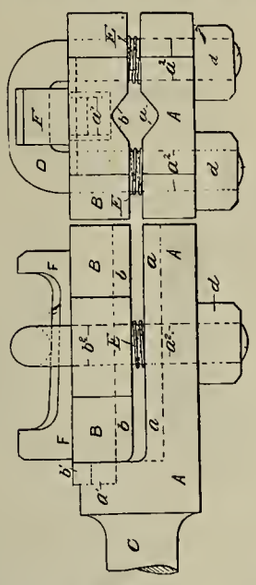
Battery guide comprising metallic block having upon opposite sides of its stem space downwardly converging guides, and cap having lateral flanges, edges of which converge downwardly and are adapted to engage guides.

CUPEL MAKING MACHINE.—No. 753,121; A. C. Calkins, Los Angeles, Cal.



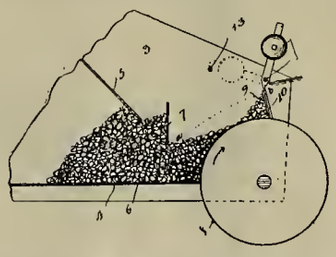
Cupel making machine, comprising main frame, feed hopper, reciprocating plunger mounted on main frame, two-part mold swingable alternately under hopper and plunger, and comprising upper member having vertical aperture or cell, lower solid body that forms false bottom for cell, upper and lower portions having interengaging members, whereby two can be moved in unison, and means for supporting upper and lower members for movement independent of each other, and means for imparting compressing movement to plunger.

CHUCK FOR ROCK DRILLING MACHINES.—No. 752,972; J. Hodge, Witwatersrand Gold Fields, Transvaal.



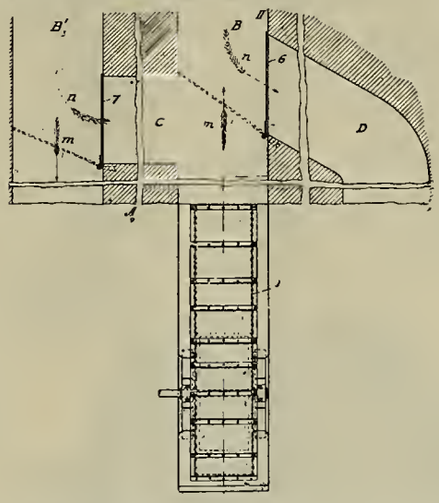
In rock drill chuck head or body constructed in two parts longitudinally, one part being provided with projection and other part with corresponding groove or recess to receive projection, in such manner that two parts of head may be expanded to receive shank of drill, and means for compressing two parts of head to secure drill.

GATE FOR ORE POCKETS OR SIMILAR RECEPTACLES.—No. 753,076; F. K. Hoover & A. J. Mason, Chicago, Ill.



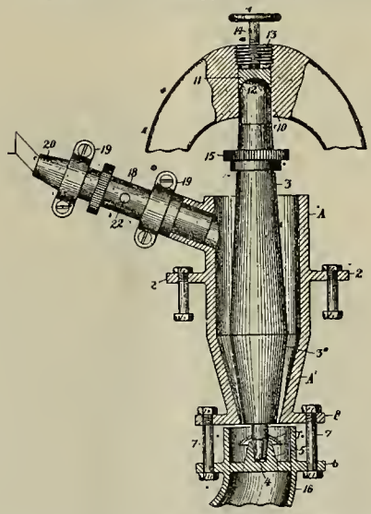
The combination with pocket or hopper having discharge roller mounted across discharging end, of pivoted gate in nature of guard mounted above and parallel with discharging surface of roller, and controling means connected with pivot of gate serving to hold the latter stationary in both its fully open and closed positions, but permitting gate to pass from closed to open position under impact of material thereagainst when roller is operated.

MINE VENTILATION SYSTEM AND APPARATUS.—No. 752,955; W. Clifford, Jeannette, Pa.



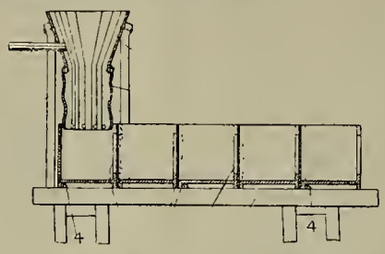
In mine having plurality of entries, drift or drifts connecting entries, and drift connecting one of entries with open air, combination of fan adapted to impel current of air through the mine, and movable doors placed at points of communication between entries and drifts, adapted when in one position to allow current to circulate through mine in one direction and when in another position to allow current to circulate in another direction and out through drift to open air.

ROCK BREAKER AND PULVERIZER.—No. 752,945; D. D. Bailey aud J. O. Bailey, Banner, Cal.



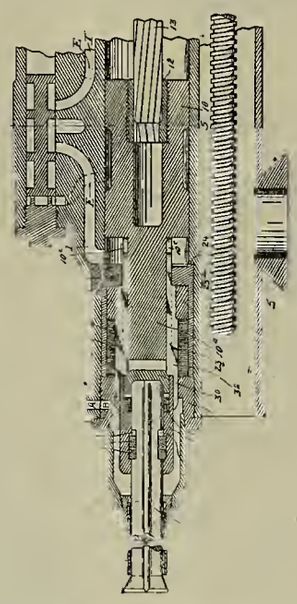
Crusher and pulverizer consisting of shell, upper portion of which is cylindrical, lower portion convergent, crusher consisting of upper cone divergent downwardly, and lower cone convergent downwardly, bases of cones being contiguous, feed-chute connecting with cylindrical portion of shell at point below top thereof, step and spindle forming journal for lower cone, and cap within which upper end of upper cone is turnable, and screws by which step and cap are vertically adjustable.

RECIPROCATORY GOLD SEPARATOR.—No. 752,926; J. P. Schmitz, San Francisco, Cal.



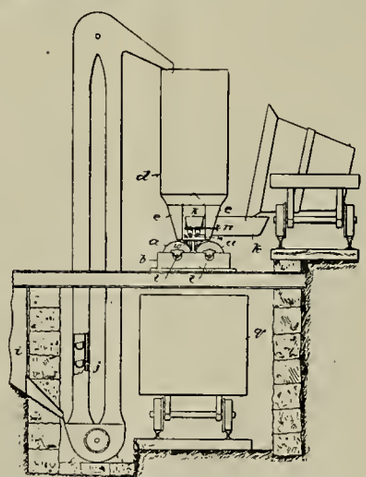
Improved gold separator comprising flat smooth table inclined in directiou of its length, and having stops or abutments along sides; inclined trough of equal diameter throughout aud consisting of segmental sections abutting endwise, each of sections having flange at one end which projects both above and below bottom of section and flange at opposite end which projects below only, each of outwardly extending flanges forming rockers for section; transversely disposed stops on table engaged by rockers to prevent end movement of trough; packing strips between abutting sections; meaus for oscillating trough; and lugs on outer sidcs of trough and adapted to contact with abutments at end only of each transverse oscillation of trough.

ROCK DRILLING MACHINE.—No. 752,819; S. W. Brothers, Denver, Colo.



In rock drilling machine, combination with casing and reciprocating piston therein, of drill holding chuck, and means for connecting pistou and chuck whereby they rotate together, but have independent longitudinal movement, means comprising detachable keys mounted in seats formed in chuck and cngaging seats or grooves formed iu piston.

ORE AGGLUTINIZING APPARATUS.—No. 752,726; E. A. Uehling, Passaic, N. J.



* In ore agglutinizing apparatus, combination of two co-operating rolls, means for rotating rolls, means for feeding ore to rolls and means for feeding slag to rolls, together with means for regulating supply of ore and slag.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

E. B. McFarland of Portland, Or., and a company of Portland and Idaho men have taken over the Petty group of mines, 70 miles from Skagway, for $100,000. They will start operations this month with H. T. Gager as manager. The mines are on the White Pass and Yukon rivers, in Tagish Lake district, and are readily accessible. The ore is gold and silver, with traces of copper and lead.

ARIZONA.

Cochise County.

The Tombstone Con. M. Co. at Tombstone is operating at four different shafts below the water level. The four points are the main shaft, the Emerald, the West Side and Silver Thread. At the two latter placos—which are some 50 feet below the old water level—ore is being extracted and shipped, while at the main shaft a drift is being run at the 700-foot level, 100 feet below the water line, toward the Contention and Grand Central ledges. This drift is in 120 feet. At the Emerald the incline shaft is below the water line and will be sunk to the first station, when drifting will be started toward the ore zone. The distance between the Silver Thread on the north and the Emerald on the south is 1¼ mile. The pumps in the main shaft are sending up 2,000,000 gallons daily to the surface. The four-compartment shaft is being continued to the 1000-foot level. Three carloads of ore are being shipped daily to El Paso, Texas, and 100 tons per day is being shipped from the Lucky Cuss dumps. The latter dump contained 12,000 tons of ore, which was contracted for by the smelter company.

Graham County.

The Stevens C. Co., near Clifton, last week closed down temporarily, awaiting the arrival of air drills and boiler for the pumping plant. The company will put in an air plant. Manager Alsdorf expects the company will resume work by April 1.

The Shannon C. Co. at Clifton is entering on its second year as a producer and it is expected the second section of the concentrator will be in full operation next month, which will mean a production for the year 1904 of 12,000,000 pounds of copper, at a cost, it is claimed, of 8 cents per pound. The company employs 400 men, owns its own stores, dwellings and a hospital, besides concentrator and smelting plant. Last week the company produced 150 tons of copper.

The Arizona C. Co.'s report for the year ended September 30, 1903, and submitted February 15, 1904, shows that during that year they made out of their smelting and other profits $1,600,000, and during the last half year 209,150 tons of ore were treated, yielding an average of 3.28% copper. Of this, 194,238 tons were concentrating ore, yielding an average of 2.51% copper. The production, as well as profits, was curtailed by the strike of the miners last June. The mines are at Clifton, adjacent to the properties of the Shannon C. Co. and the Detroit C. Co. The company produced 30,000,000 pounds of copper in 1903 at a cost of 7 cents a pound. It employs 1500 men and has 4000 acres of mining ground.

Maricopa County.

(Special Correspondence).—A. Anderson is preparing to ship silver-lead ore from Morristown to the smelter.——The Arizona M. & D. Co. have completed a road from the Hassayampa river to the Montezuma lead mine. Men have been at work cleaning out the Montezuma shaft so that work can be started in the mine this month.

The Vulture Development Co. has taken over the Angel mine, near Wickenburg. The company is not connected with the Vulture mine, but will operate properties in that district.——C. P. Pierson expects to put men to work on his copper claim, near Morristown. Shipping ore is on the dump. —— H. Herlick of Phœnix has bought the H. J. Bennett copper group, 12 miles east of Morristown.

G. Hamlin of the Relief mine reports opening up free gold-bearing diorite in the west drift of the mine.——C. M. Love of Chicago, Ill., president of the New Vulture M. Co., says the Vulture mine will have development increased and other work done.——C. Feihls, assayer for the White Tanks M. Co., which owns the Wickenburg smelter, says they are arranging for full operations.——G. Carguile is working claims in Cave Creek district. The ore is free milling.

Wickenburg, Feb. 29.

C. M. Love of Chicago, Ill., president of the New Vulture M. Co., which owns the Vulture mine, near Wickenburg, is arranging to resume operations.

Mohave County.

(Special Correspondence). — Considerable activity is manifested in the Leland-Gold Road district. The Mohave G. M. Co. at Leland has completed a narrow gauge railway from the east bank of the Colorado river, opposite Needles, to its Leland mine, a distance of 17 miles (as the Mohave & Milltown Railroad), and on this line, 7 miles above the river, is the 40-stamp mill of the company, which has completed its first month's run. It is handling three tons per stamp daily, and water is pumped 2½ miles and stored in a cement-lined reservoir. The railroad grades vary from 3½% to 6%. Oil is used for fuel. The company has twenty steel ore cars of five tons capacity used in hauling the ore, which runs $15 per ton. About ninety men are on the payroll at the mine, working in three shifts. The ledge runs directly over the top of a steep, cone-shaped hill, and on this the company is running tunnels from both sides. On the south side three are being driven, on the north two, to connect with the two upper ones on the opposite side. Two hundred feet are yet to be driven to connect the upper drifts and 900 feet to connect the lower. All this work is in payable ore. On the south a tramway leads from the mine to the chutes. The Vivian mine, which has promising ore bodies, is near the Leland.

One mile east of Snowball is the German-American group, with hoists on the Pioneer and the Treadwell. At present no work is being done on this property. The Treadwell is equipped with electric power buildings and other facilities. This property covers an extension of the Leland ledge. Other properties in the camp are the Teddy Roosevelt, owned by W. A. Brooks, and several in Silver creek, 4 miles distant, owned and operated by D. Slocum, Black Mountain G. M. Co., M. Miller et al.

Five miles by stage from Leland is the Gold Road mine, Acme postoffice. A year ago a mill of 120 tons capacity was put in operation. It is a dry crushing process. Owing to heavy expense of operating, stops are being taken toward replacing it with the wet process. Sixteen cyanide tanks are in use and values are extracted to 85%. Three cleanups a month are made, giving an average of about 1400 ounces gold bullion each, valued at $18,000. The group, consisting of fourteen claims, is owned by a close corporation, of which O. P. Posey is president. The ledge runs the length of three claims. On its western extreme the company is sinking a shaft, now down to 400-foot level, and the vein has been crosscut for 19 feet, with the hanging wall not reached. The 10 feet next the foot wall averages $20 per ton. The remainder runs $5 per ton and for the present will not be removed. The surface cropping of the ledge along the canyon east of the shaft has been found to carry values. Thirteen hundred feet of this was leased in sections of 100 feet each, and considerable work is being done there. Some of the leasers are taking out high-grade ore. It is quarried off the face of the ledge and sorted. The first-class is being shipped to smelters and the other is worked at the company's mill. The company mills the ore for $5 per ton, guarantees 80% extraction, pays $16 per ounce for the gold and receives 30% of the net product. The vein is a fissure in a porphyry dike 400 feet wide, and on the surface is mineralized for length of 1500 feet. The company works sixty men in two shifts in the mine proper, and is using three electric and three air drills. Another compressor will be put in and air drills used entirely. The ore from the shaft is dumped directly into a gyratory crusher and reduced to hen's egg size, then passes down a chute to a tunnel connecting with the surface from the 50-foot level, and is received into cars which tram it to the mill, passing through a system of crushers until it is carried to the cyanide tanks. The mill is constructed in four units, each of which runs independently of the others. Water is brought 4 miles from Little Meadows, on the Kingman road, and it is thought can be developed in sufficient quantity for operating a wet mill. Water is coming into the mine also in considerable quantities. J. D. Spargo is manager, and has mapped out a general plan along which future work will be prosecuted.

Acme, Feb. 27.

(Special Correspondence).—F. Tofty reports making a strike of lead-silver in the hills west of the Minnesota.——The Minnesota M. Co. has its steam hoist in place for sinking on the Manzanita.

F. Ferguson & Son have the shaft on the Redemption mine down 100 feet, and are taking out $40 gold and copper ore.——The Samoa mine, owned by the Chloride G. M. Co., is sacking high-grade shipping ore.

The Lucky Boy mine suspended operations last week indefinitely.——Superintendent J. H. Pyne says he will have the wagon road to the Roger Boy mine completed by the 15th inst. ——F. Mitchell has crosscut into a body of gold-silver ore on the Last Dollar.

The Midnight mine has a 30-foot ledge of milling ore on the 200-foot level.——S. Rhea has completed a 200-foot contract of drifting on the Gem mine at Corbat.

The Chloride G. M. Co., operating the Paymaster mine, in Todd basin, under lease and bond, is making shipments of ore.——J. Carroll has opened up silver ore on his claim, west of the Juno mine, near Chloride. —— The Maguire mine, near Kingman, is inactive at present, but will resume this month.

The shaft on the Dompsey & O'Dea gold mine at Pilgrim, near Chloride, is down 103 feet, and is shipping gold ore.

The Great West mine, in Weaver district, will have its crushers and cyanide plant in operation April 1.——The Virginia mine and 10-stamp mill in Weaver district is temporarily closed down, pending arrival of additional machinery.

J. Prisk has resumed work on the Pastime mine in Mineral Park district, with a small vein of shipping ore in sight.

Chloride, Feb. 9.

(Special Correspondence).—For the past year little work has been done in Chloride district. However, the prospects are for renewed activity the coming year. It is said there are by actual count between Chloride and Kingman eighty-five claims that have produced not less than $10,000 each, some from $50,000 to $500,000, yet the deepest working in the entire district is but 570 feet down. Two drawbacks to Chloride district have been incompetent management and the fact that the ore is refractory.

Recently the Minnesota-Connor group was taken over by the Chloride M. & D. Co., controlled by Griffith & Rigbter, under lease and bond, and next week its mill will again be running. This mill has a capacity of 250 tons per day, which will be increased. The first work will be to run through a tailings dump of 27,000 tons, at the same time sinking on the main shaft to develop the ore body and, incidentally, more water. The ore is an arsenical iron sulphide, carrying some copper and zinc, a little lead, and principally gold and silver, the concentrates running $60 per ton. The mill is run by a 235 H. P. Corliss engine and ligbted, as also the mine, by electricity. From the Minnesota-Connor shaft, with a 72° incline, the ore is elevated to a 300-ton ore chute and automatically dumped. Thence it passes through a Blake crusher, a Dodge crusher, two sets of rolls, then elevated to the trommels, three sizes, and the coarse size goes to another set of rolls. From the trommels the ore goes to two concentrating tables, and through automatic classifiers to other tables, of which there are nine in all, and to a mill for finer grinding. The slimes are concentrated on four Frue vanners. Settling tanks save the slimes and water, so that not more than 2000 gallons of water used in milling is actually lost per day. Concentrates are handled by gravity and conveyed to a drying platform, from which they are hauled to the station, 2 miles, and shipped. Formerly jigs were used in the concentrating process. It is proposed to install a cyaniding plant. A reservoir is built on the hill above the mill. D. G. Jewett, superintendent, states that he will have in mine and mill about forty men at work.

Nearer Chloride the Elkhart mine and mill will resume operations the coming month. It has been taken over by J. H. McNeil of Los Angeles, Cal., with A. C. Moorhead as manager, as the Security M. & Dev. Co. Preparations are being made to work the tailings over and the shaft, down 500 feet, will be sunk 500 feet more. There has been a total of 6000 feet of development in this mine since 1897, but it has been idle for a year. Mine and tailings work will be first done, but the mill will not be put in operation as yet. The ore is a lead sulphide carrying gold and silver values.

Between the Elkhart and the Minnesota-Connor is the Tennessee mine and mill.

On the slopes of Suhrum's peak in Cerbat range, 4 miles east of Chloride, are Samoa and Lucky Boy mines that have kept up steady shipments of high-grade ore. The former is under bond to L. Hoffman and the latter to F. H. Stull and J. P. Finegan, with C. Richard in charge. The ore averages $45 per ton and cost of shipping and smelting amounts to $15 per ton. The Samoa is taking out high-grade ore and doing additional development. On the 180-foot level in one stope the vein is showing 18 to 24 inches in width. It carries high perceutage of silver with gold values.

Other prospects in the vicinity include the Roger Boy, owned by E. Pyne; the Pay Roll, of J. M. Murphy; the Rainbow, of A. M. McDuffie, the Sunshine, J. Barry: the Altata, owned by a Chicago, Ill., company; the Midnight, K. St. Charles; the Pinkham: the Schuylkill, W. D. O'Neill and others.

At Mineral Park little work is being done. The town was recently partly destroyed by fire. Near it the turquoise mine is being worked by a few men. Nearer Cerbat the Paymaster mine is again being opened up, and the ore shoot which was lost has been again found and is being worked. It is under bond to L. Hoffman and is superintended by T. Stinson. This mine's deepest workings are down 200 feet.

At Stockton Hill the C. O. D. mine, owned by the Tagggart Mercantile Co., is being unwatered.——W. A. Mensch, of the Enterprise M. Co., 18 miles east of Kingman, reports favorable prospects. Drifting on the 200-foot level last week opened up a water channel and the water rose 45 feet in the shaft. He is working twelve men and reports concentrates running $144 per ton. The ore is mainly copper sulphide, carrying gold, silver and lead values. The vein crops 30 feet wide on the surface. The group consists of twenty claims.

The Great West mine, 35 miles northwest of Chloride, owned by Eastern men, is being operated, with T. McGraw as superintendent.

On the other side of Kingman, on Burro creek, the Monmouth M. & D. Co. is working. It is headed by J. P. Wallace. The ledge is showing for 3000 feet in length, 40 feet wide, and unassorted runs $2 to $8 per ton. It is 75 miles southeast of Kingman, in the foothills of the Aquarius mountains. Development is progressing.

The O'Dea & Dempsey group, 10 miles west of Chloride, is the only free-milling proposition in this section at present in operation. Some development work is being done by the owners. The property is still held at the option of the Marquette Exploration Co. of Chicago, Ill., for $250,000. The ledge crops for 1600 feet and is 40 feet wide, dipping west at an angle of 30°. It is on the lower slope of a high hill, into which it dips. The vein is irregular, as far as uncovered, showing unbroken hanging wall of porphyry. The foot wall is also porphyry, but not the same as the hanging. The ore taken out is being piled on the dump, no steps having been taken as yet to ship or mill it. Free gold can be seen in the rock. There are four shafts with a total of 250 feet of work.——Two miles from the Dempsey-O'Dea are the Azalia claims, owned by Brown, Pettit & Carey. Little development has as yet been done.

Chloride, Feb. 27.

The company organized to take over the Hunrath mines, near Silver Creek, in San Francisco district, near Acme, will put men to work on the mines next month. ——R. Zuver has opened up a group of mines in the Silver Creek section, San Francisco district, which is showing ore. R. J. Holmes is part owner. They have men at work taking out ore.

Pima County.

(Special Correspondence).—To the Imperial Copper M. Co.'s property a branch road is being constructed from Red Rock station, on the Southern Pacific Railroad, a distance of 23 miles. Grant Bros. are the contractors. The work began to-day.

Tucson, Feb. 23.

Yavapai County.

Stukey Bros., who took over the Dixie 10-stamp mill at Walker, and have overhauled the plant, started crushing ore last week. They have men at work on the Everhart and Eureka claims of the Sheldon group and have a large amount of ore on the dump ready to be milled.

Considerable mining machinery is reported going in on properties tributary to Prescott. The Oro Grande M. Co., north of Wickenburg, is putting in 8000 feet of 4-inch pipe, and C. W. Platt, superintendent of the Illizonia M. Co., near Prescott, is putting in a 20 H. P. gasoline hoist, air compressor and drills.

Superintendent F. E. Jordan, of the properties of the Great Republic G. M. Co., on lower Turkey creek, 2 miles below Turkey station, on the Prescott & Eastern railroad, says the new hoisting plant has been put in place and development work will be increased before the company starts to take out and ship ore.——The Cash mill in Hassayampa district, near Prescott, is in full operation and fifty men are at work.

T. Wilkinson of Burlington, Iowa, of the Oro-Cobre M. Co., which has claims in Copper Basin section, near Prescott, has bought twelve adjoining claims to this group. He has put men to work on development. The number will be increased and machinery added.

The Pittsburg-Jerome C. & G. M. Co., organized by Pittsburg, Pa., men, to develop a group in Jerome copper belt, will sink a 500-foot shaft at the head of Mescal guloh, south of the United Verde mines.

CALIFORNIA.

Amador County.

Machinery is going in on the Dead Wood mine for Kimball Bros., at Defender. They have water to contend with, but have a steam pump in operation, and report making good headway sinking.—— J. B. Dille has been running a tunnel on the Kankakee and has tapped his ledge at depth. He is taking out ore.

At the Shenandoah mine, near Plymouth, a shoot of ore with gold values has been struck in the north drift, says Superintendent Thornton. —— Superintendent Worthing of the Bay State mine has put in an assaying laboratory. He is increasing work at the Bay State, working several levels, and keeps the 10-stamp mill steadily in operation.

The mill at the Bunker Hill mine, near Amador City, is in full operation.

W. J. McGee, a director in the Central Eureka M. Co. at Sutter Creek, says the contractors finished sinking 100 feet from the 2100-foot level sump last week. The contract price was $12.50 per foot, with $100 as a premium if the 100 feet were completed in twenty days. The shaft went into hard quartz and Superintendent Thomas extended the premium limit to twenty-three days, within which the work was finished. The nine contractors netted $5.50 per day per man. The company furnished all material except powder, fuse and caps. The mill was kept going to full capacity—5000 tons per month—during sinking. The same contractors have taken another 100 feet to sink on the same terms.

It is reported the Thorpe mine at Fourth Crossing will be reopened.——The owners of the Reilly Ranch mining property on the Calaveras river, near San Andreas, are arranging for working it by dredging.

The Ophir M. Co. has made final payment on the Lloyd mine on Central hill, near San Andreas, and will increase operations there. In the Reed mine the incline shaft has reached the ledge.

At the Argonaut mine, at Jackson, with forty-five men at work, progress is being made. The Argonaut is operated by shaft, total depth of which is 2230 feet. It is equipped with double reel hoist, run by water power, capable of hoisting three tons of rock 3000 feet, at rate of 600 feet per minute, says the Record. There is also a 40-stamp mill on the ground as yet idle. While some attention is being given to cleaning out drifts, which were formerly worked, the principal work is prospecting. After completion of repairs to the shaft, a station was cut at the 1600-foot level and drifts started north and south. In the meantime the north drift at the 1570 level has been driven and is in 220 feet; miners are cleaning out the north and south drifts at the 1460 level. The mine is being unwatered as rapidly as necessity for use of the lower workings appears. The water is below the 1800-foot level, where at 1810 feet a station is being cut. J. B. Francis is superintendent.

At the Zeila mine, near Jackson, the usual number of men are at work in the mine and mill. The Zeila treats all its product at the mine, there being, in addition to the 40-stamp mill, a chlorination plant for treatment of the concentrates. At present the entire work underground is devoted to exhaustion of the ore bodies uncovered, says the Record. No new development is being done in the mine.

Butte County.

The Big Butte M. Co. has bought more mining land on Butte creek, adjoining their original claim, near Forest Ranch, and is increasing its working force.

Calaveras County.

At the Stockton Hill mine at Mokelumne Hill the additional three stamps began dropping last week, making six stamps in operation.

The Oriole mine was closed down last week, says the Angels Record. —— The diamond drill is still being used at the Sultana mine. —— The Wilber-Womble mine at Hodson is temporarily closed down. —— It is reported the Angels mine at Angels will this month start an addition of sixty stamps to its forty stamps now in operation. —— Work was started last week at the Carson Hill mine at Irvine, south of Angels. —— A drift will be run on the 700-foot level of the Angels mine to the Sultana 700 level to make an air passage between the two mines.

The '49 M. Co., operating at Douglas Flat, has struck the pay gravel channel. Another shaft has been sunk west of the hoisting works. Levels were run and it was there the strike was made. A hoist will be put up and they will develop the west end as well as the east end.

Ore has been opened up at one of the Hercules-Horseshoe group of mines at Indian creek, near Murphys. E. Delray, superintendent, says there is a shoot of 12 feet in length of rich quartz. There is an arrastra and also a small mill on the mine and crushing will be started this month.

The San Andreas Gold Channel M. Co. has been incorporated by W. H. Miller and J. L. Flanagan of Sacramento and F. J. Juchter et al. of San Andreas, to work the Chris Anderson gravel mine on the Central Hill blue gravel lead near San Andreas. Juchter has a working bond on the Chris Anderson mine. They will start work this week. A 10 H. P. gas engine and a double-action sinking pump, capable of raising 9000 gallons of water per hour from the bottom of the shaft, will be put in. The shaft is down 85 feet and will be sunk to bedrock, which is thought to be 15 feet farther.

El Dorado County.

Superintendent Voorheis of the Lew Wallace group of mines near San Andreas is arranging for the summer's work on mines near El Dorado owned by himself and C. F. Walter.

Placerville reports say a mill will be built at the Slap Jack Flat mine in Dark Canyon, near Placerville.

Fresno County.

The California Oil Fields (Ltd.) has another well at Coalinga down in the oil sand waiting to be perforated. This well increases number of producing wells to seventeen. A 2000-barrel tank has also been added to its storage capacity. On a knoll west of the rigs a 2000-barrel water tank has been built.

Kern County.

The Karma M. Co. mill at Mojave is in operation.——The Queen Esther mine and mill are in full operation.

S. J. Montgomery and D. J. McCormick have located the Ophir tunnel site near El Paso, 8 miles northeast of Randsburg. They expect to run a 200-foot tunnel. A 6-foot ledge has been uncovered which is said to assay 32 ounces silver and 30% lead.

Nevada County.

The compressor at the Mountaineer mine, near Nevada City, is in place and development will be increased. The electric motor for the air compressor is being set up.——The cable used in transmitting electricity to the pump on the 750-foot level of the Brunswick mine, near Grass Valley, has been replaced with a larger one.

Operations will be resumed at the New Eureka mine at Canada hill, near Grass Valley, the suspension being temporary, due to storms.——When work is resumed at Shady Creek, near Nevada City, in the spring, Manager F. H. Hall will put in a heavier pump and make other improvements.

The Brunswick mine, near Grass Valley, will resume full operations this month, says Manager Mallon.

The Buckeye mine, near Nevada City, has suspended operations until completion of the 10-stamp mill.——The air compressor of the Murchie mine is in operation and the number of underground men has been increased. The mill will begin crushing this week.

G. W. Manwell, superintendent of the Black Swan drift gravel mine of Mooney Flat, near Nevada City, says the cave that occurred there recently has been cleared and work resumed. The dirt caved in the main drift for a distance of 25 feet, from the surface down.

C. Christopher, superintendent of the Peabody mine, near Grass Valley, expects to reopen the mine.

The mill at the Spanish Ridge mine (formerly the 16 to 1) above Washington is running, says Superintendent Egan.

Operations at the Canfield placer mine on Shady creek, near Nevada City, are temporarily suspended on account of high water in the creek. The bed of the creek was being worked, says Superintendent W. Graham.

The California mine, on Deadman's Flat, near Grass Valley, has been bonded to G. R. Tuttle. Work will start in the spring. The claim embraces ninety acres, most of which is patented. The mine is equipped with hoisting and pumping plant and a 5-stamp mill.

Placer County.

The Rawhide quartz mine on the American river, near Shady Run, near Towle, has been sold to the Soldan G. M. Co. of San Francisco, with H. W. Morris as manager. The company will put in an air compressor, and as soon as the weather is settled enough to handle machinery will add ten more stamps to the mill. Twenty men will be put to work this week.

Riverside County.

F. James, T. H. Whitaker et al. of Los Angeles have organized the Pinon Con. M. Co. to develop a group in Pinon mining district, 15 miles north of Indio. Development machinery and a mill and cyanide plant will be put in.

Santa Barbara County.

The Western Union Oil Co., near Santa Barbara, is drilling three wells on the Careaga property and the drills will not be stopped at usual depth of 1700 or 1800 feet, but will go to depth of 3600 feet, with expectation of striking the lower oil sand. The Western Union wells are averaging 150 barrels a day.

Shasta County.

The Yellow Jacket, Keno, Maud, Amy, Jay Bird, Imperial, Pine Crag, West Eureka, Dorothea and Josephine quartz claims in Backbone district, near Redding, have been consolidated by the owners, R. M. Saeltzer, R. E. Corrigan, and J. S. Smithson, as the Graves Con. group of mines.——The Summit Con. group of mines has been organized, comprising the Maine, Yankee, Iowa, Oregon, Texas, Keystone, Avery and McHugh quartz claims in the Backbone mining district. The owners are M. E. Dittmar, G. F. Graves, C. Avery and M. Lindley.

The Mount Shasta mine on Clear Creek has been shut down temporarily pending reorganization of the company, as the Phœnix Con. M. Co.

A company has been incorporated in San Francisco to develop the five claims of the Little Bully Hill group, near De Lamar, with J. O'B. Reddin president, and H. L. Paddock, D. Byron, W. Haines, C. E. Anderson and R. C. Wilson. The last named is superintendent. A shaft is being sunk to 200 feet.

The Midas M. Co. has suspended operations at Harrison gulch owing to objections of the union men to working with a non-union man put on by Superintendent Oswald. The men are "locked out." The pumps are kept running.

Sierra County.

The Plumbago mine at Alleghany is closed down until the flume that carries the water to the power house can be repaired. The high water of the Middle Yuba last week took 50 feet of the flume away.

As a result of the unusually heavy rain storm of last week, work in the Oriental mine at Alleghany is discontinued temporarily, says Manager M. W. Mather. The bridge which conveyed the Oriental pipe line across the Middle Yuba river was carried away by the high water. The bridge was 80 feet in length and 6 feet from the bottom of the river. The pipe line furnished water that generated power for the Oriental mine, the machinery being in the Plumbago power house.

Siskiyou County.

It is reported J. Johnston of New York, secretary and treasurer of the Montana S. & R. Co., is negotiating for the Headwater G. M. Co. properties in Humbug district, near Yreka. Johnston has put men to work on the property.

The Medina G. M. Co. has bought the Johnson mine of Quartz valley, near Etna. This mine has been idle for several years. It was owned by the Johnson estate. The Medina Co. is operating in Oro Fino district in the Gardner mine and is made up of Eastern men.

Sonoma County.

Gold is reported found near Santa Rosa, in the vicinity of which there are mineral veins, some of which contain cinnabar.

Trinity County.

The dredger on the Junkans Ranch placers, near Weaverville, has ceased operations temporarily. The ground will be tested with a prospecting drill to ascertain the best place for working.

The Dorleska mine on Union creek, tributary of Coffee creek, near Trinity Center, is temporarily closed down, owing to heavy snowfall.

Tuolumne County.

(Special Correspondence).—The Soulsby mine, at Soulsbyville, is reported sold to Eastern men. W. Sharwood, one of the former owners, is still superintendent. The mine has a narrow vein in the granite, and is credited with a total production, to date, of over $6,000,000 in gold. It is developed to depth of 800 feet. A characteristic geological feature of the mine is the occurrence of pegmatite dikes, cutting the vein at various angles, and the presence of ore shoots adjacent to these dikes.

Soulsbyville, March 2.

(Special Correspondence).—The Black M. Co. has been incorporated under Wyoming laws by G. W. Campbell, W. G. Scott and C. S. Dow, and they have leased the Black Oak mine, near Soulsbyville, from the owners. The mine has been closed down for four months owing to a strike. In the meantime general repairs have been made throughout the mine and top works and the hoist has been raised and reset. Preparations are being made to resume full operations. Improvements will be made in the process of handling their ores. Experiments with the cyanide process have been made. The concentrates from the vanners will be reground and slimed in a ball mill and cyanided. The high-grade, sulphide ore will be sorted at the shaft as heretofore, but, instead of being shipped to a smelter, will be treated separately in one 5-stamp battery of the 40-stamp mill, concentrated, reground and cyanided separately. W. G. Scott is superintendent.

Soulsbyville, March 2.

At the Bell mine, near Tuttletown, the grading for the 20-stamp mill is finished and the masonry work started. In the mine sinking is still in progress. The shaft, which is down 610 feet, will be sunk 20 feet deeper. When this is done a station will be cut at the 600-foot level and drifts run east and west.

The Girard G. M. Co. has been incorporated — principal place of business Jamestown—by J. C. Davis, A. B. Overholser, C. M. C. Peters, F. P. Finkbohner of Jamestown and A. Arnold of Oakdale. ——The Golden West M. Co. has been incorporated—principal place of business San Francisco—to operate in Tuolumne county by P. Mariscano, S. S. Petrovich, C. Bovone, E. R. Hedges and G. F. Buck.

F. E. L. Robinson, of Sonora, has a bond on the Wheal Porrin mine, at Soulsbyville.——An oil plant will be installed at the Mack mine, near Groveland, and oil used as fuel.——The Clio mine, at Jacksonville, is being unwatered, and will be inspected by the Providence mine owners.

The Stockton Gravel M. Co., whose placer properties are in the Star district, near Columbia, is making an extensive prospecting season this winter. Their first shaft, down 80 feet, is in channel gravel.

C. A. Fitzgerald has bought the Homestead and Carolina placer mines, near Jacksonville.——L. Bosovich has bought a half interest in the Hard Scrabble placer mine (the Bosovich & Conlin), 1 mile east of Columbia.——J. H. Merrell has bought the Cosmopolite mill site near Groveland.

J. M. Merrell of Oakland has deeded to the Cosmopolite M. Co. the Cosmopolite quartz mine, near Groveland; also the Cosmopolite quartz mines Nos. 2, 3 and 4 and a millsite.

At the John Royal mine, near Columbia, the 10-stamp mill is running.

An air compressor and four machine drills for the Horseshoe Bend mine on the Stanislaus river, near Columbia, are on the ground. It is proposed to build a stamp mill. E. Goss of Sonora is superintendent.

The twenty stamps recently added to the Jumper mill at Stent were put in operation last week, and eighty stamps are now dropping.

It is expected the Clio mine at Jacksonville will be reopened for development work.

The Dresden G. M. Co. has taken over land traversed by and within 50 feet of New York gulch, near Jamestown, together with certain tunnels and other rights necessary to work the North Star, New York, Morning Star, Comet, Last Chance and Blue Gravel placer claims.

COLORADO.

Boulder County.

The Chlorination mill at Eldora is expected to be reopened under a bond and lease by C. G. Maynard, et al. of Cripple Creek. They have also a bond and a lease of the Enterprise mine on Spencer mountain and will start work at both mine and mill. Alterations and repairs are to be made at the mill which will greatly increase its efficiency.

The Arapahoe M. Co. is driving the crosscut from the 1000-foot tunnel towards the Cashier and Maud S. vein, near Boulder. Machine drills will be put in and work increased.——Roberts & Rodgers of Cripple Creek have a bond and lease on the Don D. group on Cedar mountain. They are sinking a new shaft and expect to go 200 feet before starting lateral work. The vein is 3 feet wide.

The Sunset G. M. & M. Co., at Sunset, reports work progressing, and 20 men are at work, besides ore teams, coal haulers and mill men. The company has bonds on the Skandia group and the Governor Routt group, and has also bought additional claims. It bought the 5-stamp mill (the Thompson mill), and is running it on Skandia ore. As soon as the machinery is placed the Governor Routt mine will be worked. There is a body of mill ore exposed, besides a streak of smelting ore.

Clear Creek County.

(Special Correspondence). — The lower tunnel of the Capital M. & T. Co. is in 1400 feet and cuts the mountain at depth of 700 feet. They expect to drive 200 feet farther before striking the vein they have on the surface. They are working one shift per day with machine drill. The upper tunnel is in 250 feet, driving by hand, and expect to drive it 130 feet farther. W. Cooper is manager.

D. Kennedy, manager of the Centennial G. M. Co., is drifting on the vein at the 600 foot level and taking out ore that averages $50 per ton. In places it is 5 feet wide. At present he is not running the mill, due to scarcity of water. He

has some smelting ore which runs high in gold and is shipped to the smelters.

The Transcontinental T. & M. Co. is preparing to put up a plant of machinery —compressor, etc.

Georgetown, Colo., Feb. 28.

(Special Correspondence). — The Jackson concentrating mill is handling the usual tonnage.——The Wnlthem M. & M. Co. is building a mill on Chicago creek. The initial capacity will he twonty-five tons, which will he increasod to seventy-five tons. This company has a lease and bond on the Ward & Ward Extension proporty and is sinking a shaft. Thoy will put in a completo hoisting plant.

Four new mills are in course of erection in Idaho Springs section of Clear Creek county. Nearly all the mills are running steadily and getting all the ore thoy cnn handle. Water has been scarce for some time on account of littlo snow.

Idaho Springs, Feb. 29.

(Special Correspondence).—The Empire Tunnol Co. of Georgetown is oporating the Gold Dirt mine nnd intends opening up the lower levels. The shaft is 515 feot deep, hut has not been opened up bolow tho third level. The shaft connects with the Aorta tunnel. The company is shipping one carload per week.

Empire, Feb. 28.

The Brazil group at Freeland is reported sold to the Con. Brazil M. Co. for $200,000. The group consists of sixteen claims and a millsite, the latter and four of the claims being patented. The group is near the Freeland, Lamartine, Gum Tree and Jo Reynolds mines. W. A. Haggott is president of the new company, and F. G. Shaffer of Idaho Springs secretary and treasurer, with G. Riley of Idaho Springs managing director. The millsite covers rights on Trail creek, and in addition to the mines the property contains thirty acres of timber. The property has been worked periodically and has produced $12,000, principally in high-grade matorial. Shaft No. 1 is on the west end of the ore body and has from 6 to 18 inchos of quartz, which milled $50 a ton. No. 2 has quartz which averages $30. The ore is sulphide of lead, carrying gray copper and nativo silver. The Big Forty, Tolland County and Bullion tunnols are surveyed to intersect the group under the present workings. The Burns-Moore tunnel will cut within 1200 feet of the group, and the Monarch tunnel, which will probably he the first available, will cut within 2000 foet of the group and at depth of 2300 feet from the surface.

Arrangements are made for starting operations on the Ramsdale and other lodes, near Georgetown, hy a local company.

C. I. Burt, operating the Vulcan mine above Silver Plume, has mado arrangements whoreby the sampler will treat a large tonnage of his ore. A number of men are employed in the various workings of the property, in addition to the regular leasers. High-grade ore opened last month is awaiting shipment. Assay values run 600 ounces in silver per ton. There is said to he no zinc in tbe ore. It is intonded to start machine drills next week, providing he can secure sufficient water for power. A drift is to run from the Pay Rock to cut under the Vulcan at additional depth of 200 feet.

Cadmium ore has been found in the Kitty Owsley mine's vein, near Georgetown, and shipments sent to Swansea, Wales, are reported to have given returns of $100 per ton after paying transportation charges.

Development is heing increased hy the Manhattan Union M. Co. at Argontino. Last week contract was awarded for sinking the shaft 400 feet from the surface and another contract given for drifting 500 feet from the 400-foot station. There is a tunnel driven 800 feet. The mine is equipped with machinery. At the 400-foot station of tho tunnel level a raise has heen started which is up 120 feet, says Superintendent Tingle.

The operators of the Magnet mine, near Georgetown, have started shipments of high-grade ore. A winze is heing sunk and a drift will he run for cutting under the ore hodies.

Superintendent C. L. Tingle of the Stevens mines and mill at Argentine, says preparations are being made to increase the mill to 100 tons daily capacity. The present output is 30 tons daily.

Chaffee County.

The Jasper mine, in Turret district, has heen sold to the Four B's M. Co., of Lincoln, Neh., for $25,000. The property has heen operated under hond and lease hy the Four B's Co. It is 1 mile northeast of Turret and 12 miles north of Salida, and is equipped with machinery. At present there are several carloads of ore in the drifts ready for shipment. The shaft has heen sunk to 325 feet on the main vein. At intervals the vein is tapped hy crosscuts from the shaft. The values are principally in gold, hut some copper is shown. The new owners will add more machinery and improve the present plant, with view to handliug larger output.

Fremont County.

The Union mill at Floreuce of the United States R. & R. Co. fired up another roaster last week, and it is expected by March 15th the entiro mill will be running full hlast. It has been operating at about one-half capacity since January 1st on account of not receiving enough ore from Cripplo Creek. The ore from the Golden Cyclo mine hns hoon diverted from the Standard mill in Colorado City to Florence. When the plant is in full blast fifty more men will he required.

Gilpin County.

(Special Correspondence).—Scarcity of snow in this section is causing anxiety as to supply of water for the coming summer. Tho water in the creeks is the lowest for several years and but little snow in the hills. Work is progressing as usual in the Central City minos, and nearly all the mills are husy.

V. M. Came and B. G. Granville, owners of the "Gilpin County Now Treatment" of low-grade gold ores, are preparing to work on a largor scalo. They now have a lahoratory where they are experimenting, hut will huild a plant to handle 125 tons of ore per day. They will treat ore running from $5 to $15 per ton.

Central City, Feh. 29.

(Special Correspondence).—The Fish-Cook-Greggory and Bobtail mines, which have heen closed for soveral months on account of litigation, will start up March 1st. O. B. Thompson, manager for these properties, has sunk the Cook shaft 500 feet deeper, making it 1400 feet. The mine has a three compartment shaft. Thompson will also start the mill which has also heen idle since tho mines wore closed down.

Black Hawk, Feb. 28.

Near Rollinsville the Bluegrass M. Co. of Phœnix has completed its 10-stamp mill and will hegin crushing ore this week. They have several months run on the dump. K. C. Parrish is in charge. ——The Shepherd tunnel, which formerly produced ore, is heing retimhered and the company expects to increase development.

The Phœnix-Burroughs mine on Quartz hill, near Central City, has put in a new 1-inch steel cahle 3000 feet in length for hoisting. During the month of January the consolidated properties of this company shipped 147 cars (1250 tons) to the stamp mills, concentrator and sampling works. From sixty to seventy-five men are employed on company and leasing account, says Manager R. Sykes of Denver.

The Quartz Hill M. Co. is operating the Golden Dollar mine, near Russell Gulch, with W. Bradden in charge. Machinery has heen put in and a shaft huilding erected. Sinking is in progress. They will crosscut to the vein.

The Roderick Dhu M. Co., operating the Protection mine on Quartz hill, near Central City, is shipping twenty tons of ore per day to the mills on North Cloar creek. The manager reports that the ground is showing increased values and that they have run the grade up to $6.50 per ton.

Missouri parties are interested in the Russell group at Russell Gulch, and developments continue regularly under Superintendent A. Thompson. A 60 H. P. hoiler has heen added and sinking is under way. The shaft is down 400 feet. Steam drills are used. Both sinking and station pumps are handling the water. The company has an agreement with the Old Town mine, wherehy they are permitted to drift west from the 200-foot level of that property to explore ground on the eastern end of the Russell group.

Gunnison County.

Dice Bros., owners of the Lottie K. mine, near Pitkin, are shipping ore. Six inches of $40 ore is reported in a winze sunk near the hreast of a 130-foot tunnel. The values are gold and lead.——The Corona M. Co. of Boston, Mass., has started work on its Oh My mine in Bowerman. A tunnel will be driven on the vein, and development will he under supervision of W. J. Nourse.——Some payahle copper ore is reported showing in a 40-foot shaft on the Copper Field lode. A tunnel is in 35 feet, which will cut the vein showing in the shaft at depth.

Lake County.

(Special Correspondence).—W. S. Jones, superintendent of the Cloud City mine, has the shaft down 504 feet, and will sink 200 feet farther. This property adjoins the Midas-Coronado and other producers in the "down town" district.

Leadville, Feh. 28.

Pueblo County.

A ship load of South American silver and gold ore arrived last week at the Eiler smelter of the American S. & R. Co. of Puehlo via the Colorado & Southern road from Galveston, Texns. Other shipments are said to be coming in from Chili and Peru, and it is largely on necount of these foreign shipments that the company's Philadelphia smelter will be started up at full capacity. At present there are five furnaces and fourteen roastors at the Philadelphia plant not in operation. As soon as these are started up the numhor of men will he increased about 1000, making tho total number of smelter men employed in Pueblo 2500.

San Juan County.

Sisson & Graham have started up work again on tho Bolla tunnel (the old Northern Light). A company has been organized, and will increase development until all the veins in its course are oponed up. Further up, near timberline, the tunnel will reach the Elvira-Virginia vein, which has a vein showing on the surface silver and lead, with milling valuo in gold. The Northern Light M. & M. Co. owns thirty-six claims on line of its tunnel site, east of Cemont creek, near Silverton, and has a bond on twonty-seven (oprated by Graham) on the Red mountain side. The coming summor power drills and improvements will go in.

The Yukon tunnel, near Silverton, is going ahead and has attained a distance of 1950 feet. Two veins have heen cut, one showing copper and iron sulphide, says Manager Lamont. He is arranging with the San Juan S. & R. Co. to ship this ore to the smelter.

The Henrietta mine has started up. The drifts on No. 6 level north and south on the Henrietta vein will ho driven and the stoping of ores in other levels will be started this month, tho tram line heing in readiness to transport tho copper ores to the smelting plant.

The Gold King M. Co., near Silverton, hesides the amalgam scraped off the plates every twenty-four hours, is getting out five carloads of concentrates daily, says the Silverton Standard. Each car has a capacity of twenty tons.

San Miguel County.

The Black Bear M. Co., in Ingram basin, near Telluride, reports drifting progressing on south vein of crosscut, and a point 355 feet from intersection has heen reached. A shaft is heing sunk from this drift 75 feet from intersection with the crosscut and 40 feet deep, showing a 5-foot vein of ore. It is intended to put in an electric hoist as soon as the shaft reaches depth of 100 feet; in the spring ore will he sent to the Smuggler-Union mill.

The Butterfly-Terrihle plant at Ophir, with forty men at work, has heen producing 175 tons of ore daily. The ore averages $9 per ton, the values heing saved on plates hy amalgamation. The east drift of the Butterfly, which is cut by the crosscut tunnel, has heen driven 600 feet. There remains 200 feet before the eastorn limit of the Butterfly territory is reached. The distance hetween this drift and the next level ahove is 320 feet. The pay streak from which the ore is heing extracted is from 1 to 3 feet in width.—— V. U. Rodgers and F. Fox, doing development work on the San Bernardino, opposite the Butterfly, expect to complete the blocking out of ore by April 1. Development work on this ore hody has heen going on for several months. The San Bernardino ore runs high in silver values and 30% in lead. This ore is shipped to the smelter.

The Rio Grande Southern M. & M. Co. for the past eight months has heen operating the Shoemaker group of mines 2 miles north of Ophir. An extension has been secured on the company's lease and option on this ground, and this spring the company will increase development work. This work contemplates the driving of a crosscut tunnel to cut the vein at a vertical depth of 1000 feet helow the surface. P. B. McAtee of Durango and G. Sanders of Telluride are directors of the Rio Grande Southern M. & M. Co.

The Gold King mine in Turkey Creek hasin, near Telluride, will have development work increased hy the company and the mine put on a producing hasis. The Gold King is heing operated hy M. Bertolin, who holds a lease on the property. There are ten levels in the Gold King mine.

Summit County.

J. C. Whisler, superintendent of the French Gulch G. M. Co. (formerly the Mecca Placer M. Co.), near Breckenridge, says a pit, 75x150 feet, was excavated to hedrock (from 13 to 19 feet deep) with hydraulic elevators and a boulder hoisting cahleway put up. A douhle or branching Y-shaped sluice was laid along the hedrock and the gravel washed with giants into the upper hranches of the Y. After leaving most of the placer gold in the hranch sluices — which were so arranged that they could be cleaned up independently, so that while one continued to work the other could he relieved of the accumulated gold—the tailings passed to the main sluice and through it to the hydraulic elevator pipes. As the season advanced and the water supply became insufficient to both handlo the tailings through the elevator and to keep the pit drained, the steam pump was used to remove excess of water from the pit. When cold weather set in Superintendent Whisler rigged up a washing plant in a shed made by hoarding up part of the trestle which supports a portion of the elevated flume. Ordinary sluice hoxes, lined with rifles, nre arranged next tho wall; the steeply sloping boxes discharge from one into the other until the gravel has passod ovor about 40 feet of riffles altogether. The building is warmed hy a large wood stove; the water used, warmed by waste steam, is pumped into the upper sluice hox from the pit (to which it returns and is usod over again) hy the steam pump. The hedrock drifts are driven 5½ feet wide and 6½ feot high. The richest gravel is wheelbarrowed to the washing room and is shovoled into the upper hox; the second grado gravel is wheeled to the head of the Y sluice, where iu the spring the giants will disintegrate the mass and force it through the sluices. Three men are employed at present at an expense of $12 per day. Whisler says the output averages $24 worth of gold and nuggets per working day.

The Excelsior property, consisting of lodes and placers, at mouth of French gulch, near Breckenridge, will he reopened the coming season, says Manager Braun. The principal owner of the Excelsior is W. Sieck of Chicago, Ill.

Teller County.

C. M. Crowder & Co. will sink a shaft on Colorado Boss No. 1 on Bull hill, Cripple Creek, owned hy the Cripple Creek Con. Co. The shaft is down 150 feet and it is intontion of lessees to sink 600 feet farther. On every 100-foot level lateral work will he done. The lessees have opened a body of ore. They have also taken a lease on the lower working of the Anaconda mine, which adjoins their claim, and are sinking a winze on the level 400 feet helow the tunnel level on a hody of ore of shipping grade. The same lessees have a lease on the south end of the Iron Master claim of the Doctor-Jack Pot Co. It is expected they will start sinking a shaft there from surface, and if ore is opened up in any of the three properties all will probahly he worked from their main shaft.

Drainage of the Cripple Creek mines is heing steadily accomplished hy the El Paso tunnel, says the Gazette. The decrease reported in the Elkton and Mary McKinney properties approximates 3 feet a week, while proportionate gains are estimated hy other companies where regular measurements are taken. The eighth level of the Elkton and the sixth of the Mary McKinney are not far helow water line, while in several other mines admission has already heen gained to the submerged levels. According to measurements made at the portal last week hy Engineor Jacquith, 6500 gallons a minute are coming out, and that has heen steadily maintained for several weeks. In the meantime the east heading is advancing into Raven hill and recently cut several small feeders. The hreast of the tunnel is over 6000 feet from the portal. It is reported the owners and general managers of the Bull Hill mines, especially those affected hy water, propose further extensions of El Paso drainage tunnel. It would he necessary, perhaps, to vary the course slightly and to drive it another mile to accomplish good to the mines on Bull hill and tho south slope of Battlo mountain. Should this tunnel he continued into Bull hill it would drain such mines as the Findley, Golden Cycle, Hull City Placer, Last Dollar and others to a depth of 1300 feet. This would enahle these producers to use pumps, if the water quostion trouhled them helow this depth. It is thought it would require nearly two years to do this work.

Manager Gilhert of the Peggy G. M. Co., at Cripple Creek, expects this week to start sinking the shaft on the Le Clair claim another lift or to 400 feet from surface and from that point extensive lateral work will he done. The ore shoot west of the shaft is said to he flat, while that to the south is nearly vertical. During January 150 tons of ore returning values of five ounces gold per ton were sent out. Besides this, development work was done.

Lessees Harrison & Seaver, operating the W. P. H. mine, in which they made the high-grade ore strike last month, have extended the hroast of the drift 20 feet in a southerly direction, and have opened up a 4-foot vein from which assays give returns of $500 per ton. The winze on the rich streak has heen sunk to depth of 12 feet from the hottom of the shaft, and the 16-inch shoot is reported to maintain its high average. The lessees are also continuing sinking of the shaft, having reached a depth of 40 feet helow the 245-foot level. They will put in a two-

drill air compressor, also a hoist. When these additions are made the shipments of second and third-grade ore will be increased. T. Walsh, who has a lease on the Forest Queen, which adjoins the W. P. H., and which is thought to carry the extension of the W. P. H. shoot, is sinking the shaft. On reaching the 200-foot point lateral work will be started. Lessee Walsh has done considerable lateral work at depth of 185 feet from the surface.

The output of Cripple Creek district for February amounted to $1,769,600, a decrease from January of $83,400, which is explained by February being two days shorter than January. The tonnage for the month is 54,500, with an average value of $29. The month of March is expected to show increased value over February. There is more ore being sacked by mines at the present time than ever before in history of Cripple Creek camp. The following table shows individual treatment during February:

	Tons.	Total.
U. S. R. & R.	25,000	$625,000
Portland	8,300	249,000
Telluride	4,000	160,000
Economic	2,800	61,600
Dorcas	2,700	121,500
Homestake	1,700	8,500
Sioux Falls	1,000	4,000
Smelters	9,000	540,000
Totals	54,500	$1,769,600

The Zenobia G. M. Co., controlled by the Stratton estate, has leased the Zenobia claim on Bull hill, Cripple Creek, to J. M. Wright for eighteen months and 27½% flat royalty. The executors of the Stratton estate report that they will not consider any applications for leases on the Bull hill property of the Stratton-Cripple Creek Co. The property of this company on Bull hill will not be leased for some time yet.

Lessees Francis & Co., operating a lease on the Proper claim of the Stratton estate, up Poverty gulch, near Cripple Creek, are putting in a plant of machinery. A boiler with 80 H. P. capacity and a compressor will be put in. The lessees have sunk the shaft to a depth of 120 feet with a whim. They intend to sink the shaft to a depth of 300 feet before doing lateral work. They have opened up a vein.

IDAHO.

Boise County.

The Osborn mine at Horseshoe Bend is being equipped with a steam hoist, pump and other machinery by Superintendent G. Leighton of the Idaho G. M. D. Co., which owns the mine. About 7000 feet of underground work has been done. Manager J. A. Richardson says a mill will be built with a capacity of 100 tons per day.

Custer County.

C. E. Gable, manager of the Golden Sunbeam M. Co.'s mines and mill on Jordan creek, near Custer, says the company will increase the capacity of the plant to 300 tons daily. At present the management is reducing thirty tons daily. The Sunbeam group covers a porphyry sheet, says Manager Gable, in which are contained gold values of $4 per ton, the proposition a free milling one, while the expense of mining is confined to quarrying.

Elmore County.

Oil is reported struck at Medbury Hill, between Mountain Home and Glenn's Ferry.

Superintendent B. Ford of the South Boise M. & D. Co., which owns 320 acres of bar placers and 320 acres of dredging ground at the junction of the South Boise and Big Smoky rivers, near Pine Grove, east of Boise, says he is preparing to resume. A hydraulic plant with a capacity of 2000 yards per day was put in last fall, which will be put in operation as soon as the weather will permit. He says the gravel on the bar is from 100 to 120 feet deep and will average 40 cents per yard. In addition to this, the company owns other property near by, which it is intended to develop the coming summer. Ford also has charge of a group owned by Roanoke, Va., men, consisting of 520 acres, 12 miles from the South Boise M. & D. Co.'s holdings. It is intended to put in two hydraulic plants the coming summer.

Idaho County.

Dobbin & Chambard are down 42 feet in the shaft on the Lost Lake property, near Hump, says the Spokesman-Review, and have crosscut 12 feet with 4½ feet of ore showing free gold. Sinking was stopped on account of water.——The Atlas has run into some of the best ore taken out of the vein.——Work on the Granite has been completed for the winter. Fifty feet of shaft has been sunk and 16 feet of crosscutting done. Some good ore has been taken out, but the ledge is still broken up. Drifting will be commenced in the spring at a depth of 250 feet.——At the Jumbo the new 10 stamps are dropping.——Del Rio tunnel is in 315 feet, and some large kidneys of ore are being found, showing free gold. Crosscuttng will be commenced.——The Crackerjack Co. will begin in a few days on the crosscut tunnel from the feeder to the main ledge, 70 feet ahead. Machines will be put on this work and drifting north and south will be commenced as soon as the ledge is cut. The mill will be started about March 15.

J. J. Bye of Pittsburg, Pa., part owner of the Pactolian M. Co. mines in Rapid River district, states that at the Pactolian a winter force of six men is at work and developments are progressing. Fair-grade ore has been opened up. The company will increase operations and also will build a plant during the coming season.

Kootenai County.

The J. Ferguson claims at Blacktail have been sold to the Wisconsin M. Co. for $50,000. Further development work will be started next month. J. Ferguson of Sandpoint is superintendent.

R. E. Stratton, superintendent of the Panhandle S. Co., at Sandpoint, says men will be put to work next week and the smelter will be put in operation.

W. T. Bailey of Duluth, Minn., part owner in the Continental mine, near Porthill, says development work in the mine will be increased this season. A compressor is being set up. They are now working 100 men, and fifty of them are in the mine. Shipments are being made to amount of forty tons a day. They haul the ore 22 miles to the railroad. Since the sledding has been good not a day has passed without this amount going to Porthill.

Shoshone County.

Under management of O. Linn, the Nine-Mile M. Co. resumed operations this week, after six months' idleness. The mines are on Nine-mile creek, 3 miles above Wallace, and 2200 feet of tunnel work has been done. In the lower tunnel a crosscut will be run to tap the ledge at depth of 500 feet. In the upper workings there is said to be a body of silver-lead ore. There are six claims in the group, all patented. O. Linn and J. Flinck are principal owners.

KANSAS.

Cherokee County.

Ford & Troupe of the Mission mine, south of Baxter Springs, are preparing to put in a 150-ton crusher plant at their mine.

At Galena, coal supply is on the ground for the Lou Dillon M. Co., and operations will start this week. The Lou Dillon was formerly the Cousin ground, and will be operated by Stone, Pinson & Hallam of the B. & E. M. Co. They have a shaft down 120 feet and have opened up a good face of jack. The Cousins mill will be operated by a Webb City company.

MICHIGAN.

Houghton County.

Operations the coming summer will explore the deposits of the South Range, to determine their extent outside of the Baltic, Trimountain and Champion lines. The exploration of the Globe property will start as soon as the weather conditions permit, says the News. The Globe tract is owned by J. Stanton, of New York, and consists of 3200 acres south of the Champion mine at Painesdale.

The Calumet & Hecla No. 20 shaft on the Kearsarge lode, near Calumet, has struck the lode and found it well mineralized.

The strike of the miners at the mines of the Copper Range Con. C. Co., at and near Painesdale, continues.

Keweenaw County.

The Ahmeek management reports it is intended to supply one head at the Tamarack mill with rock from the Ahmeek mine, near Allouez. The union with the Seneca is being negotiated.

The Mohawk mill, near Allouez, started three heads in operation this week.

Ontonagon County.

At the Adventure mine at Greenland the daily rock output is 500 tons, and is all being taken from ground tributary to No. 3 shaft. The aim of the company at present is to sink this shaft as rapidly as possible to a depth of 1000 feet to ascertain the value of the lodes at that point, and no special effort is being made to secure an increase in the daily output of rock.

It is reported the Belt mine will be reopened in the spring by New York parties. The Belt is east of the Hilton end of the Adventure Con., near Greenland, and is owned by J. H. Rice et al. of Houghton.

MISSOURI.

Jasper County.

The Joplin News-Herald says the highest price reported paid for zinc ores last week was $38 per ton, and the assay price $35 per ton of 60% zinc. Lead advanced to $56. The shipment is 700 tons of zinc less than the preceding week, partly attributable to a lack of cars for loading the ore bought. The value was $25,000 less for the entire district, but the value of the ore sold within 3½ miles of Joplin was $83,815, or nearly as large as the preceding week.

The No Name M. Co. has been organized in Carthage to operate on a sub-lease of four acres on the strike made by J. W. Aylor and A. R. Bowen on the Williams land, west of Carthage. Mineral was found at 55 feet depth and was continuous from that to a depth of 120 feet, except one break of 15 feet between two runs of ore. Sinking of the shaft on the drill hole was begun last week. The incorporators are V. Grieb, D. & D. S. Miller, L. L. Ashcraft, A. Myers, R. A. Goldsbury and D. McCoy.

A company has been formed to prospect a tract of land, 4 miles south of Carl Junction, by E. S. Keskeys and S. D. Chitwood & Sons. They are prospecting the tract with a drill and have struck shines.——The Power M. Co. of Joplin has been incorporated by W. P. Leon, C. W. Power and W. J. Montfort.

MONTANA.

Jefferson County.

P. Gruner and J. Wassen are working the Mantle mine in Cataract district, 2 miles from Basin, on lease and bond. It is worked by a shaft down 50 feet and 70 feet of stopes and drifts. They are averaging a car of ore a week, which is being shipped to Butte for treatment. The ore is lead carbonate carrying values in gold and silver. The vein is 2 feet wide.

The Elkhorn M. Co. has given a bond and lease on the Elkhorn Queen mine for $20,000 and a royalty of 10% to R. C. Wallace, J. H. Freezer, Z. T. Vinson and F. S. P. Lindsey of Helena. The mine is near the Elkhorn and is a gold, silver and lead proposition.

Lewis and Clarke County.

J. C. Cory of Helena has a bond on the Atlanta group, in Rimini district, near Helena. There are three claims, the Gum Boot Jim, Atlanta and Hunter—a mile from Rimini. There is a shaft down 180 feet and crosscut tunnel to tap bottom of shaft, which latter is nearly finished. The ore at the bottom of the shaft is said to be in shipping quantities. All this work is on the Atlanta. Work will be started to develop the entire group.

Powell County.

The mining property at Danielsville of F. A. Heinze, of Butte, is reported closed down, throwing sixty men out of employment.

NEVADA.

Eureka County.

P. Porter, manager of the Keystone M. Co. at Eureka, reports the lower tunnel, driven into the mountain 160 feet below the next one above, has struck the ore, showing vein of 12 feet width.

Lincoln County.

Gold bullion of $31,000 value, the result of the cleanup at the mill for last half of month of January, was shipped last week from Bamberger's De Lamar mines, at De Lamar.

J. Knight of Provo, Utah, has bought a half interest in a group of claims in Silver Park mining district, 35 miles north of Pioche, and the Nevada-Park M. Co. has been incorporated, with J. Knight, L. Holbrook, R. E. Allen, S. A. King and J. J. Knight as officers. The holdings cover ten full lode claims, three of which are patented. For fifteen years the mine has been idle.

The first payment has been made on the Welland & Clifford group of mines at West Point, near Pioche, by C. R. Rives of the Pioche Nevada Con. M. Co. The Pioche Nevada Con. M. Co. has the two Clark claims near West Point, namely, the Comstock No. 1 and Comstock No. 2.

J. N. Williams and J. M. Yates of Boulder, Colo., have a twelve-month's working bond on the Blackhawk group of mines, near Searchlight, for $30,000. Men have been put to work. The Blackhawk group consists of three claims and is east of the Pompeii mine. On the surface the vein averages 4 feet. —— Contractors are sinking the Pompeii shaft at the rate of 60 feet a month. The contract calls for a total depth of 300 feet, besides crosscutting and drifting. They are down 200 feet, says Manager Spare.

A strike has been made at Camp Duncan, 12 miles northeast of Searchlight and 4 west of the Colorado river. Duncan & Sinclair of Tonopah, W. Thurman, H. A. Perkins, E. K. Wood, G. H. Hamstadt, G. Dupont, W. L. Colton and L. Wheatley of Searchlight are doing development work. The ledge on Mount Duncan crops 12 feet in width. A tunnel has tapped it at depth of 100 feet.——The Woods group at Camp Duncan has been sold to W. H. Fuller. The group comprises the Roosevelt, Ivanhoe and Golden Terra, on which little development work has as yet been done.

Lyon County.

J. H. Rae, manager of the Como-Eureka mine, owned by the Federal Co., Ltd., at Como, near Dayton, says five more stamps are being added to the company's mill, which is to be further equipped with a cyanide plant. A new development of 6 feet of free-milling ore, showing average value of $12 gold per ton, has been made in the mine. The mill is running to clear away an accumulation of low-grade ore, and when the crushing capacity is increased it will be started on the high-grade ore body. A pumping plant, with a water-lifting capacity of 100 gallons per minute, is on the ground and will be set up. It will be operated by electric power transmitted from the Federal Co.'s dynamo plant on the Carson river at Dayton, which can supply 250 H. P., only 50 H. P. of which is required until the pumping plant is set up, and the capacity of the mill enlarged to handle 100 tons of ore daily. The milling plant is also equipped with rollers, which pulverize the ore after it has passed through the coarse screens of the stamp batteries, and from these the pulp passes over six concentrating tables.

Washoe County.

J. H. Sheehan has resumed operations on the Crown Point mine at Olinghouse.

In southern part of district eighteen men are at work developing and prospecting their claims at Ninth Crossing, near Wadsworth. The Ninth Crossing G. M. Co. of Reno has miners sinking a shaft 4x6 feet, which is down 50 feet. Superintendent T. Hart reports a crosscut will be started east to cut a ledge of quartz of known values at surface. Ore is free milling.——M. Lund, R. Nelson and R. Peterson of Reno have a group of five claims with ledges of free-milling gold ore. The ledge which is being developed is reported 5 feet in width. A crosscut is being run to tap a ledge at a depth of 120 feet—now in 20 feet. Further up the hillside is a cross vein of 18 inches wide carrying $10 in gold.

NEW MEXICO.

Grant County.

The St. Louis-Gold Gulch M. Co. will put in a steam hoist on the Lucky Bill mine at Gold Gulch, also on the Flying Dutchman, together with machine drills and a 500-foot capacity sinking plant. They will remodel the Gold Gulch concentrator as a 50-ton cyanide plant.

Rio Arriba County.

A strike of coal is reported made in Gallinas district, west of Ojo Caliente, and is 2 miles from the survey of the proposed railway line from San Felipe to Durango. It is 40 miles southwest of Tres Piedras. The Denver & Rio Grande Railroad Co. has men making examination of the deposits. It is claimed the line of railway will tap the deposits of mica in Alamos canyon, west of Petaca, and enable those properties to be worked, most of them being idle at present on account of the long haul by wagon to the railroad. The Superior Mica Co. of Milton, Pa., is doing work on 125 acres of ground there and is preparing to begin shipping of mica this month.

Sierra County.

The Hillsboro G. M. Co., which owns the Ready Pay group of mines at Hillsboro, largely owned by A. G. Brown of Utica, N. Y., is arranging to increase development work. The company has a 3-stamp mill. Owing to lack of water which is being arranged for, the mill cannot be started as yet. —— E. F. Pearson, manager of the Richmond G. M. Co., is arranging to increase development work on that group of mines. Work on the lower tunnel has opened up additional bodies of milling ore.

Socorro County.

A gold field is reported located in the San Mateo mountains, 30 miles west of San Marcial, and near Rosedale, by E. L. Watkins.

The Dividend M. Co. has thirty men at work on its property at Estey City. The company is preparing to put up a 50-ton smelter.

OREGON.

Grant County.

The Oregon Gold Dredging Co. has been incorporated to build a dredger on the Crane Flat placers, near Granite, work on which will be started this month. G. J. Barrett of Granite is local manager.

Josephine County.

J. M. Depew reports having struck the Boulder ledge (or "Old Spot," from the spotted appearance of the ore), with O. P. Templeton and A. G. Arnold. Shafts have been sunk, open cuts made and tunneling done. The ledge is on the east side of Mount Baldy, 4 miles from Grants Pass.

SOUTH DAKOTA.

Lawrence County.

Machinery is being put in by the Hidden Treasure G. M. Co. and sinking will be resumed, says Superintendent W. Lawlor. A gasoline boist and a separate gaso-

line engine for the electric lighting plant are being set up. The dynamo will operate the drills and lights. This shaft has been started from the floor of the main tunnel and is down 50 feet. The hoisting machinery is being set up at the station cut in the tunnel, which is 100 feet underground. In the spring a larger steam hoisting plant will be set up at the surface, to which a raise will be made from the present tunnel level.

The Wauconda M. Co. is preparing to put in machinery on its mine 5 miles south of Lead. Delay has been occasioned by the deep snow, says F. Ames, superintendent.

Ore has been opened on the 500-foot level by the Columbus Con. M. Co. in Sawpit gulch, near Central City. Two veins have been cut, one west and one east of the main shaft. They are equally distant from the shaft, being each 100 feet. At depth of 200 feet the principal ledge of the Columbus is said to be 247 feet wide and carries gold values running $3 a ton. This ledge is opened on the 200-foot level by crosscutting and drifting. The company has plans completed for building a mill of 1000 tons daily capacity in Sawpit gulch near the shaft. Water will be pumped from Deadwood gulch. Another shaft will be started at ¼ mile north of the main shaft.

Pennington County.

The Mainstay M. Co. is preparing to resume work at its mine and mill near Keystone, arrangements having been made for handling its concentrates at a Denver, Colo., smelter, says Manager T. R. Griffith. The Bismarck ore, while carrying values in free gold, also contains a large percentage of values in concentrates. Concentrating machinery is being put in.——J. Madill began work on the Eleventh Hour mine last week, taking out ore for shipment. Three cars of twenty tons each have been shipped to the Imperial mill at Deadwood, and regular shipments are to continue. The ore is hauled from the mine by sleds 1¼ mile down grade to Iron Creek station.

UTAH.

Iron County.

With heavier pumps put in, drifting on the 300-foot level of the Johnny mine, at Stateline, was resumed last week.

Juab County.

The Showers Con. at Diamond, in the south end of Tintic district, has been dismantled, the machinery removed and operations have been suspended indefinitely.

Copper ore has been opened up on the 1400-foot level of the Black Jack mine at Tintic, near Eureka, says J. Knight of Provo, manager.

Arrangements have been made whereby the Star Con. mine of Tintic, near Eureka, will be equipped with a chlorination plant. It will start in with capacity of 200 tons daily, which will before end of year be increased to 500 tons daily, says W. V. Landers of Boston, Mass., manager.

Morgan County.

Secretary N. B. Dresser of the Park City Co-operative M. & D. Co. of Park City, operating on the Copper mountains, on Weber river, reports ore had been struck in the face of the drift 25 feet from the mouth. It consists of a seam of the black oxide of copper on the foot wall. More men will be put on.

Salt Lake County.

A hoist has been put up at the Galena mine in Bingham, one of the United States M. Co.'s properties.

H. M. Crowther, manager of the Continental M. & S. Co. at Alta, says he is preparing to build a concentrator to have initial capacity of 100 tons daily.

Summit County.

After a month's partial suspension of operations for repairs and installation of a pump, the Silver King Con. mine of Park City has started up again.

Tooele County.

Work has been started at the Black Diamond mine at Stockton.

Wasatch County.

A contract has been signed by which the output of hydrocarbons from the mines of the Gilson Asphaltum Co. of Salt Lake City in the Uintah reservation section is to be afforded an all-rail outlet over the tracks of the Uintah Railway between the camps and Crevasse on the line of the Denver & Rio Grande. Grading will begin next week and the line is expected to be ready for operation by July 1. With this as an outlet, the asphalt company will the present year begin production, a number of contracts for the product guaranteeing it a steady market. The first connection will be made with the Dragon ledge. The next connection, as projected, will be with the interests of the Raven M. Co., in the southern part of the reservation. Sutherland, Van Cott & Allison of Salt Lake City are interested.

Weber County.

The Great Northern C. M. Co. has been incorporated at Ogden for developing the Great Northern group of claims, in the Sierra Madre mining district, by A. W. Agee, D. Convery and S. H. Browne.

WASHINGTON.

Franklin County.

R. W. Taylor and J. W. Kouba are preparing to put in machinery to work their placer ground on the Columbia river, 5 miles above Pasco. It will include a gasoline engine and a pump, with capacity of 600 gallons per minute, 20 foot elevation. The river is 200 feet distant, and water will be taken therefrom through a canvas hose and used in hydraulicking the banks through sluices into a gold-saving machine. They report having 4 feet of pay earth near surface, and another 14 feet deeper, 3 feet thick.

Snohomish County.

The Everett R. & Electric Co. has started construction of a power plant to generate 15,000 H. P. at Lake Isabel, on the Great Northern, 32 miles east of Everett. It is said the intake for the 32-inch pipe will be 30 feet below surface of Lake Isabel. The pipe will be 12,000 feet long, with a fall in that distance of 2,500 feet. Owing to the heavy pressure, a special steel pipe will be used, decreasing in diameter to 20 inches near the nozzle, which is to be five-eighths inch diameter. Using a Pelton wheel, this stream is intended to develop 10,000 H. P. Later another stream and wheel will be put in, developing 6700 H. P. The pressure on the steel pipe will be 1100 pounds to the square inch. The speed of the water, leaving the nozzle, will be 417 feet per second. It is said the only plant in the world to exceed this in its head of water is one in Switzerland, having a head of 3700 feet. In California there is one with a head of 1900 feet at Electra, Amador county.

It is reported the Sunset C. M. Co., operating at Index, will build a concentrator near the Index mine.

Stevens County.

The annual report of the Crystal Marble Co. of Spokane, operating in Stevens county, shows: Last year 300 tons of marble were quarried and this year 400 tons are channeled. This is of the diamond dark variety. Other kinds are in the company's holdings and will be quarried this season. The channeler was started last week on a crystal white ledge which has been uncovered, and is reported free from surface defects. The company is working twenty men at the quarry, and as soon as the snow is gone the force will be doubled. It is expected additional channelers, hoists and derricks will be put in, says F. A. Chase of Spokane, secretary and manager.

FOREIGN.

AFRICA.

Cape Colony.

Arrangements have been made with the Goldfields Diamond Drilling Co. to bore 2500 feet at the following mines: The Columbia, 500 feet from bottom of straight shaft; the Queen Cross, 1000 feet from bottom of straight shaft; and the East Queen Cross and Vesuvius, 1000 feet from surface. The Vesuvius is also going to prospect with the diamond drill. The ore put through the mills for the month is 22,241 tons 9 cwt., yielding 25,619 ozs. 2 dwts. 22 grs., being an increase of 2639 tons and 1201 ounces when compared with the corresponding month of the previous year. The value of mill gold for the month is £85,948 1s 3d. Old tailings treated by cyanide show 1850 tons for 624 ounces, being a decrease in tonnage of 3259, and in bullion 2086 ounces. Thirteen thousand eight hundred and seventy-one tons of new tailings were treated for 8601 ounces. The new tailings show a decrease of 6407 tons and 2658 ounces when compared with December of the previous year. Assayer's return is 203 tons for 481 ounces. The total value of the product from all sources is £101,768 1s 2d. The dividends for the month show an increase of £31,022 4s. For this month £77,522 4s was paid in dividends, and in December of the previous year £46,500. Of the dividend producing mines for the month, the Queen Cross shows the return of over three ounces to the ton, 2432 tons of quartz being treated at the mill for a return of 7830 ounces of gold, the value being £26,045. This mine has paid in dividends for the month £45,000, as against £30,000 paid in December of the previous year. The Brilliant Central comes next with £10,000 in dividends for the month, the yield from the mine being 3239 tons for 3705 ounces. There is a considerable improvement of late in the value of the ore produced from this mine.

Transvaal.

The Transvaal Chamber of Mines at Johannesburg reports the gold output for January amounted to 278,867 fine ounces for Witwatersrand, an increase of 157 ounces over December, 1903. The output for the outside districts was 9957 fine ounces, an increase of 2606 ounces.

AUSTRALIA.

Queensland.

The gold returns of Queensland for the month of January are:

	Tons Crushed.	Yield in Ounces.
Charters Towers	18,600	17,100
Croydon	4,100	2,300
Gympie	9,200	4,900
Mount Morgan	26,000	9,900
Ravenswood	2,500	2,700
Other fields	1,300	1,000
Alluvial		600
Total yield		38,500

Victoria.

The Victorian gold yield for month of January amounted to 53,109 ounces, being an increase of 10,921 ounces over January, 1903.

Western Australia.

It is reported opal has been found 3 miles from Coolgardie by J. T. Moore. The ground in the vicinity of the find has been pegged in all directions.

BRITISH COLUMBIA.

Boundary District.

Development work has been resumed on the Blue Jay mine, in Skylark camp, 2 miles below Phœnix.——Manager Rea, of the Betts and Hesperus, on Hardy mountain, is preparing to put in a 5-drill air compressor.——W. Newton, part owner of the McKinley claim, in Franklin camp, says development work will be resumed this spring. The McKinley has surface showing of values in copper and gold across a ledge that has been stripped for 25 feet.

East Kootenay District.

The oil industry and the development of oil ground in the Flathead valley, near the international boundary line, south of Fort Steele, is receiving attention, says the Fort Steele Prospector. There are two companies operating in Kintla Lake district. The oil found has a paraffine base. The Kintla Lake Co. has oil in its well at a depth of 1000 feet, but it is still sinking and expects to drill 2000 feet.

Nelson District.

It is stated work will be resumed on the Mollie Gibson mine, near Nelson, which was closed down a year ago by a snowslide. There is said to be ore in sight in the mine on the first, second, third and fourth levels. The mine has been opened by four tunnels. The lower one is 500 feet from the apex of the vein. The ore averages 60 ounces in silver and 15% lead.

Rossland District.

During the last fiscal year the Le Roi M. Co. at Rossland made a profit of $400,000, according to a statement made at the annual meeting in London. The financial statement for the year ended June 30, 1903, showed profits of $400,000. This was supplemented by the announcement that the January profits this year aggregated $50,000 net.

The report of the Le Roi No. 2 M. Co., operating at Rossland, for the year ending in September last, shows as result of year's working 31,100 tons of ore raised, of which 17,550 tons were shipped to the smelter, of an average value of $20.69. The cost of realizing on this amounted to $8.288 per ton, leaving net returns from smelters, $217,750. Since the termination of the contract with the Northport smelter in August, 1903, a contract has been made with a Greenwood smelter for treatment of the Josie output on more favorable terms. Shipments commenced on September 9 and returns for the current year up to December 31 show profits from shipments at the rate of $10,000 per month. The new oil concentration plant went into operation in November. So far it has only been considered advisable by the management to put through ore of low grade (averaging under $5), so as to enable those in control to gain experience of the working and technical difficulties of the process, says the director's report.

Slocan District.

Twelve men are working at the Cinderella-Medford mine near Sandon, and Cory & Foster, lessees, expect to ship one carload of ore per week while rawhiding continues.——The Queen Bess mine, in Idaho Basin, near Sandon, has been sold to W. E. Zwickey, G. Potter, R. Irving et al. The Queen-Dominion M. Co., Ltd., is being organized to operate the property. The Queen Bess, formerly owned by the Queen Bess Proprietary Co., is said to have shipped $250,000 worth of ore, which is galena and carbonates. A total of 2700 feet of tunnels and shafts have been driven.

Yale District.

H. Mayhew, of Flintshire, Wales, a director of the York and Lancaster Co., which owns the Alice group, near Creston, reports he has, with J. Hampton, leased the Alice group from the company, and intends to install a concentrator and an aerial tramway. It is a silver-lead group.

CANADA.

Yukon Territory.

Tacoma reports say the spring rush from the Pacific coast States to the new Alsek mining district, near White Horse, has started. Many men are going in with horses and outfits to engage in business or start mining. The diggings are 150 miles west of White Horse, and are reached by a rough trail over a gently rolling country. Official reports, covering the stakings in Alsek district, show that to Jan. 1, 1904, thirty-five creeks had been staked, with a total of 1500 claims. Two hundred and fifty claims have been staked on Bullion creek and 133 on Sheep creek. J. Potoker, from Alsek, reports prospects all along Sheep creek run from 10 to 20 cents per pan. The creek is full of water this winter at a greater depth than 10 feet, and bedrock cannot be reached. It is thought the district can be worked to the best advantage in summer by open-cut system. A movement from the Klondike and Atlin districts to Alsek has begun and roadhouses are being built.

MEXICO.

Chihuahua.

G. W. Boyce reports work progressing on the Senorita mine at Victorino. The shaft on the vein is down 80 feet and crosscutting is being done. Assays show twelve ounces silver. This ore body is said to be a mineralized dike, 9000 feet long, averaging 30 feet wide.

C. Barbier and F. Ramirez have started work on La Reina mine, near Cusihuriachic. As soon as sufficient ore is accumulated they will start the Burns mill.

Durango.

(Special Correspondence).—Several new railroad enterprises are in progress near Durango. The International Railroad is building toward Guanacevi, a silver camp. A competing line over nearly the same route is the proposed Parral & Durango Railroad, controlled by Americans operating mines at Parral. The object of this company is to tap the Guadalupe y Calvo district in Chihuahua and the gold and silver mines on the headwaters of the Sinaloa river. Another proposed line headed for Culiacan will connect with the short line now running from that point to the port of Altata, on the coast. Surveys of this line pass near the lead camp of Topia and the gold and silver mines of San Andreas. This route will open up the coal territory at the San Juan ranch, near Remedios, and pass near the gold and silver mines of La Trinidad and Bacis. Other surveys have been made from Durango to Tepic, passing through a section carrying gold, silver, lead and tin ores.

R. C. Kirk of Vivorillas has a plant at work pumping water from the workings on the Pueblito mine, on which he intends to do development work.——The number of men at the La Dura mine has been increased. The mine is a steady producer of shipping ore. The mine is near the Sinaloa-Durango boundary line and owned by F. Aragon of Cosala. F. Jarrold is superintendent.

Durango, Feb. 27.

Sinaloa.

(Special Correspondence).—The Barrateros mine, near Cosala, which was shut down temporarily, has resumed work. The tunnel which is being driven to tap the old Spanish shaft has attained a length of 760 feet. It is in a lime belt cutting through the coast granite.

Minney & Co. have completed their second cleanup at their mill at San Galindo, on the Elota river. They are testing the ores of the Mariposa (formerly La Trinidad) mine, near Guadalupe de Los Reyes.——T. Boland has men developing his claim on the south side of the Sierras Barrateros. The values occur in pockets of gray copper, running well in silver.

The Franco-Spanish M. Co., owning the Estaca and Descubriadora mines at Guadalupe de los Reyes, have a diligencia (stage) running between that point and the port of Mazatlan, making the distance in eighteen hours.——The old Santa Ana mine, on the Elota river, near the Durango line, has been denounced by the Mexican stamp agent at Cosala.

Cosala, Feb. 27.

Sonora.

The Greene Con. G. M. Co., W. C. Greene of Cananea president and manager, is preparing to put in machinery to operate on the San Miguel and San Domingo mines in the eastern part of Magdalena district. The property includes the Santo Domingo and La Busca placer fields.

G. W. Crowe, manager of the Ruby G. & C. Co., east of Ortiz, says the gold mines owned by the company are showing up satisfactorily. F. B. Wilson, of New York, is president.

Personal.

P. L. YOUNG left London on the 18th ult. for Valparaiso, Cbile.

A. H. JEREMY, a coal mine operator of Pittsburg, Pa., is in San Francisco, Cal.

L. A. STEVENS of Boston, Mass., is in Chibuahua, Mexico, on mining business.

L. T. BAKER of Britton, S. D., is visiting the Gold Bug mine, near Sumpter, Or.

F. N. HUBER, of the United States Geological Survey, is in San Francisco, Cal.

J. C. BRANNER of Stanford University, Cal., bas gone to Europe on a year's vacation.

B. B. THAYER succeeds Wm. Scallon as Montana representative Amalgamated Copper Co.

T. MCGREW is superintendent of the Great West mine near Chloride, Mobave county, Ariz.

C. M. LOVE, president of the New Vulture M. Co., is in Wickenburg, Ariz., from Cbicago, Ill.

H. FISCHER AND W. J. RAND of Boston, Mass., are examining mines near Wickenburg, Ariz.

F. J. HURNE, president of the Colorado Fuel & Iron Co., is in San Francisco, Cal., from Denver, Colo.

R. L. AND W. J. DOUGLASS, mining superintendents of Virginia City, Nev., are in San Francisco, Cal.

F. C. FINCKLE, cbief engineer of the Edison Electric Co. of Los Angeles, Cal., is in San Francisco, Cal.

J. A. BUNTING, owning extensive oil interests in California, is in San Francisco from a trip to Tyoah, Tex.

W. E. GRAY of Denver, Colo., has returned from Georgetown, Colo., from looking after mining interests.

E. F. PEARSON, manager of the Richmond G. M. Co., at Hillshoro, N. M., is in the East on company husiness.

MANAGER E. F. FREUDENTHAL of the Manhattan M. & S. Co. of Pioche, Nev., is in New York City on husiness.

H. SCHNITZEL of Lead, S. D., is manager of the Hidden Fortune G. M. Co., vice A. H. Danforth, resigned.

CAPT. WM. HART of the California Debris Commission has returned to San Francisco from San Andreas, Cal.

B. F. MONTGOMERY of Colorado Springs is interested in mining on Chicago creek, near Idaho Springs, Colo.

C. O'KEEFE has resigued as president and manager of the mines of the Sonora M. & M. Co. near Altar, Sonora, Mex.

E. C. VOORHEIS of the United States Assay Commission has returned to Sutter Creek, Cal., from Philadelphia, Pa.

J. J. TRENAM, manager of the Stockton and Beaver Con. mines, at Stockton, Utah, is in the East on mining husiness.

R. C. BONNEY is manager of the Sun & Moon mine at Idaho Springs, Colo. H. N. Simms resigned on account of ill health.

A. H. DANFORTH of Lead, S. D., has resigned as manager of the Hidden Fortune G. M. Co. and has gone to Colorado.

R. C. WILSON is superintendent of the Little Bully Hill group of mines at De Lan ar (Winthrop P. O.), Shasta county, Cal.

H. C. HANSON of Logan, Utah, manager of the Amazon M. Co., has gone to San Francisco, Cal., on company husiness.

C. S. ROBINSON of Cripple Creek, Colo., and E. S. Plumh of Colorado Springs, Colo., are examining mines in Mexico.

J. H. SMITH of Little Falls, N. Y., is president and manager of the Sonora M. & M. Co., operating in Altar district, Sonora, Mex.

HOMER WILSON of San Francisco, Cal., is in New York in the interest of the Wildman-Mahoney mines, of Sutter Creek, Cal.

G. W. CAMPBELL has returned to San Francisco, Cal., from the Black Oak mine, near Soulsbyville, Tuolumne county, Cal.

J. W. CARY, for the past three years with the Mine & Smelter Supply Co., Denver, Colo., has retired to look after other interests.

SUPERINTENDENT DENTON of the Trimountain and Baltic mines, near Painesdale, Mich., returned there last week from a trip to Florida.

A. F. NATHAN, manager of the Stilwell M. Co., operating in Mexico, has removed bis headquarters from Chihuabua to Mexico City, Mex.

R. E. STRATTON, superintendent of the Panhandle Smelting Co., has established headquarters at Sandpoint, Kootenai county, Idabo.

R. H. ROGERS of Springfield, O., interested in tbe Horshoe Bend Rancho mining property in Tuolumne county, Cal., is in San Francisco, Cal.

MARK MANLEY, superintendent of tbe Enterprise mine on East fork, near Coleridge, Trinity county, returned last week from a business trip to Boston, Mass.

J. M. HILLYER has been examining the Compio silver mine and adjacent gold claims near Guadalupe de los Reyes, Mexico, and is now at Panuco, Sinaloa, Mexico.

H. W. GOODE, president and manager of the Portland General Electric Co. and general manager of the Lewis and Clark Exposition, is in San Francisco, Cal., from Portland, Or.

C. BECKER, Denver, Colo., an assistant the past two years witb L. Humphrey with the Guggenbeim Exploration Co., has accepted management of a copper mine in Sinaloa, Mexico.

J. H. FENNESSY, treasurer of the Mine & Smelter Supply Co., Denver, Colo., will assume the duties of president of that corporation; Cbas. H. Tibbitts will be general manager and Albert H. Seep vice-president.

H. MAYHEW, colliery manager of the Harwarden estate, in Flintsbire, Wales, is visiting mines in Britisb Columbia in which he is interested, including the Alic group near Creston, B. C., and mines at Ymir. He will go to New York, N. Y., this week.

FORMER MANAGER MCLOUD, of the Abe Lincoln mine, in Poverty gulch, Cripple Creek, Colo., will manage the Bull Hill properties of the Stratton's Cripple Creek M. & D. Co., including the American Eagle, John A. Logan, Orphan May, Lucky Gus Kellie and Six Points.

F. D. WEEKS of New York, metallurgical engineer for the Engineering Co. of America, was recently in Denver, Colo., on his return from the Northwest, where he was making examination for the installation of a smelting plant. Mr. Weeks recently had charge of the installation of a large nickel plant in Sudbury, Ont.

PRESIDENT ALDERSON returned to Golden, Colo., from St. Louis, after arranging for the exhibit of the Colorado School of Mines at the fair and for the summer school there next summer. The space assigned to the Colorado School of Mines at St. Louis is 30x40 feet, diagonally opposite the mines and mineral huilding.

J. S. AND R. J. CARY, president and vice-president, respectively, of the Mine & Smelter Supply Co., Denver, Colo., bave retired from the firm and will hereafter look after their interests in Routt county, Colo., where tbey are interested in coal and other mining interests. The Mine & Smelter Supply Co. will continue in business as heretofore under new management.

Commercial Paragraphs.

W. H. COVERDALE & CO. have incorporated to do a general engineering and contracting business, with offices at 66 Broadway, New York City.

THE Burt Manufacturing Co., Akron, O., have sold the Jones & Laughlin Steel Co. a 30-inch exhaust head for their plant at Pittshurg, Pa.

THE marble used in the construction of the new fourteen-story huilding of the Merchants' Exchange, San Francisco, Cal., is from the quarry of the Columhia Marhle Co., Columhia, Tuolumne county, Cal.

G. W. PENNINGTON & SONS, INC., of No. 313 Folsom street, San Francisco, Cal., report their shops in full operation, filling orders for their hammered steel shoes and dies. They also manufacture cam and crank shafts, rock breaker plates, refined tool steel, hammer, pick and machinery steel, and other forgings.

THE California Gas & Electric Co. of San Francisco, Cal., has bought the Standard Electric Co. and the United Gas & Electric Co., ahsorhing both corporations and becoming the largest institution of the kind in this west half of America, taking in twenty-nine different companies. The electric lines are over 1000 miles in length. The company is now producing ahout 45,000 H. P. and proposes to create 33,000 H. P. additional.

Trade Treatises.

Bulletin L-508 of tbe Laidlaw-Dunn-Gordon Co. of New York tells about the improved Cincinnati air compressor. It will be sent upon application to any one interested in air compressing machinery.

The Weinman Machine Works, Columbus, Ohio, send their general catalogue of pumping machinery for 1904, describing and illustrating their steam pumps, together with considerable technical information of general interest.

Obituary.

J. T. GRAYSON, formerly of Cincinnati, Ohio, but lately of Portland, Or., interested in Oregon mines, died at Cincinnati, Obio, on Feb. 25tb. Deceased was general manager of the Alpine Con. G. M. Co.

Latest Market Reports.

SAN FRANCISCO, March 4, 1904.

METALS.

SILVER.—Per oz., Troy: London, 26 1/16d (standard ounce, 925 fine); New York, bar silver, 57 3/8c, refined (1000 fine); San Francisco, 57 1/2c; Mexican dollars, 46 1/2@47 1/2c San Francisco, 45 1/4c New York.

COPPER. — New York: Standard, $12.50; Lake, 1 to 3 casks, $12.50; Electrolytic, 1 to 3 casks, $12.37 1/2; Casting, 1 to 3 casks, $12.25; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 15s spot per ton.

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4 3/4c 1000 to 4000 lbs.; pipe 6 1/2, sheet 7, bar 5 3/4c; pig, $4.85. London: £11 17s 6d ℔ long ton.

SPELTER.—New York, $5.15; St. Louis, $5.00; London, £21 15s ℔ ton; San Francisco, ton lots, 6 3/4c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.00 @ 28.40; San Francisco, ton lots, 30 1/2c; 500 lbs., 31c; 200 lbs., 31 1/2c; less, 32 1/2c; bar tin, ℔ lb., 35@37 1/2c. London, £124 6s 7d spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76 1/2 lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 1/2c; extra, 17 1/2c; genuine, 31 1/2c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumhers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the hasic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ hhl.

CEMENT.—Imported, $2.15@2.40 ℔ hhl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ℔ hhl. in sacks, 4 sacks to hhl.

STRUCTURAL MATERIALS.

IRON.—Pittshurg, Bessemer pig, $13.60 @13.60; gray forge, $12.60; San Francisco, bar, 3c ℔ lb., 3 1/2c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, har, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 00@14 25
Northern 2	13 50@13 75
Northern 3	13 00@13 25
Southern 1	13 85@14 35
Southern 2	13 35@13 85
Southern 3	12 85@13 35
Forge	12 10@12 60
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 40@ 1 45
Bars, steel	1 46@ 1 46
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 50@13 00
No. 1 cast, net ton	11 00@12 00
Iron rails	17 00@17 50
Car wheels	14 00@15 00
Cast borings	4 50@ 5 00
Turnings	8 00@ 9 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6 1/2c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8 1/2c; 100-lb. lots, 10 1/2c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 1/2c; less than one ton, 17 1/2c. No. 1*, 60%, carload lots, 13 1/2c; less than one ton, 15 1/2c. No. 1** 50%, carload lots, 11 1/2c; less than one ton, 13 3/4c. No. 2, 40%, carload lots, 10c: less than one ton, 12c. No. 2, 35%, carload lots, 9 1/2c; less tban one ton, 11 1/2c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet aud up.

CANDLES.—Granite 6s, 16 oz., 40s., 11 1/2c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23 1/2c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3 1/2c per lb.; caustic soda, in drums, 3@3 1/2c ℔ lb.; Cal. s. soda, hhls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, hbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2 1/2@2 3/4c; powdered sulphur, 2@3c; flour sulpbur, French, 3 1/4@3 1/2c; alum, $2.00@2.25; California refined, 1 3/4@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5 1/4@5 1/2c; cbloride of lime, spot, $2.50@2.75; sulphuric acid, in carhoys, 66% B, 1 3/4@2c ℔ lb.; nitric acid, carhoys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymho, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumherland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, hbl., 49c; cs., 54c; raw, hbl., 47c; cs., 52c; Lucol oil hoiled, hhl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20 1/2c; Astral, 20 1/2c; Star, 20 1/2c; Extra Star, 24 1/2c; Eocene, 23 1/2c; Elaine, 26 1/2c; Water White, in hulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21 1/2c; cs., 25c; Mineral Sperm, cs., 26 1/2c.; Deodorized Stove Gasoline, hulk, 16c; do., cs., 22 1/2c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19 1/2c; Lard Oil, E W. S., hhl., 85c; cs., 90c; Neats-foot Oil, pure, bhl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6 1/2c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1/2c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, 1/2c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6 1/2c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 6 1/2c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., $1.00.

BISMUTH.—Subnitrate, ℔ lb., $2.00.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—$2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 75c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c: 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittshurg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Dividends.

On the 1st inst. the Bunker Hill & Sullivan M. & C. Co. declared a dividend of $45,000, payahle on the 4th.

MINING AND SCIENTIFIC PRESS.

Whole No. 2277.—VOLUME LXXXVIII. Number 11. SAN FRANCISCO, CAL., SATURDAY, MARCH 13, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Some of the Mines of Arizona.

About 12 miles in a southerly direction from Prescott, Yavapai county, Ariz., is the summit of Las Prietas mountains, which extend in an easterly and westerly direction between the Hassayampa river and the Agua Frio. The country from the vicinity of the base of the mountains northward is granitic. The rocks of the range itself are mostly metamorphic. The dominant point in the range is Mount Union, which has an altitude of about 7500 feet, though this summit is not very noticeably higher than the surrounding ridges. The slopes are rounded, and those of the main range are covered with a dense growth of chaparral and other brush, with scattering pines. The granitic area supports a magnificent pine forest. From the direction of Prescott a high, rough ridge of eruptive rocks, known under the general name of porphyry, joins the Prietas range in the vicinity of Mount Union.

The entire region of Las Prietas, from its most easterly to its most westerly limits, is recognized as a mineral country of promise. Along the western spurs are numerous gold and silver-bearing veins which have been worked with more or less success. Among these are the Catoctin, Dos Oris, Blue Dick, Ohio and Jersey Lily. Farther eastward, and near the contact of the granite and the metamorphic rocks, are a number of mines and prospects, some of which are attractive. Some years since a shoot of very rich gold rock was taken from the Howard mine, near the Hassayampa, under the shadow of Mount Union. The quartz was snow-white, with abundance of bright, native gold. The most noted mine on the range is the Senator, near Mount Union. This property has been extensively developed and is equipped with mill and operating plant. There are several groups of mines in the vicinity, among them being the Snowstorm, the Cash and the Grubb properties. The Cash is equipped with two steam hoists over shafts 500 feet and 700 feet deep, respectively, and it also has a 10-stamp mill. The other properties of the immediate vicinity are in the development stage. Farther eastward are the mines of the Walker district, at the head of Lynx creek, and the mines of Poland, Provideuce and Big Bug districts. Other mines of the vicinity are described elsewhere herein. Although these mines have been known for years, it is only recently, comparatively speaking, that the conditions were favorable to their operation. This is chiefly due to the complex nature of the ores. These generally consist of the sulphides of iron, zinc, lead and copper, with gold and silver, in a quartz gangue. This renders the metallurgical problem difficult of solution at a distance from railroad transportation, but the energetic mine operators of the district are solving this problem, and the promise of additional railroad facilities, either electric or steam, tends to aid materially in the solution of the economic problem. The mines for the most part occur in fissures in the highly metamorphosed shales—now deuse, hard slates—and are almost universally accompanied by intrusive dikes of felsite or porphyry. In some iustauces the intruded igneous rocks are also mineral-beariug. It is said of some of these ores that a considerable portion of their gold is amenable to amalgamation on plates in the stamp mill. The tailings are concentrated and shipped. In past years a number of the mines of this vicinity have profitably shipped their high-grade sorted ores to Colorado for treatment.

Cash Mill, Mount Union, Fifteen Miles Southeast of Prescolt, Arizona.

The Coming Power.

The great motive force in mining in the future will, without doubt, be electricity. This power has already been successfully applied to various branches of the mining and metallurgical iudustries, but that the best or ultimate results as to effectiveness or application have been reached, or even approached, is not believed by those competent to judge—nor would it be in keeping with progress to entertain such an idea. In transportation, lighting, and the transmission of messages or signals, electricity has reached a high degree of usefulness, and it has also successfully eutered the field of practical mining in the operation of compressors, mill machinery, hoisting engines and rock drills. In metallurgy it is also being successfully employed, but far greater advances in this direction may be anticipated. In the mining regions of the West electric power plants are already numerous and are constantly increasing in number. Within the past week a compauy has been orgauized at Salt Lake City, Utah, under the laws of Idaho, the purpose of which is to utilize the power of Shoshone falls, on Snake river. It is the intentiou to build three power plauts, the aggregate power of which it is estimated will reach 80,000 H. P., which will be distributed to mines within a radius of 200 miles.

THE Peruvian Governmeut has issued an order withdrawing deposits of borax and niter from appropriation by deuouncemeut under the mining laws, reserving these for the benefit of the Government, it being the evident intention of the Government to either exploit deposits of this character or to dispose of them to the highest bidder, thus realizing a considerable income from them.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MARCH 12, 1904.

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Proposed Mining Law.

A new feature in mining law is contemplated in the recommendation by the Senate Committee on Mines and Mining of a bill introduced by Senator Heyburn of Idaho, providing for jury trials of cases wherein patent applications are adversed, the idea being to have the trials come before a court of competent jurisdiction instead of before the land office, as has been the custom in the past. This will permit of those who are personally informed as to the date and character of the location and the monuments of the claim, acting as witnesses in such suits. It is believed that this course will in a great measure do away with the unsatisfactory operation of these cases, and permit the facts to be arrived at without delay, while giving the court and jury an opportunity to judge of the character of witnesses, which is impossible where the trial is held at a long distance from the mine in question, and where the principal witnesses make no personal appearance, but merely send in their depositions. Should this bill become a law it will to a great extent remedy the troubles arising over the practice of the land department of insisting that the calls of the deputy United States surveyors shall take precedence over the monuments on the ground in determining the actual position of a claim.

AN interesting contention has arisen over the ownership of an Alaska mine at Nome, which is represented to have produced $1,300,000 within the past five years. The matter is being heard before a board of arbitration in Chicago, Ill. The contestants are a Swedish church, known as the Swedish Evangelical Mission Covenant of America, on one side, and a mining corporation and several individuals on the other. It is claimed by the church society that one of its missionaries staked the claim years ago when acting as agent or missionary for the church, and they contend that, as he was an agent of the church society, the property properly belongs to the church. The locator also says he located the mine for the church. This claim is being vigorously contested by the opponents to this somewhat novel theory of location by agent.

Mining Without Timbers.

The necessity for the practice of closer and still closer economies in mine management has led to the introduction of innovations in the practical operation of many mines. Forty or fifty years ago only small mines could be successfully operated, because no method of supporting the ground was known, where the "pillar and stall" method was inapplicable. In 1860 the square-set method was introduced and proved a boon to the managers of great mines everywhere. At first the square-set method was employed with the timbers alone to support the back of the stope or hanging wall, or both, but numerous disastrous caves resulted. The filling of timbered stopes followed and is to-day generally recognized as the best and safest practice throughout the mines of the world, and there are numerous large mines which can be successfully operated in no other way than by the square-set system of timbering and contemporaneous filling. There are various modifications of the square set, in which the method of framing the timbers and the manner of placing them represent the principal features of difference. In some systems the timbers are all framed on the surface and are placed without delay in the stope when required. In others the timbers are only partially framed on the surface, and when it becomes necessary to place them much hewing with an ax and adz underground is required—an expensive method. In some systems the ties of the square set are replaced by two "sprags"—one connecting the upper and one the lower post of two adjacent sets. Beside these there are many other modifications, but none of them are superior to, or less expensive, than the regulation Nevada sets. In some regions when mining is first commenced, timber is abundant and comparatively inexpensive, but as years go by the timber supply becomes scarce and consequently costly. This has been the experience in numerous regions. But what of semi-arid and desert regions, like those of the Rand, South Africa, Australia, and some of the regions of Mexico and the United States? Timber is always a large item in the expense of mine operation, and particularly so in timberless regions. This has led to various experiments in mining with less timber than is required in the square-set method. These efforts have resulted in the evolution of several methods by which large bodies of ore are extracted by the use of a minimum amount of timber. With this issue of the MINING AND SCIENTIFIC PRESS is concluded a series of valuable articles on mining methods at the Homestake mine, Lead, South Dakota. The methods introduced the past few years are not widely different from those in use at the Broken Hill mines in New South Wales, Australia, and somewhat similar methods are being introduced at the Mount Morgan mine, Queensland, Australia, and elsewhere. These methods are applicable to those mines where the ore bodies are large and the rocks firm. Ground which caves easily would generally be considered unsafe to mine by these methods, and in such cases the full square set, with filling, must be resorted to. The methods in vogue in the iron mines of the Lake Superior region, Michigan, and in Minnesota, are also valuable, and illustrate a somewhat different practice. These methods, and particularly the "caving system," are not always readily applicable to precious metal mines, as there often exists too little difference in the physical appearance of ore and waste rock in the latter to make a separation of the valuable from the valueless easily possible. Where iron ore is to be separated from sandstone the problem is simplified, and the ore can easily be separated from the waste. In each mine the manager or superintendent must study out the conditions under which he is operating and strive to utilize all the natural advantages, and to minimize those conditions which are against him, and the result will usually be an improvement on old systems and a lessening of costs. Because some particular method has been in use for forty years is not a good reason for not making intelligent experiment and evolving an innovation occasionally which will redound to the credit of the manager who dares to try something new, and which was unknown to his ancestors.

Premature Installations.

In former years, when the science of mining was less thoroughly understood than at present, there seemed an excuse for prematurely building a reduction plant at an undeveloped mine; but in these days there seems little to justify such a mistaken step, yet this is of frequent occurrence. Prospects are taken up by corporations at the suggestion of promoters, and, although the property may have only limited development, and while there still exists great uncertainty as to the amount and value, as well as the character of the ore which may be developed in the future, great smelters and mills are built at a cost too often reaching into hundreds of thousands of dollars, when one-fourth of this amount legitimately expended in the development of the mine may show the uselessness of the plant, for the reason that it is unsuited to the ore, if, fortunately, there be ore to treat. In some instances a successful man finds himself embarrassed through having accepted a position with a concern presumed to be responsible, but without having first made inspection of the property. In such instances the unlucky superintendent may find he has a large smelter or mill to supply and no mine to furnish the ore. In another case he may find abundance of ore, but of a character requiring a wholly different equipment than that which has been provided. In a third instance, and probably the most usual of these cases, he finds abundance of ore and suitable plant, but too little value to make it possible to derive a profit from its operation. Fortunately, such cases are becoming more and more rare, as experience in mining accumulates; but such instances still occur. Sometimes they are the result of unscrupulous promotions, but more frequently are because of the overconfidence of the owners, or the inexperience of the superintendent. The man who has once put up a mill before getting his mine can be pretty surely counted upon not to do so again. The world sneers at him; his friends laugh at him; but some sympathize with him. His eagerness, optimism and energy are needed to help the world along. But the loss, chagrin and humiliation which he suffers are such bitter lessons that he is liable to be too cautious rather than too rash in the future. Mine owners and mine buyers are beginning to understand that the estimation of the amount of payable ore in a fairly developed mine is no longer guess work, and that it pays in the long run to have their mines carefully, patiently, faithfully sampled—and this by disinterested persons, too—assay plans made, and the tonnage estimated therefrom by competent mining engineers before the erection of works. In the same way that insurance is found to pay—by protection against the chances of loss—so in mining it pays to cut the ore up into blocks by levels and winzes, even though the cost be considerable, and have it thoroughly sampled.

THE official reports of several copper mining companies operating in the Keweenaw peninsula, Michigan, show that a substantial profit can be made in mining and crushing ore containing less than 1% copper per ton. The copper is all in the form of native metal, usually occurring in disseminated grains. This is freed by the crushing and concentrated, the concentrates containing over 70% metallic copper, which is smelted in the furnaces and shipped as copper ingots. The ratio of profit to output is small, still the net result is satisfactory, and the past year has shown that with improved methods and machinery it is possible to derive a profit from a lower grade of ore than has ever before been obtained.

THE bill introduced in Congress providing for the return of money remaining unexpended from deposits made with the Surveyor General to cover expense of platting and office work in connection with patent proceedings of mining locations, has been reported favorably by the Senate Committee, with the recommendation that the bill become a law. As the law exists, a stated amount must be deposited in all cases, though the expense in some is much more than in others. It is the object of the proposed legislation to have all unexpended money of each deposit returned to the applicant. The defect in the present bill was long since recognized, but the land office has made no effort to remedy the matter.

CONCENTRATES.

THE sample of metal sent from Sumpter, Or., is gold, plated with quicksilver. By heating the mercury will all disappear, leaving clean gold.

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THE mineral specimen from Alameda county, Cal., is chromic iron. The green scales are not copper, but magnesian material, stained green by chrome. It occurs in serpentine.

✣✣✣✣

RED OXIDE OF COPPER is the richest copper ore known, containing when pure 88.8% copper. If no reduction works are at hand, it should return a good profit by shipping to a smelter. It is not used in refining petroleum.

✣✣✣✣

IT is unwise to sink a shaft in a gulch, even if the dump eventually surrounds the shaft and raises the collar above the immediate drainage. Unless a concrete dam be built around the shaft, the drainage of the gulch will to a great extent penetrate the dump and flood the shaft.

✣✣✣✣

THE mineral sample from Olalla, B. C., is metamorphic shale, containing a small amount of pyrite (iron sulphide) and of pyrrhotite, a sub-sulphido of iron, slightly magnetic, also a very small amount of the copper-iron sulphido chalcopyrite. The dark mineral is pyrrhotite.

✣✣✣✣

THE rocks from Mancos, Colo., are: No 1, rhyolite, the quartz is microscopic; No. 2 is felsite, a feldspathic igneous rock: No. 3 is similar to No. 2, but contains finely disseminated marcasite (white iron sulphide); No. 4, quartzite, with some marcasite and calcium carbonate, the latter incrusting; No. 5 is hornblende, and No. 6 is basalt.

✣✣✣✣

A SECURE CRIB DAM may be made in even a torrential stream, if a solid foundation can be found. It is customary, if there are no large reefs of rock to tie to, to cut an excavation in either bank and to build cribs in these excavations, filling them with rock—the dam proper being constructed between the cribs and firmly built into them.

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WHEN a vein is found faulted it is not always possible to tell in which direction the "throw" has taken place. Particularly is this the case where the rock on both sides of the fault are of the same character, such as granite. Often the plane of the fault is not sufficiently clean to admit of careful measurement of angles, and then approximations only are possible.

✣✣✣✣

THAT there is any difference between fissure and true fissure is not clear. A fault fissure is essentially the same as any other fissure, except that in the case of a fault fissure there may have been some movement of the walls relatively to each other. No particular type of fissure vein is more indicative of value than any other kind. Some of the most perfect fissure veins are without ore of value.

✣✣✣✣

A MINER or other employe of a mining company or corporation, who does not hold a position of trust involving confidential relations with the company employing him, may locate a claim for himself or for another as agent at any time when not "on shift," as when off shift his time is his own to spend as he sees fit. A claim on any other than unoccupied Government land open to location is void.

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ONE cubic inch of steam will expand 1728 times, or to about 1 cubic foot. It is this property of steam that makes it valuable as a creator of motive power. The explosion of gas in engines acts in the same manner. Upon the explosion taking place the material expands to many times its original volume, and, in the same manner as steam, drives the piston from one end of a cylinder to the other.

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THE lead-silver mines of Resting Springs, in eastern San Bernardino county, Cal., were worked nearly forty years ago. A large amount of ore was shipped across the desert to San Pedro, Cal., via Los Angelos, and thence shipped to San Francisco for treatment. A smelter was built at the mines, but owing to excessive cost of treatment was closed down, and the mines have since remained idle.

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WHEN a blast furnace is in proper working order the region of highest temperature is at the zone of combustion in the vicinity of the tuyeres—about 2000° C. There is a decrease in temperature from this point upward toward the top of the charge, where it is usually 100° C. or more. Where the ore column is very high and little carbonaceous fuel is employed, as in pyritic and semi-pyritic smelting, the temperature at the surface may not exceed 40° C.

✣✣✣✣

WHERE a drain tunnel has been driven under a shaft, and the water still remains in the shaft or shows only a small amount of drainage, it is probable that the crevices of the rocks have become filled with fine clay or silt, and this material is rendering the seepage of water through it slow and difficult. If the shaft be bailed out it may improve matters somewhat, as the splashing of the water about the shaft would have a tendency to dislodge the silt and re-establish the flow of water through the rocks.

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IF, in the operation of a mine, the workings, in their downward extension, pass beneath the lands of another and buildings or other structures, reservoirs, etc., are destroyed or damaged by reason of subsidence of the ground, due to caving of the mine workings beneath, the mine owner is responsible for such damage: Humphries vs. Brogden, 12 A. B. 739; also Carlin vs. Chappel, 101 Pa. St., 47 Amer. Rep., 722. The owner may not set up the defense that he worked the mines in workmanlike manner.

✣✣✣✣

THE cost of handling ores in a reverberatory furnace depends upon a great many conditions. The size of the furnace, kind of fuel used, character of ore and whether the ore is stirred by hand or mechanically stirred, all share a direct and important influence on cost. Crude petroleum as fuel is superior to either wood or coal, for the reason that the process of roasting can be carried nearer perfection with oil than with the other fuels mentioned, and the heat is always under control by properly manipulating the side doors of the furnace to admit a greater or less amount of oxygen.

✣✣✣✣

IT is good practice to put the cap in a charge of nitro powder 3 or 4 inches below the top of the charge. Placing it near the bottom of the charge has no advantage, and there is a possibility of setting fire to the powder from the burning fuse before the fire reaches the exploder. It is better to put in tamping, though the blast will do nearly as good execution without it. It need not be tightly rammed. Water poured into the hole will answer, provided the cap is properly protected. A bar of metal must not be used in tamping any kind of powder, as it is dangerous. Picking out missed holes is also very dangerous, particularly as long as the cap remains in the hole.

✣✣✣✣

THE rocks from Daggett, Cal., are: No. 1, liparite (a variety of rhyolite); No. 2, pearlite (volcanic glass); No. 3, hornblende andesite; No. 4, rhyolite tuff; No. 5, rhyolite breccia; No. 6, sandstone, composed wholly of volcanic grains; No. 7, colemanite (calcium borate), and is a mineral, not a rock; No. 8 is jasper, containing flakes of horn silver; No. 9, mica schist; No. 10, nevadite, a variety of rhyolite, resembling granite in physical appearance; No. 10 is shale (volcanic mud); No 11 is baryta (heavy spar); No. 12 is marble (calcium carbonate), with a little gold; No. 13 is iron oxide, surrounding a nodule of copper-silver glance, with copper carbonate about the glance; No. 14, shale, containing a fossil of Tertiary age.

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THE mineral specimens from Copperton, Zuni mountains, New Mexico, are: No. 1, typical quartz porphyry, containing crystals of pink orthoclase and blebs of vitreous quartz: there is also present a small amount of malachite (green copper carbonate). No. 2 is the result of alteration of No. 1. It shows schistoso structure, but the quartz blebs are still plainly seen. Some silica has been infiltrated, and copper carbonate is more abundant than in No. 1. The rock has been deformed by pressure and movement, causing the rock to be "stretched" and sheared with subsequent alteration of the mineral constituents. No. 3 may be considered an intermediate stage of alteration between Nos. 1 and 2. It also contains a little copper carbonate.

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TAILINGS may be used to advantage in filling the stopes of a mine if the tailings are first dried, and there be no water in the mine. Should the pile of sand become wet after having been placed in the stopes, it would be difficult to anticipate the result. The sand would run through every available crevice, filling all open workings, and prove to be a nuisance and source of expense, instead of a benefit. There are many mines having large waste dumps on the surface, which could be made available for filling by driving a raise into the pile or near it, through which the waste rock may be allowed to run down into the mine. This can generally be accomplished at small cost—that of driving the raises, and the cost of filling per ton of ore extracted would be but a few cents per ton.

✣✣✣✣

THERE is a wide range in altitude of the ore deposits of Leadville, Colo., there being as great a difference in elevation as 2000 feet, caused by a series of step-faults. The ore bodies were formed at a depth approximating 10,000 feet, according to S. F. Emmons, and were subsequently uplifted and the overlying rocks eroded by glaciers and otherwise down to the region of mineralization. The several prominent hills of Leadville, Fryer hill, Carbonate hill, Iron hill, Breece hill, Prospect hill, etc., all owe their existence to a system of faulting, which has lifted each particular block to separate elevations, the hills all being rounded by subsequent erosion, there being no abrupt surface indication, such as a bluff or scarp, of the existence of faults along the lines of the several displacements. A large portion of the lower area is covered with the debris of a glacial lake bed.

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CONVERTER LININGS are made from a mixture of quartz and clay, the former being the essential material, the clay being employed as a binder to hold the quartz fragments together so that they may withstand the destructive force of the blast and also the surging of the molten charge in the converter. For this purpose the quartz is run through a breaker and both coarse and fine fragments (the largest about five-eighths inch in diameter) are mixed together with the clay. If all coarse rock be used the lining will not stand well. In a large converter nearly 10,000 pounds of lining are required. It is the opinion of experienced copper smelters that the less clay that can be used to hold the lining together, the better. The clay must be of good quality—plastic, but not necessarily "fire clay." The lining is placed in the converter and rammed with a heated bar of iron. The ramming must be done with care and should be done by experienced men. After ramming, the convertor should be thoroughly and slowly dried. Haste to use a newly lined convertor will generally result in the prompt necessity for relining.

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NATURAL VENTILATION in mines is superior to any other kind; but some mines are so situated or developed, having only a single exit, that natural ventilation is reduced to a minimum, and, as a result, unless artificial ventilation is provided, the mine is poorly ventilated. Where a shaft is connected with a tunnel, the direction of the current of air will be determined by outside conditions. If the column of air from the tunnel level to a height equal with the collar of the shaft be warmer and lighter than the air in the tunnel and shaft, the heavier column will fall and the air will flow down the shaft and out of the tunnel. At night, or in winter, or at any time when the column of outside air is colder and heavier than that within the mine, the direction of air current will be reversed and the shaft becomes an up-cast. Occasionally the direction of air current is constant in mines where two or more shafts are connected, and, through some cause, the direction of current is changed and continues in the newly established direction. It is said that at the Yellow Jacket shaft on the Comstock Lode, Virginia City, Nev., the shaft was a down-cast and had always been such since connecting with adjoining mines, but that a fire in the mine changed the direction of current and the shaft thereafter was an up-cast. It is probable that in such a case the columns of air must have been very nearly balanced and required little to change it.

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TELLURIUM was discovered in 1782 by M. von Reichenstein, in gold ore from Transylvania, Austria. It is a brittle, silver-white metal, having a specific gravity of 6.25, resembling sulphur in its degree of volatility. When in combination with gold, upon roasting it causes a loss of gold due to volatilization greatly in excess of that occurring when gold is melted alone. It has very high electrical resistance. Metallic tellurium is produced by mixing 300 pounds of ore containing about 3% tellurium with 700 pounds of sulphuric acid at 66° B., in a cast iron pot, and boiling for several hours. Twenty-four hours later the liquid is poured into a lead-lined vat where sixty-five gallons of hot water are added. During the following six hours forty pounds of commercial hydrochloric acid are mixed in. After standing another twenty-four hours the mass is run through a filter press, and the tellurium solution passes to a lead-lined tank having a tight cover, where it is treated with sulphurous acid for three days, during which time the tellurium is precipitated in metallic form. This is continued until no precipitation occurs on testing with sodium sulphite. The commercial value of tellurium per pound is about as follows: For 30% pure, $10; 60%, $12.50; 80%, $16. Fused tellurium containing 94% to 97% of the element is worth $35 per pound. Tellurium occurs native, but is more commonly associated with gold, silver, lead and bismuth, also less commonly with nickel (melonite).

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IN exceptional cases the wages paid a watchman to take care of machinery and to look after the timber in an idle mine, making repairs, etc., may be counted as money spent on annual assessment, but in such cases it must be shown that work is to be resumed. Concerning this the Supreme Court of California said: "The cases must be rare in which it can justly be said that such money is expended in prospecting or working the mine. There may be cases where work has been temporarily suspended, and there are structures which are likely to be lost if not cared for, and it appears that the structure will be required when work is resumed, and that the parties do intend to resume work, in which money expended to preserve the structure will be on the same basis as money expended to create them anew. But this could not go on indefinitely. As soon as it should appear that this was done merely to comply with the law and to hold the property without any intent to make use of such structures within a reasonable period, such expenditure could not be said to have been made in work upon the mine. Much less could the mine owner bring picks, shovels, and things of that kind, upon the mine, and have some one to watch them to prevent them being stolen, and have such cost of watching considered as work upon the mine." "Expenditures made in unwatering a mine might be considered in estimating annual work," says Lindley on Mines, "if such unwatering was for the purpose of resumption of active operations. But where this class of work was done for the sole purpose of having an expert examination made preliminary to a proposed sale, we do not think such expenditure should be allowed."

Some Features of Mining Operations in the Homestake Mine, Lead, South Dakota.

NUMBER V—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by BRUCE C. YATES, E. M.*

HOMESTAKE SYSTEM.—However satisfactory this method of blocking out the ore body may be, it did not solve the timber problem. After much deliberation and discussion it was decided to try stopiug in these rooms without timbers. Again the practical ideas of the mine foreman and his assistants worked ont a system which seems to be well adapted to the conditions existing iu the Homestake mine, and which for the sake of convenience has been called the "Homestake System of Stoping."

The level is opened by the room or block method and sills are laid in the rooms the same as for timbered stopes. When the sills are in, three lines of track are laid running leugthwise of the stope, but crossing the ledge with as many cross tracks connecting them as are necessary. The sill-floor sets are put np and lagging placed over the top. The tracks are protected by double lagging on top and the rock is prevented from runniug in, at the sides, on to the tracks by lagging or slabs spiked to the posts.

As soon as the timber is in position the mining operation begins. The ore is broken down and allowed to fall through the lagging, entirely filling the sill-floor sets, with the exception of the carways. The lagging, which serves merely as a staging, is removed as fast as the sets are filled with broken ore. No rock is removed from the stope until this filling is finished. When the next cut or breast is carried across the stope some ore mnst be removed to make room for the miners.

In the large stopes two D-24 Ingersoll machines are employed, with from one to two "baby" machines, which are used to drill blockholes in the large bonlders.

Somewhat of an innovation in machine drills for blockholing has beeu introducecd. A small pneumatic hammer, such as is used in shops for chipping and caulkiug, fitted with a rotating movement, operates a small drill bit about 1 inch in diameter. This machine will drill holes from 6 inches to 12 inches deep, and has so far proven very sncccssfnl in blockholing large boulders in the open stopes.

As there are no timbers to break, no limit is placed on the miner as to the amonut of rock he may bring down at one blast. The stope shonld be finished as quickly as possible so that the broken rock may all be removed if needed. Consequently large slabs of ore are blasted down and these mnst be broken np to regular car size either on top of the pile or on the sill-floor as it is drawn down by the shovelers.

Ou acconnt of the uneven size of the rocks chntes are not generally used in these stopes, but the car men shovel the ore into cars from the level of the track, there being as many places to shovel from as there are spaces between posts along the track. However, where the rock is soft and where it breaks fine, chntes are used to advantage.

Should a large rock come down which the shovelers cannot break with a rock hammer, he moves his car to another opening uutil the "blockholer" comes around.

Two or three regular sets on each side of the stope are carried np as fast as the stope is worked, in which are placed the ladders and air pipes. These open sets also assist in ventilating the stope.

*Copyrighted.

When the stope is worked np 80 or 85 feet raises are made to the level above through which the filling is to be dumped, and the ore is then drawn out. While the ore is being drawn ont the walls and roofs are carefnlly watched and all loose material is dressed down. No accident of a serious nature has occurred in one of these stopes during the two years in which this method has been employed that could in any way be attributed to the method.

When one end has been emptied of ore a section of the sill-floor is lagged aud the filling is dumped in until it begins to run over the lagging. In this way the filling follows the shovelers and the walls of the stope are snpported at one end by the ore and at the other by the waste.

When small ore bodies are worked bv this method no pillars are left in, but when one section is worked np a snfficient height another section is started at one end and the ore is left in until the entire body is worked.

Stoping without timber is not confined to the Homestake miue, but there are certain featnres of the method as employed here peculiar to the Homestake, and which are considered necessary to suit our conditions. In the Treadwell mine the sill-floor is not opened on the station level, but drifts are run in the ledge and raises put up from these drifts to a level some 15 feet above.

No timber is required except for chntes, but a back of ore is left in, which takes the place of the sill-floor timbers used in the Homestake. The cost of the timber would, in a great measnre, be offset by the cost of making raises and pntting in chutes. The accessibility of the ore is another advantage in favor of the Homestake method and becomes a necessity in a mine which furnishes nearly 4000 tons of ore every twenty-four hours.

As only a small per cent of the ore can be removed before the stope is finished there is of necessity a large reserve always on hand, which allows the mine to lay off whenever desirable. The present broken ore reserve in the mine is nearly 1,000,000 tons.

Another plan of working these stopes is now being carried out by which at least 50% of the sill-floor timbers will be saved. Instead of the two outside tracks being in the stope a drift is cnt under the edge of each pillar of sufficient height and width to receive one line of regular stope sets, and tracks are laid in these. The timbers are pnt in place and the ore is broken down until the sill chamber is partly filled, the broken rock holding the timber sets in place. An opening is made iu the broken rock through the center of the stope in which another line of sets is put up, the loose rock being shoveled back

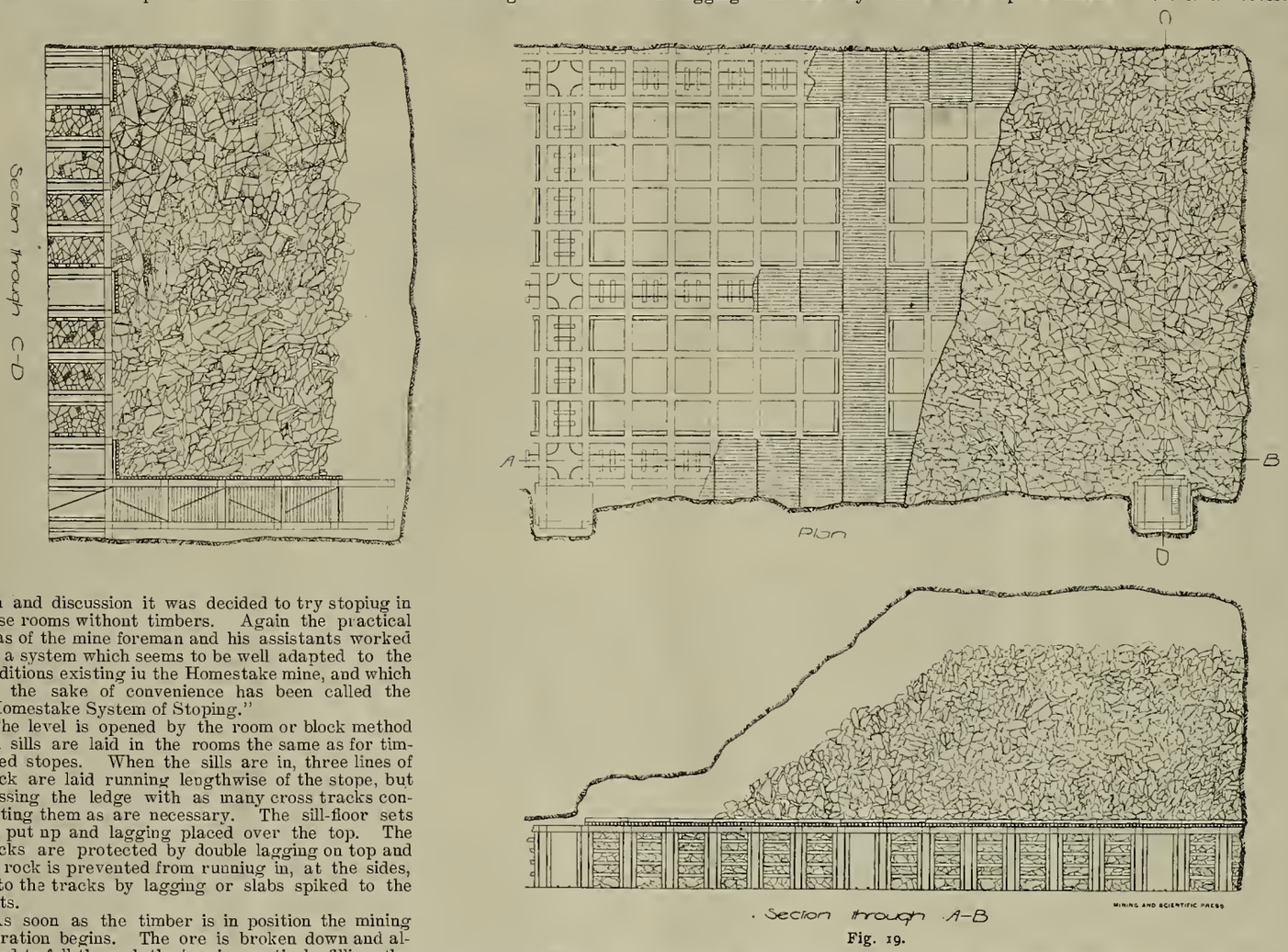


Fig. 19.

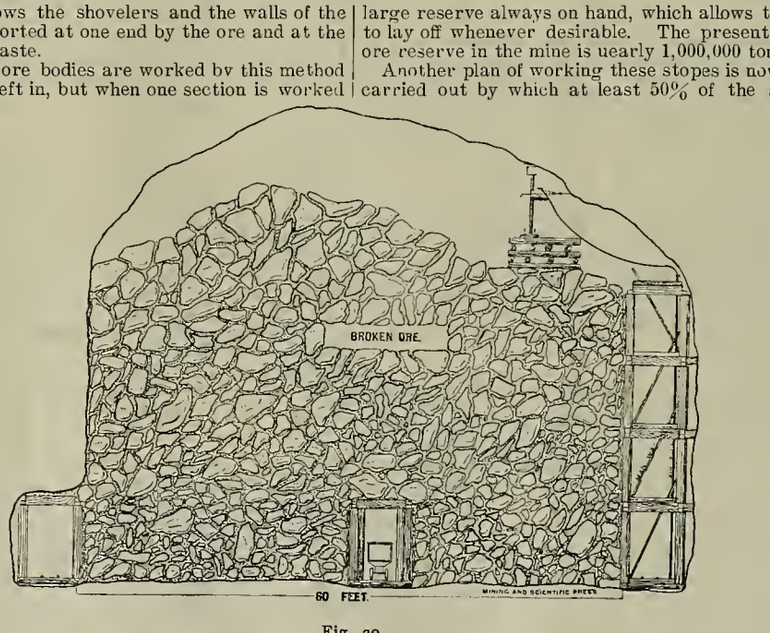


Fig. 20.

against the posts to support them. No sills are laid between the rows and only six rows of posts are required, whereas eleven rows are required in the other stopes. The tracks will be laid in these open sets and the two under the pillars may be used again when the pillar is being taken out.

Following is a comparative table giving the cost of timber in a stope which has been worked and timbered by square sets and the same stope if worked by the Homestake method:

TIMBERED STOPE.

Name of Piece.	Number of Pieces.	Linear Feet or Feet Board Measure.	Cost of Material.	Labor, Sawing and Framing.	Total.
Sill floor posts	421	3,650	$ 474 50	$ 96 83	$ 571 33
Upper floor posts	2,077	16,616	2,160 08	477 71	2,637 79
Caps	2,410	13,255	1,723 15	506 10	2,229 25
Ties	2,261	12,435	1,616 55	474 81	2,091 36
Sills—203 long, 382 short		4,537	226 85	22 69	249 54
Lagging	13,029	75,000	3,795 30	379 53	4,174 83
Lagging strips	2,410	4,025	64 82	30 00	94 82
Wedges	2,352	784	13 33	11 76	25 09
47 sill floor chutes—complete			311 68	10 25	327 93
215 upper floor bins—complete			786 22	37 90	824 12
Ladders	11	117	1 99	3 50	5 49
Labor placing timbers and chutes					4,745 00
Breakage (10% of lagging, 5% posts, caps and ties					793 97
Totals			$11,174 47	$2,057 08	$18,770 52

STOPE WORKED BY HOMESTAKE METHOD.

Sill floor posts	421	3,650	474 50	96 83	571 33
Caps	410	2 250	293 15	86 10	379 25
Ties	381	2,095	272 35	80 01	352 36
Sills, long	203	2,436	121 80	12 18	133 98
Sills, short	382	2,101	105 65	10 50	115 55
Lagging	1,752	10,214	510 70	51 07	561 77
Lagging to protect track	761	4,454	222 70	22 27	244 97
Relief lagging	1,681	13,472	673 60	67 36	740 96
Wedges	200	66	1 12	1 00	2 12

MANWAYS.

Upper floor posts	96	768	99 84	22 08	121 92
Caps	48	264	34 32	10 08	44 40
Ties	48	264	34 32	10 08	44 40
Lagging, floors	96	560	28 00	2 80	30 80
Lagging, sides	720	4,197	209 85	20 98	230 83
Drift pins	1,440	457 lbs.	22 85		22 85
Ladders	28	235	4 00	7 00	11 00
Labor standing sill floor timbers					758 16
Totals			$ $3,108 15	$500 34	$4,366 65

Seventy-three thousand tons were taken from this stope. $18,770.52 ÷ 73,000 = $0.257 per ton by former method: $4366.65 ÷ 73,000 = $0.060 per ton by Homestake method; $0.257 — $0.060 = $0.197 saving per ton.

The operation of these stopes has brought out another change in the general working plan of the mine which will make a material saving in the cost of development. Timbered stopes cannot be worked economically more than 80 or 90 feet high, as the timber begins to crush of its own weight, while the untimbered stopes can be carried up 150 feet as well as 100 feet. As a result the distance between new levels will be made 150 feet, which will effect a saving of one-third in development work, and one-third more ore can be recovered from the stopes with the same sill-floor work.

Fig. 19 is a part plan, longitudinal and cross-section of a stope being worked by the Homestake method, and Fig. 20 is a cross-section showing the change as just described.

The Original Source of Platinum.

Among the mysteries that hang over the direct, or remote, origin of certain minerals, that over platinum seems to be gradually resolving itself. We all know platinum, but whence it came until comparatively lately was not known. When we have found it in our placer clean-ups or in Pacific beach sands, it has been as a stranger that has evidently wandered far from home. Even the great nuggets that came from the Ural region in Russia, from which the largest supply of this mysterious metal has hitherto come, bear evideuce in their rounded and battered shape of having traveled considerably from their parent rock and of having been badly used since they left it. The researches of late in regions from which we might have suspected these travelers to have come have been partially rewarded and have found them, at least, in small quantities, at home and in the parent rock.

Platinum, says Spurr, in Vol. XXXIII, Trans. A. I. M. E., in the majority of cases, is fouud closely associated with chromite or nickel, or both.

Like these minerals, it is almost iuvariably genetically connected with basic, olivine rocks, or with the serpentine rocks arising from the alteration of these.

As au original constituent in basic rocks, it is said to have been found by both Daubre and Englehardt.

More recently native platinum has been discovered in the Urals, in Nizhivi-Jagil district and the Goroblagodat district. There it occurs in extremely basic peridotitic rocks containing large amounts of magnetite and chromite, besides platinum.

According to Iuostram Zeff, the platinum occurs as leaves in the chromite. In the Goroblagodat district, while peridotites contain by far the larger amount of platinum, Saytzeff found the metal as an original constituent in other igneous rocks also, such as porphyrite, gabbro-diorite and syenite-gneiss. C. W. Purington also obtained, on crushing and panning the peridotite of this district, many fine colors of platinum. Spurr considers the Ural occurrence in basic igneous rocks and association with the igneous minerals, chromite and magnetite, as a product of magmatic segregation—that is, of a local gathering together in a molten mass of certain elements or constituent minerals of that mass.

So far it seems that platinum has been found only as a constituent mineral—like mica, hornblende or augite—of certain igneous rocks.

At the Rambler mine, a copper property in Wyoming, platinum was discovered by Prof. W. C. Knight of the University of Wyoming associated with other minerals of the platinum group. Platinum ore is also reported from New Zealand.

Small Veins Also Valuable.

That large veins of low-grade ore are uot the only ones that pay to work has often been proven iu Colorado, Arizona, California, Idaho and elsewhere. The large mine, generally speakiug, however, is more popular with investors, as it represents quautity, and the fact is recognized that, given a large quantity of ore, with moderate values and average couditions, a great and euduring industry can be built up, which, under competent management, will prove a profitable enterprise. There are, however, many small mines, those having moderate width of vein, but in which the ore is of such grade as to insure profits as large as those derived from operatious of greater magnitude. The mines of Grass Valley and Nevada City, Cal., are of small or moderate size, yet these mines have proven very profitable for many years. The Eureka-Idaho shoot, near Grass Valley, which produced over $25,000,000, was a vein but 2 or 3 feet in width. The Soulsby miue, at Sonlsbyville, in Tuolumne Co., Cal., has produced over $6,000,000, and is a vein rarely 3 feet wide; the Sheep Ranch mine, in Calaveras Co., Cal., discovered about 1875, has been worked to a depth of 1300 feet, and is credited with a production of over $3,000,000. This vein is never over 4 feet in width, aud is mostly less thau 2 feet. The accompanying illustration is that of the Sheep Ranch mill. In Colorado are veins innumerable, less than 2 feet wide, which have produced millions of dollars at large profit. Small veins, when good, are usually very good, but the management of a mine having a small vein requires as much knowledge as that essential to the operation of a large one, for there are many difficult problems in the development and exploitation of small veins, which are almost unknown in large ore deposits. Among these are the faulting of the vein, the sudden pinching of the ore shoot, the nuexpected influx of large volumes of water, sndden changes in the character of the ore, besides numerous other annoying and sometimes serious problems, requiring an extensive knowledge of engineering, chemistry and metallurgy, beside the faculty of handling men, sometimes under conflicting conditions.

Some Laboratory Work in Cyaniding.

To the Editor:—To those inquiring for a method of determining the oxygen in cyanide solutions, I would refer them to the several methods to be found in Sutton's "Volumetric Analysis," pages 224-225.

Gold-plated zinc shavings, about which there has been some discussiou, are not of uncommon occurrence. I can at present think of more than a dozen places where I have seen and had experience with them, and a cyanide man who shakes his head at such a proposition shows his lack of experience. At Johannesburg, Cal., at the plant of the Johannesburg Reduction Co. (the Red Dog mill), I have seen shavings so completely covered with bright, metallic gold that neither HCl nor H_2SO_4 would touch the zinc, although analysis proved the zinc to be in the greater quantity by more than 50%. HNO_3 seemed to penetrate the film of gold and eat out the zinc, leaving the gold in a very finely divided state—so fine that it actually floated on the solutiou. Again, in Peru, I have seen ziuc shavings so thickly coated with gold that uot even HNO_3 would touch them, the whole mass having a fine, metallic gold color. This pheuomenou looks fine iu the zinc boxes, but is really a sitnation that should be avoided: First, because it renders a large amount of ziuc shavings useless as far as more precipitation is concerned; second, it is hard to recover the gold from such shavings without great expense, for in roasting such shavings the loss by volatilization is great and reduction by dissolving out the zinc is costly, and on account of the film of gold breaking up and floating it is dangerous to handle.

In Peru I finally had to remove such shavings from the head box—in which they always appear—treat them in a rotary zinc shaving washer, such as you described in a recent issue, with a very strong cyauide solution, when the coatiug of gold readily dissolved and left the shavings ready to use again. The strong solution containing the dissolved gold I then diluted to about .12%, ran it through the boxes again and precipitated the same values with the same zinc on which they were precipitated before. Iu seeking the cause for this state of affairs I have made many experiments, and invariably find that it is caused by a rich gold solutiou comiug into contact with the zinc thread when there is not enough free cyanide of potassium present to give the proper reactiou, which is supposed to be $2K\,Au\,Cy_2 + Zn = K_2\,Zn\,Cy_4 + 2Au$. There appeared to be the proper combination of the Au and KCy. It is a well-known fact that an excess of free cyanide must be present to enable the proper precipitation to take place, but in this case we have the wonderful reaction of a filiform precipitation of Au on zinc thread without any free cyanide present. However, on further investigation I always fouud my zinc shavings to coutain an appreciable amount of lead as an impurity, or else my solution to contain mercury in solution, or both. So the cause of this state of seemingly wonderful complications can be directly traced to the presence of some constituents which tend to set up an electric current, thereby electrolytically depositing the filiform gold.

The idea which has beeu suggested, of letting zinc shavings soak in strong cyanide solution over night, is about as big a mistake as anyone could make. Zinc shavings should never be left in cyanide solution that is not running, for in case zinc is left standing

Sheep Ranch Mine, Calaveras Co., Cal.

quietly in KCy solution the precipitation of K_2 Zn Cy_4 immediately begins, and in the morning the zinc thread will all be matted together with zinc potassic cyanide, and every thread of zinc so coated will be unavailable for future use. This is one of the worst combinations that we have to deal with in cyanide practice.

As for using chloride of lime, every well-posted chemist knows that there is more alkali in CaO than there is in Ca Cl_2. Any one using Ca Cl_2 will have to use lots more of it to obtain the same effects, and they are all the time adding chlorine, which has an acid reaction, where it is desired to overcome the acidity in the ores by using a counteracting alkali, such as CaO, or NaOH (caustic soda). His consumption of KCy in using chloride of lime instead of oxide of calcium (lime) will just about be doubled. Such practice is not followed, except for preliminary washes, where certain deleterious salts are to be eradicated, but this, in turn, should be washed out of the pulp under treatment before adding the KCy solutions. It takes a pure alkali to neutralize acid.

JESSE J. MACDONALD.

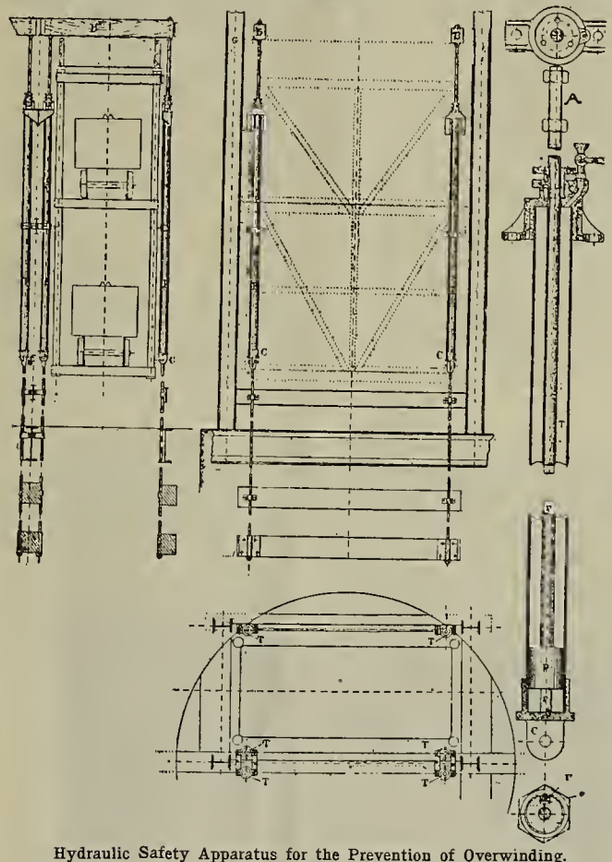
Los Angeles, Cal., March 7.

Hydraulic Safety Appliance for the Prevention of Overwinding.

Written by R. A. HENRY.*

In this appliance (see accompanying figure) four tubes TT of drawn iron, calibrated to an internal diameter of 3§ inches, are mounted vertically in the upper part of each winding compartment of the shaft. Each tube receives a rod A, traversing a steel stuffing-box and terminating in a piston p in one piece with the rod itself. The upper ends of each pair of rods are bolted to a wooden traverse B. The tubes are fastened to the frame of the compartment by means of rings situated below the stuffing-boxes, and also by eyelets C and iron stays to the pit lining, so that there is no strain on the actual framework when the appliance comes into action. The piston p is provided with a small orifice s, which is gradually covered, in proportion as the piston rises in its cylinder, by a bar, r r, the closing being complete by the time the pistou reaches the upper limit of its stroke. The tubes T are completely filled with a suitable liquid, such as oil, fat, or a solution of glycerine in water. When the roof of the cage passes by the keps G it comes in contact with the traverses, B, the lower surfaces of which are covered with rope fenders to diminish the shock of the impact. By this means the cage lifts the traverses B, and with them the piston rods A and pistons, p, the latter in rising being restrained by the liquid in the cylinders, which liquid, however, is gradually allowed to escape to the under side of the pistons through the orifices s. The resistance in question is sufficient to top the cage, and should the velocity of the cage amount to 50 feet per second the stays are strong enough to cause the winding rope to break.

*Annales des Mines de Belgique.



Hydraulic Safety Apparatus for the Prevention of Overwinding.

Horse Power for 10-Stamp Battery.*

Modern practice in stamp mills includes the use of stamps with weights varying from 500 to 1200 pounds per stamp, and height of drop varying from 4 inches to 10 inches. The diagram herewith shows the horse power required for each 10-stamp battery for weights of stamps and heights of drop between the limits mentioned. This diagram is based upon ninety drops per minute, and includes the friction of the cam shaft in the cam shaft bearing, the friction of the cam against the tappets; the friction of the stem against the guides and the power required for raising the stem vertically. The diagram shows a line for each height of drop from 4 inches to 10 inches inclusive.

To explain the use of this diagram, we give the following example: Required—the horse power to drive a 10-stamp battery of 900-pound stamps, dropping ninety drops per minute, height of drop being 7 inches? Find the figure 900 at the bottom of the diagram under weight of stamps, follow this line vertically until it intersects the 7-inch drop line, then proceed in a horizontal line to the left of the diagram, where it will be found that the required power for each 10-stamp battery is about 17.4 H. P.

Another use of the diagram is in finding the change in horse power by varying the height of drop without changing the weight of the stamp. For example, with a 900-pound stamp, in changing the drop from 7 inches to 8 inches, the increase in horse power for each 10-stamp battery is 17.4 to 19.4 H. P.

The above powers are determined on the assumption that the bearings are properly lubricated and the stems in good alignement.

*Extract Bulletin Colorado School of Mines.

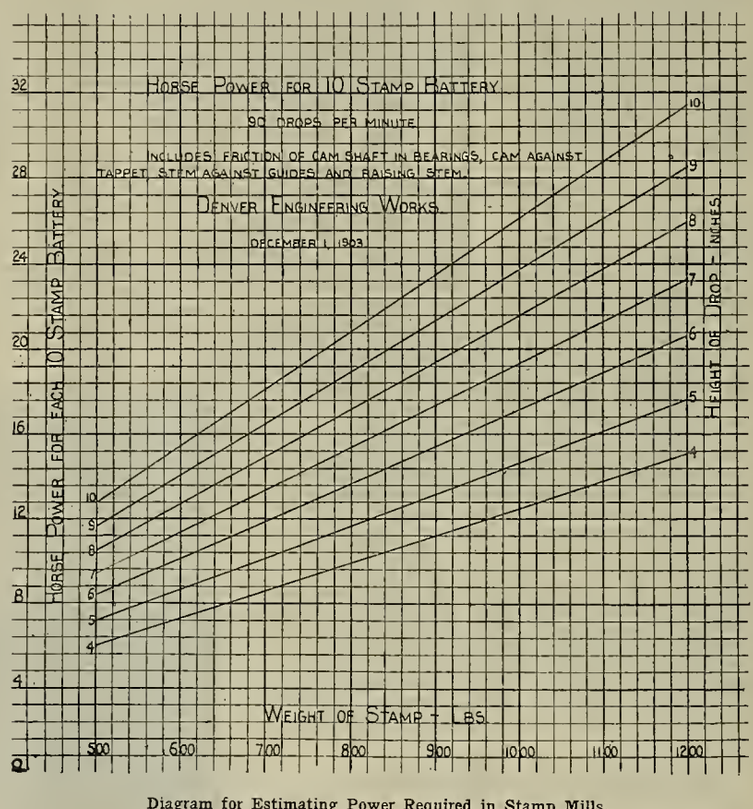


Diagram for Estimating Power Required in Stamp Mills.

Clarifying Solutions for Colorimetric Copper Determinations.

TO THE EDITOR:—In running copper determinations in Cochise county, Ariz., the writer finds it expedient, because of large zinc percentage, to use the colorimetric method. Wide-mouth bottles, 4 inches high by 1¼ inch in diameter, are used. A standard ammoniacal copper solution, of which 1 c.c. = $\frac{1}{10}$% for 1 gram, is titrated into a blank bottle containing alkalined water (H_2O + NH_4OH). By having the bottles all numbered, a large batch of samples can be run with one blank, beginning with the lowest and passing in succession to the richest solution. Using ½ gram of ore, extremely close results can be obtained up to 15% Cu, and by the simple expedient of dividing the solution into two equal parts, the same accuracy is obtained up to 30% Cu.

The method of solution was simply to use HNO_3 and potassium chlorate. But in many of the solutions appeared a greenish tint, which was very difficult to match with the true blue of the standard solution. No amount of potassium chlorate would remove this. After many experiments, it was found that violent stirring with rubber-tipped rod just before filtering seemed to coagulate this green coloring matter with the iron precipitate, and the beautiful virgin blue of copper hydrate is now invariably obtained.

C. R. TINSLEY.

Mineral Deposits in the Philippines.

In a report on the Mancayan and Suyoc mining districts in the province of Lepanto, A. P. Wright says: The mining possibilities of this section are the best known of any mining zone in the archipelago. It has produced more copper and gold than any other, and that from the surface. It has had a reputation as a mining region for centuries and yet no one knows anything of the ore deposits below a depth of 100 feet. At Mancayan some crude and unsuccessful attempts have been made at legitimate development by the owners of the Mancayan copper mine, but the manner in which the work has been done leaves the field of deep mining virgin. In the mineral zone extending from some 2 miles north to Mancayan to 2½ miles south of the barrio of Suyoc, the ledges are strong, standing up in places more than a hundred feet above the surface.

The Igorrotes, natives of this section, have followed mining as far back as their traditions go, and have mined both gold and copper on this belt for 300 years. No statistics have been kept save from 1840 to 1855. During these fifteen years they, according to the records, exported annually twenty tons of copper pots, pipes and other utensils peculiar to their own make. They have supplied the population of north Luzon with copper vessels, spears and trinkets for years. This product has been taken from the surface croppings of the veins and ledges in these two districts. Their tools and methods of reduction were crude and sustained at all times a loss of at least 20% in smelting. However, these people have developed skill in the working of metals and in the extraction of ores on and near the surface. They are not only copper miners and copper workers, but they are yet more skillful in the prospecting for gold-bearing veins, the extraction of ores and saving the gold. They build reservoirs on the high mountains, and in the rainy season when the water is plentiful they direct the water in ditches from head gates to the gold-bearing veins, and with the pressure they get wash down to the canyons below millions of tons of stone and earth and gold-bearing quartz. The water is turned off, the quartz selected out, taken to their stone mills, crushed and the concentrates separated by washing in a pan made from the bark of a tree. The concentrates are wrapped in a tobacco leaf, placed in a piece of earthen pot surrounded by charcoal, and with fans and blowers all foreign minerals are burned off, leaving a gold button in the bottom. There are no statistics as to the amount of gold that has been taken out in and around Suyoc, but from all traditions it has been considerable.

The Mancayan mine was worked in a desultory way

to some extent by its owners and their lessees, and produced altogether 1100 tons of copper metal. They used the Mexican furnace with charcoal, losing a high percentage of copper, but their books show an extraction of 37% per each ton of ore smelted. This mine is situated on a strong ledge traceable the entire length of the two districts. The ledge has a north and south trend and dips about 70° to the east. The quartz was originally quartz porphyry. Porphyry of a later date than the original porphyry has flowed over and completely capped it. Besides altering the quartz porphyry in its character the dike has been no doubt largely responsible for the ore deposition. The quartzose mass lies on a quartz diorite foot wall and is paralleled on the west at a distance of about 1000 yards with a feldspatic porphyry dike. Copper veins are fouud along both contacts with the diorite.

At Puckdaw hill the belt widens into a large kidney and becomes ore bearing. A central ledge occurs carrying veins of varying thickness containing payable gold with slight copper values. There are many smaller veins paralleling these dikes and all on the east side dip to the west and those on the west dipping to the east, indicating a junction of all at some unknown depth below with the main central vein. The central vein at the surface shows a width of 10 to 20 feet. What is needed is capital, machinery and skill for these two districts to become producers.

While there are many veins that are practically free milling, the ores takeu generally are smeltiug. The copper ores of Mancayan are somewhat refractory, but those of Suyoc contain magnesian lime in abundance in the gangue and very little base metals, and if mixed with the ores of Mancayan a very high per cent of extraction could be had.

There are about 100 claims located in these two districts, and nearly all show ore values aud sufficient indications to encourage developments. The districts are ou the headwaters of the Abra river, water power can be had in abuudance and timber is plentiful. The only drawback at present is inaccessibility. Mancayan is about 55 miles from Candon on the coast, and all supplies and materials have to be brought in over a pack trail.

The climate is healthful and the surrounding country is fertile and the hills and mountains furnish fine grazing for stock.

Cervautes, the capital, 14 miles north of Mancayan, has an elevation of 1700 feet above sea level, Mancayan 3983, Tubuc 4540 and Suyoc 5518. With these elevations white men can work the year around, as well as in the States.

The Comstock Lode and Its Future.

The Comstock Lode at Virginia City, Nev., has ever since its discovery in 1859 to the present day been one of the most interesting mineral deposits known to the miuing world, and it will continue to be of interest for years to come. In a little volume to be circulated at the Exposition at St. Louis, Mo., the following appears, written by G. McM. Ross, who is well qualified to describe the workings and metallurgical methods of the great Lode, having grown up with the industry. After an interesting historical sketch, the writer says:

The rich gold and silver ores were shipped to and sold in San Francisco, while experiments were being tried on the Comstock and in San Francisco on all sorts of processes and devices for the recovery of the values in gold and silver contained in the Comstock ores. The miniug companies themselves undertook the reduction of their ores with an equipment whose magnificence was only equaled by its inefficieucy. To this first work can be credited the imperfect and costly treatment of the Comstock ores that has lasted until the preseut day. Shrewd, hard-headed, practical men built mills for the reduction of Comstock ores, and, as a result of their joint efforts, the Washoe process was evolved. When this process had been established as the one best adapted for the reduction of the ores, the profits derived from milling were so large that powerful milliug companies were formed, and any efforts at the milling of their own ores by the mining companies were effectually discouraged.

The Washoe Process.—The Washoe process is the Americanized Mexicau patio process and is used for the extraction of gold and silver ores in the following way: The ore is crushed in wet-crushing 5-stamp mortars to a fineness ranging from twenty to forty mesh; the crushed ore is settled in square tanks, set ou the pan-floor levels; the finest of the slimes is settled in reservoirs outside of the mill. The crushed ore, when settled, is charged into fast-running grinding pans holding a charge rauging from one to two tons; the pans are either steam-jacketed or arranged to take live steam into the charge; the ore is kept at such a consistency as, with the motiou in the pans, will keep the quicksilver, which is added to each charge of ore, in suspension in the charge. Chemicals are used in the process, usually bluestone and salt, and the ore worked hot. The treatment lasts from three to six hours in the pans that are finally discharged into settlers (a slower-motion pan to which large quantities of water are added) to insure the settling of the quicksilver with its charge of gold and silver in such a way that the pulp or ground ore will not settle; the pulp is slowly discharged from the settlers, the quicksilver recovered and strained to secure the gold and silver amalgam, which is usually ground in a clean-up pan to remove impurities, restrained and retorted; the resulting crude bullion is melted into bars of nearly fine gold and silver.

The mill arrangement and equipment is as follows: For ten stamps of 900 to 1000 pounds each four standard 2-ton pans are required, with two settlers and a slow-motion clean-up pan, retort, assay office, etc. The actual horse power required will be sixty; but, to provide for extra rock-breaking service, a modification of the process, etc., it will be well to provide 75 H. P. for the work. Such a mill will treat from thirty to forty tons of ore per day at a cost ranging from $3 to $7 per ton, depending upon the loss of quicksilver, cost of water, power, etc. In the treatment of the ore such a mill will use 50,000 gallons of water per twenty-four hours; about 50% can be settled and used over again when water is scarce aud expeusive. The following modifications of the Washoe process have been introduced: Plate and battery amalgamation is being used successfully. The free gold contained in the gold and silver ores is amalgamated and recovered from the mortars upon silvered copper plates that are used before the ore reaches the settling tanks; the ore is, after passing over these plates, treated in the same way by the Washoe process as the ores first referred to.

Concentration Before Amalgamation.—In ores containing heavy sulphides it has been found that, by removing these sulphides before treating the ore in amalgamating pans, a higher percentage of the values is recovered at a reduced cost. Any type or kind of concentrator that will remove the sulphides can be used for the work.

The Comstock's Product.—With this process established, the production of gold and silver bullion from Comstock ores was rapidly increased. In 1860 the yield was: Gold, $550,000; silver, $200,000. In 1861: Gold, $2,500,000; silver, $1,000,000. By 1864 the productiou had reached: Gold, $6,400,000; silver, $9,600,000. By 1869 the output of gold and silver had dropped to $7,405,578. From 1870 to 1877 there was a steady and rapidly iucreased product—in the last-named year, that of the greatest output, $14,520,614.08 being gold aud $21,780,922.02 beiug silver. The total output of the Comstock mines in gold and silver to the end of 1902 is probably very close to $371,000,000. Of this sum there was about 60% silver, the remaining 40% being gold. These values were recovered; the losses are estimated at between $60,000,000 and $80,000,000; of this loss modern methods would have saved 70%.

The Mining of Comstock Ore.—The discovery of the silver sulphides having been made by placer miners, it was some time before the nature of the lode was understood. The first ore was found in small westerly dipping veins that, on being followed, developed into great masses of ore that turned when nearing the easterly dipping foot wall, and the vein or fissure followed this wall to a depth of 3200 feet below the surface. In a short time after the discovery of the silver sulphides, the mining world was fairly represented on the Comstock by men interested in some phase of mining. Added to them were the speculators and gamblers. The result of their combined efforts was to cover the surface of the earth with hundreds of mining locations, as the speculators and gamblers soon discovered that mining claims had a speculative value. On the Comstock the main lode was soon outlined and reduced to ownership by many companies. Of these twenty-eight have maintained their orgauizations to the present time. The ore bodies of the main lode were so much larger and richer than anything fouud in the outlying mines that attention and work soon concentrated upon the mines of the main lode, notwithstanding the fact that to the east and west of the Comstock Lode ore of value was found in quantity which, under conditions less excitiug than were brought about by the development of the main lode, would have been successfully worked, as it surely will be in the not distant future.

The high wages that were paid to the miners aud mechanics on the Comstock was the magnet that attracted the most skillful of these men from the euds of the earth. The managers were thus enabled to meet the unusual difficulties of mining large bodies of ore, handling large quantities of water and opening up new ground where the temperature was unusually high. The quartz miners of the Comstock had penetrated the lode to a depth of 3000 feet within twenty years of the discovery of silver sulphides on the surface. Within that time the simple hand windlass had been superseded by more and more powerful machinery, until direct-acting hoisting engines of 1000 H. P. were being used. These engines were designed for work to a depth of a mile below the surface. A tunnel was started and connected with the lode from a point in the valley of the Carson river 4 miles distant, thus forming a new base of operations 1600 feet below the surface. Powerful pumping machinery was installed at various points along the lode, one such installation costing $1,000,000. After a spleudid dash at attaining great depth, aud but a partial development of these depths, that failed to bring forth a Bonanza, while being threatened on every side by known bodies of hot water, a retreat was ordered and 1700 feet of opened and partly developed depths were abandoned and the hands upon the Comstock's dial were rudely thrust back for at least a quarter of a century. The reason and excuse for this was the fact that no unity of interest had ever been acknowledged by those in control of the various mines or groups of mines on the Comstock, and even science failed to give a reasonably definite statement of what might be expected of the Comstock in depth.

A pump had been iustalled and operated under conditions that at that time had never before been encountered by an eugineer; yet the pump was so perfect and efficient that, had a united effort been made by the principal mines of the Comstock, this pump could have been operated and the lower levels need never have been abandoned.

A vertical depth of 3300 feet was reached before the lower levels were abandoned. It was several years before the water again rose to the level of the drain tunnel, 1700 feet above. During these years millions of dollars were extracted from ore bodies that formed the margins of the old Bonanzas on the Comstock. It is one of the remarkable features of these ore bodies that they begin and end in quartz bodies—quartz being the gangue or matrix in which the ore is found, the ore forming a rough central core or lens surrounded by quartz, carrying but little ore. In Bonanza days, and during the mad rush to extract a great number of tons per day, the heart of the Bonanza was literally torn out of its quartz body, and in every instance where a Bonanza was found and mined it has paid to mine the ground again. It is also true that, in several instances, a greater tonnage was extracted during the secoud period of miuing than during the first, even when it was not possible to mine the ground thoroughly.

By 1898 the couditious on the Comstock were cheerless and nearly hopeless. Mauy of the mines were practically abandoned; ruin and decay were the prominent features. At this period, a few men, to whom failure and defeat were unknowu terms, with tireless energy and boundless faith in the Comstock, worked at, and succeeded in getting together, the loose ends of the many iuterests that centered iu the Comstock and in conviucing those in control of those interests that to save the Comstock from complete abandonment a united effort must be made to recover the lower levels of the Lode. These men were so far successful that a provisional and temporary union of all Comstock iuterests was formed by twenty-eight mines enteriug into and forming the Comstock Pumping Association. The operations of this association were successful. The original plan succeeded iu recovering 400 feet in depth of the flooded levels, in the discovery of au ore body, and in the re-establishment of sufficieut confidence iu the Comstock miues to warrant a geueral resumptiou of work aloug the Lode.

The device used in draiuing the Lode is a modified hydraulic elevator desigued to use water under a head of 2000 feet and over. Using water under such great pressure brought forward problems iu hydraulics that are not yet solved. The advantages of the system are so great as to economy of space and first cost that every feature of the system deserves the most careful study, with the view of attaining final perfection and highest possible efficiency. Before $100,000 had been expended in this system, more water was discharged into the drain tunnel at one time by it than had been discharged by the $5,000,000 worth of pumps formerly iu operation on the Comstock Lode. Shortly after this system had been in fairly successful operation it was decided to operate the mines of the Comstock by electric power. A company was formed that secured coutracts for power paid in advance of delivery aud the power plant was built. The plant is now in successful operation, deliveriug power that is used in mining, pumping, milling ore, aud for lighting, from a generating statiou at a point ou the Truckee river 33 miles distant from the Comstock Lode.

The Future of the Comstock.—This statement is not intended to be prophetic. The author has knowledge of Comstock history, and of the strange freaks it has produced iu the lives of men and in the condition of things. In these actions and reactions, Bonanzas and Borraseas have played almost equal parts. The Bonanzas have deluged men with more money than they could count; the Borrascas have wafted our men and women to other scenes where fame and fortune became theirs.

The most striking fact in the history of the Comstock is revealed by a study of the working maps. While it is true that a vertical depth of 3300 feet has been reached on a vein with an average dip of 45° to the east, and that hundreds of miles of tunnels and drifts have been run, it is equally true that barely 20% of the lode above the 1600-foot level has been prospected, that to-day good ore is being extracted withiu a few feet of the surface at many points, and that millions of tons of ore will yet be profitably worked from the croppings of the lode. Below the 1600-foot level 7% would be a very liberal allowance for the prospected or developed ground of the Comstock Lode.

The second fact is that no modern complete milling

plant for the reduction of ores exists on the Comstock. It is true that first-class modern work has been done, and that ores are now being reduced at a fraction of former costs, but the credit for this work is due to individual effort, and not to the direct action of any mining company. The data now available is conclusive as to what percentages of the values of Comstock ores can be recovered. The unaltered ores, treated by plate amalgamation and concentration, yield from 60% to 80% at once. Of the remaining 20% to 40% of the value, there can be recovered 60% to 70% by cyanide treatment. Of the other Comstock ores nearly equal results can be obtained and at not greater cost. Our neighbors in California and to the east are treating ores in this way, crushing, amalgamating, concentrating and cyaniding the tailings in quantity for $1 per ton of ore treated.

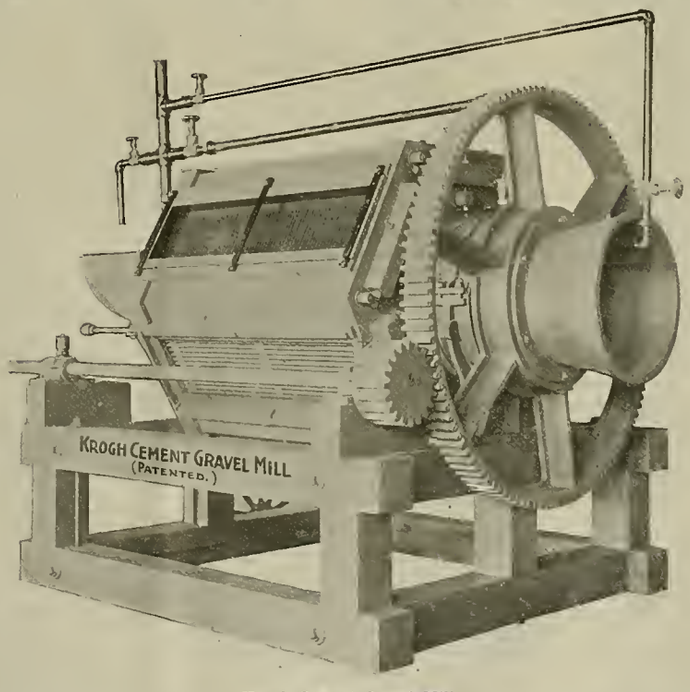
From these facts, it is reasonable to assume that the law governing the occurrence and recurrence of ore bodies will be discovered and the discovery published for the benefit of mankind. The low costs of mining and milling, so general throughout the world, will at least be duplicated on the Comstock. Those in control of the mines will become students of the great Lode.

Those who have the best information of the Comstock Lode can safely say that there is no mining field known in the world that offers inducements so great and lasting to the student, the capitalist, the mining engineer, or the speculator. If the man exists who combines in himself the best of these qualities, the Comstock is the field provided by nature for the full development of every faculty with which he has been endowed.

The Krogh Gravel Mill.

From Mariposa to Siskiyou county, Cal., and extending into Oregon, there are extensive bodies of gravel which in their deep-seated or unoxidized portions are known to miners as "blue leads." Many of these ancient river beds or channels contain gold in quantities that pay good profits to work. These bodies of gravel are frequently more or less cemented. So firmly cemented are these gravels that the largest hydraulic giants under the heaviest pressure are unable to disintegrate them and separate the gold. Masses of cemented gravel will travel for miles in sluiceways without breaking up fine enough to release the gold. Gravel coutaining low values can be mined and worked at a profit if some comparatively inexpeusive method is had for disintegrating the cemeut. These cemented gravels frequently carry high values in gold.

The accompanying cut illustrates a mill which is built to handle cemented gravels, and according to the manufacturers meets the requiremeuts of working at low cost with high efficiency and large capacity. Several have been built and are in use, demonstrating their adaptability and success. A process of separation and not of crushing is employed, as a large per cent of the wash (the boulders constituting fully 60%) is dead material.

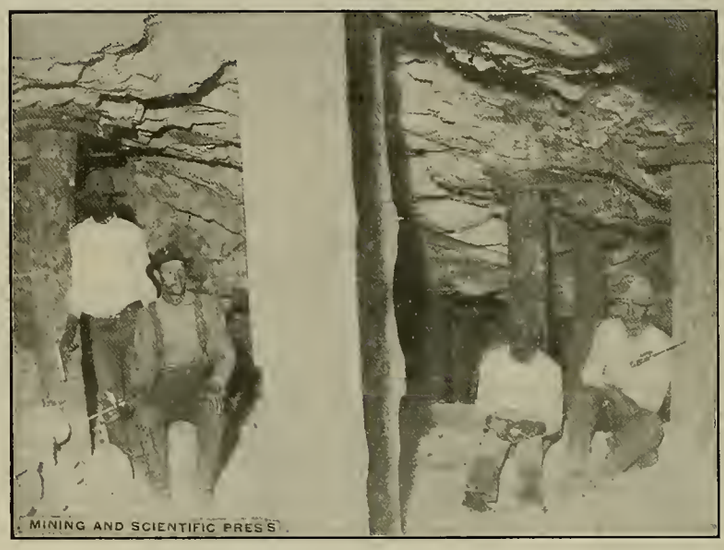


Krogh Cement Gravel Mill.

The Krogh gravel mill is designed to handle this material and to operate on the principle of disintegration, the boulders being employed to work against themselves, and by contact wear away and reduce to pulp the finer particles of gravel which adhere to them. The mill may be described as a revolving hexagonal barrel. By reference to the accompanying illustration it will be noted that the six sides consist of parallel bars or grizzlies, through which the material drops when reduced sufficiently fine, when it comes in contact with a screen, and if then fine enough drops through onto an amalgamating table. If not of the right consistency to pass the screen, it is returned to the revolving mass of material and ground still finer. The mill is about 6 feet long and 4 feet wide, with feed entrance at one end, and discharge for waste material at the other, the fine gold-bearing material passing out at the sides. The manufacturers say it has been shown under working test that one of these mills, weighing but thirteen tons, will readily disintegrate ten tons of cement gravel per hour, requiring 10 H. P. and revolving fourteen to twenty-four turns per minute. Further particulars regarding this mill can be obtained from the Krogh Manufacturing Co., 519 Market street, San Francisco, Cal.

Posts and Breasting Caps.

In miuing in veins or beds some system of timbering is usually necessary, though in some dry regions large areas are stoped without the aid of timber supports. In limestone this is often, though not always, the case. Square sets are elaborate and expensive, and there are often instances where the more simple method of posts and breasting caps, or posts aloue, may be safely employed to support a roof. The accompanying engraving illustrates a stope in a Cananea miue in Mexico, where the roof is firm enough to admit of this kind of timbering. In this instance a piece of 2-iuch plank is placed above the post and a number of wedges driven in to make it firm. By carrying a line of these posts and caps sufficiently close to the face extensive stopes may be cut on flat veins. This method of timbering is commonly employed iu drift gravel mines and in many coal mines. Often a great many of these "props" may be recovered when retreating from worked-out portions of the mine, the roof falling as the support is withdrawn. Whether it is economy or not to remove any particular post is a matter of judgment which the foreman or superintendent must decide. Often the labor expended in the removal of a post is worth more than the post itself when it has beeu recovered. This practice is much more common iu coal than iu metal mines.



Stope in a Cananea Mine, Mexico.

Mechanical vs. Hand Stoking.

A comparative test of hand stoking against mechanical feeding of pulverized coal dust, using the C. O. Bartlett & Snow system of burning pulverized coal, was made on Feb. 2, 1904, at the McCormick Division of the International Harvester Co., Chicago, Ill. The test was carried on under two B. & W. boilers, rated at 120 H. P. each, with a total heating surface on each boiler of 1200 square feet, the ratio of heating surface to grate surface being 44.4 to 1. The C. O. Bartlett & Snow Co. give the results of the test as follows: In hand stoking, 9400 pounds of fuel, Illinois coal screenings (10.5% moisture), were employed, and in the mechanical feeder 9713 pounds coal dust (40-screen) were used, containing 3.5% moisture. The screenings produced 1934 pounds of ash and refuse, the dust none at all, beside making practically no smoke. In the mechanically fed boiler 66,255 pounds of water were fed and in the other 43,193. Total water evaporated in the mechanically fed boiler, 64,940 pounds; in the haud-stoked, 42,329 pounds. With the former 253.9 H. P. were developed, being 55.5% efficiency, and with the latter 165.5 H. P., which is estimated at 41.53% B. T. U. The relative cost of the two methods is shown as follows:

COST OF EVAPORATION, $1.72 COAL PER TON.

Cost fuel per 2000 pounds of pulverized coal delivered in boiler room.....$2.10
Cost required to evaporate 1000 pounds of water from and at 212° F. (exclusive of firing, repairs, depreciation, etc.)..... 0.1455

$$\frac{12{,}555}{965.8} = 13$$ pounds water evaporated (if total heat units were used) per pound coal as fired.

$$\frac{7.214}{13} = 55.5\%$$ efficiency.

COST OF EVAPORATION BURNING SCREENED COAL.

Cost fuel per 2000 pounds of screened coal delivered in boiler room.....$1.72
Cost required to evaporate 1000 pounds of water from and at 212° F. (exclusive of firing, repairs, depreciation, etc.)..... 0.1770

$$\frac{11{,}300}{965.8} = 11.7$$ pounds water evaporated (if all heat units were used) per pound of coal fired.

$$\frac{4.859}{11.7} = 41.53\%$$ off.

The Deepest Shaft.

The Red Jacket shaft of the Calumet & Hecla copper mine, iu northern Michigan, is the deepest in the world. It has taken nine years of day and night work to sink and has cost $2,500,000, says Industries and Iron. This shaft is vertical, but all of the other shafts of the Calumet & Hecla follow the dip of the lode. Work ou it was started in 1889, immediately after the last of the three great underground fires in the older workings of the mine, which did damage of more thau $1,000,000. Work has been continued upon it since that time, and the shaft stands without a parallel in mining. It is 4920 feet iu depth, or 360 feet less than a mile. It contains six compartmeuts, each equal in size to an ordinary mining shaft, four of which are used for hoisting rock and lowering timber. One shaft is utilized for the ladderways, and the sixth compartment carries the wires and pipes for telephones, light, power, water and compressed air.

Mount Morgan Official Report.

The semi-annual report of the Mount Morgan gold mine of Queensland, Australia, contains much that is of interest to mining men everywhere. The property is one of the largest in the world, and it has had an interesting career since its discovery. The following is an abstract of Manager H. P. Seale's report for the half year ending November 30, 1903:

Open Cut.—Following are the quantities of stone excavated from the open cut workings during the half year: Pay stone, 62,349 tons; waste material sorted from pay stone, 74,185 tons; overburden removed by contract, 47,578 tons, overburden removed by steam shovel, 48,175 tons; total, 232,287 tons.

All the pay stone was "oxidized" and was sent to the West works for treatment.

The system of breaking down the stone onto benches and hand shoveling it thence into trucks is being superseded, wherever possible, by the milling system, by which the stone is broken directly around the shoots, which gradually assume the shape of inverted cones, and the contents drawn as required from the working tunnels and drifts below. New drifts and raises are being cut and all drifts will carry electric traction, for which the present plant is sufficient.

The removal of the overburden on the eastern side of the mountain has been pushed on as fast as possible, the quantity removed by contract and the steam shovel amounting to 96,253 tons for the half year. The steam shovel was started the first week in September, and has, consequently, been running three months. The amounts excavated each month have been 7000, 14,595 and 26,580 tons, respectively. This last tonnage—equal to, roughly, 1000 tons a day—is about its full capacity on the present bench. It can be considered particularly satisfactory, as the plant is working under difficult conditions, on the side of a mountain which affords few facilities for handling such a plant, and in country rock, all of which has to be blasted down. The plant will be lowered to the 252-foot bench, 56 feet below the present working bench, early in January, where better conditions should prevail, although a good deal of delay is anticipated from having to move the plant about as pay ore is uncovered.

Underground Workings.—Following are the quantities of pay stone, sulphide ore and waste material mined below. All the pay stoue was "mundic" and was sent to the Mundic works for treatment: Pay stone, 59,970 tons; sulphide ore, 301 tons; waste material (worthless stone and dike), 5901 tons; total, 66,172 tons.

The development work included: Drifting, 754 feet; sinking, 531 feet; diamond drilling, 3770 feet.

Much development work will have to be done in the future. This applies to all levels. Bodies of ore have been simply encountered and stoping started without in any way blocking out the stone first. The large faces presented by the stopes indicate immense bodies of stone still ahead, but any estimate of these would be speculative until systematic development has been done. This will be effected by diamond drilling at fairly close intervals, so that no stone will be overlooked, and going much farther afield than heretofore.

The prediction in last year's report of finding copper-bearing ore on the 750-foot level, in sufficient quantities for profitable treatment, has been realized. Diamond drilling on this level has shown 62,000 tons of ore, averaging 8 pennyweights of gold per ton and 3½% of copper for every 10 feet of depth. All the drilling was horizontal, except for one vertical up and one vertical down bore on the eastern edge of the deposit. The up bore showed 75 feet of ore of the above grade, when a flat dike was met with, after which values fell a little, and the bore had to be stopped. The down bore interseeted an entanglement of dike and pay ore, after 54 feet of which values again sunk. These bores are two of a series of bores that are being put down vertically, and, considering the present development horizontally and the structural features of the deposit, a good showing vertically can be reasonably looked for.

The cost of mining per ton of pay ore is on the increase with depth, as the ground is more difficult to break on the lower levels and the proportion of waste is naturally increasing with the fall in grade. But the fact that the stone is harder and makes better standing ground offers the compensating feature that important departures can be made from the present square set system of timbering in the lower levels, and a modified filling system, with very little timbering, can be adopted. Spaces will be left around the filling where stone is showing, so that no stone will be buried up that might later on permit of profitable treatment.

The recent discoveries on the lower levels call for a modification of the proposed new hoisting arrangements, and the new shaft will not be located until more diamond drilling determines the best position and inclination.

Reduction Works Report.—The total amount of ore received was 123,485 tons; 62,349 tons, being oxidized ore, was treated at the West works, and 61,136 tons, being sulphide ore, was treated at the Mundic works. The amount treated at the latter works was a little less than the recent average, and that at the West works about 1000 tons more per month.

The costs of treatment have been reduced, as shown by the comparative statement, each operation showing a reduction:

MUNDIC WORKS.

	Cost per Ton, 12 Months Ending May 31, 1903.	Cost per Ton, 6 Months Ending Nov. 30, 1903.	Decrease in Cost per Ton.
	s. d.	s. d.	s. d.
Crushing	2 4 87	2 3.07	0 1.80
Roasting	5 11.20	5 3.98	0 7.22
Chlorinating	4 8.93	4 0.72	0 8.21
General work	1 10.13	1 6.73	0 3.40
Totals	14 11.13	13 2.50	1 8.63

WEST WORKS.

	Cost per Ton, 12 Months Ending May 31, 1903.	Cost per Ton, 6 Months Ending Nov. 30, 1903.	Decrease in Cost per Ton.
	s. d.	s. d.	s. d.
Crushing	2 7.99	2 5 87	0 2.12
Roasting	3 1.06	2 9.13	0 3 98
Chlorinating	4 1 21	3 1 40	0 11 81
General work	1 7 01	1 2 78	0 4 86
Totals	11 5 90	9 7 18	1 10.72

These results are due to a great number of detailed improvements and economies, rather than to any radical alterations in connection with either works.

The usual amount of repairs have been effected during the period under review.

The only additions of note made to the works consist of 240 yards of canals for the precipitation of copper from the Mundic works liquors, and a trial gas producer for firing one of the West works furnaces. The latter has answered its purpose and has shown that important economy can be effected by firing all furnaces similarly. Sets of these will be added to both works.

A considerable number of minor alterations are contemplated for the purpose of reducing cost of treatment, and the more important have been gone into sufficiently to render their success assured.

Tailings.—In addition to the ore treated from the mine, 13,914 tons of tailings were retreated at the Lower reduction works and 1549.64 ounces of fine gold obtained.

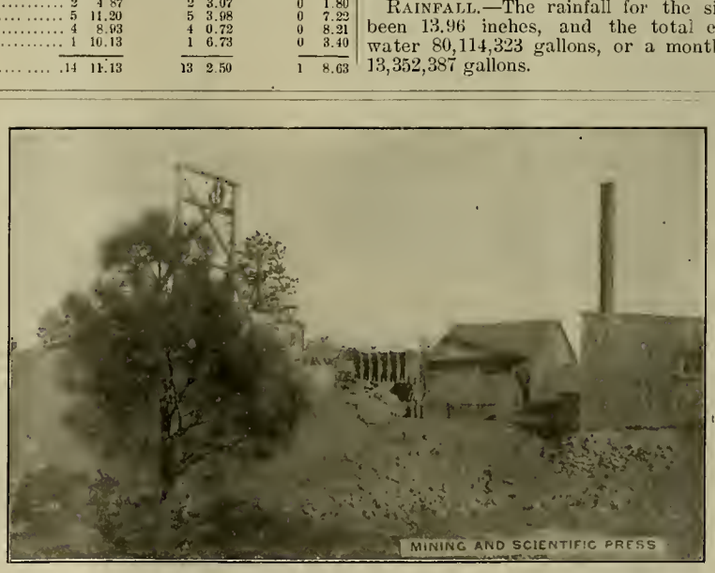
The following table will show the quantity treated at each works and the gold obtained:

Works.	Tonnage.	Bullion Obtained.	Value.	Equal in Ounces of Fine Gold.
Mundic	60,290	27,055.39	3 18 7 44	25,360.09
West	63,527	28,220 71	3 17 8.32	25,572.36
Lower	13,914	1,727.70	3 17 11.38	1,549.64
Totals	137,731	57,003.80	3 18 1.68	52,472.09

The average yield per ton of ore at the respective works is as follows:

Works.	Tonnage.	Value per Ton of Ore. Dwts.	Shillings.
Mundic	60,290	8.41	35.731
West	63,527	8.05	34.194
Lower	1,394	2.22	9.455

Rainfall.—The rainfall for the six months has been 13.96 inches, and the total consumption of water 80,114,323 gallons, or a monthly average of 13,352,387 gallons.



Ideal Mine, Groom Creek, Yavapai Co., Ariz.

Pine Mountain Mill, Lynx Creek, Ariz.

Hoist Monte Cristo Mine, Groom Creek, Ariz.

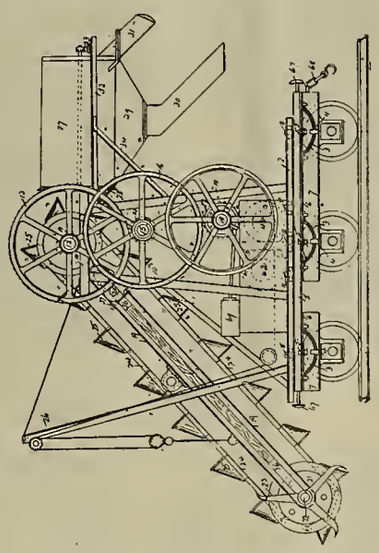
(See Front Page.)

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 1, 1904.

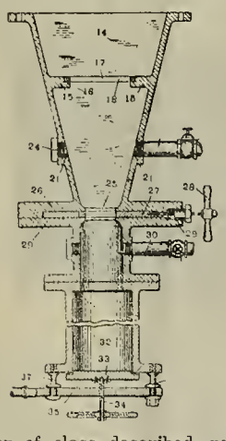
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MACHINE FOR EXCAVATING, RAISING, SCREENING AND FILLING GRAVEL BALLAST, ETC.—No. 752,709; H. Quertier, Dunedin, New Zealand.



In machine for excavating and raising gravel ballast and like, in combination, traveling truck, base plate thereon rotating about king bolt, tumbler frame upon base plate, bucket ladder carrying buckets moving upon frame, means for driving same and also winch drums, headline that is wound upon one of drums and bowlines upon other drums, outer ends of lines being attached to anchors suitably situated so that when either of bowliues is inwound base plate and superstructure may be swung round complete circle if need be.

SEPARATING HOPPER FOR STAMP MILL LAUNDERS.—No. 752,702; F. W. O'Neil, Painesdale, Mich.



In separator of class described, receiviug basin having orifice through its bottom, hollow leg mounted beneath basin, means for closing leg, valve for closing communication between leg and basin, and water supply pipe between basin and valve.

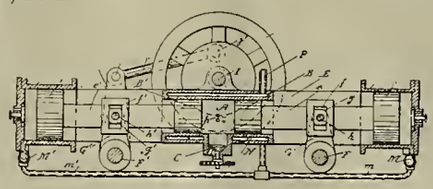
TAPPET FOR THE SHAFTS OF ORE STAMP MILLS, ETC.—No. 752,907; P. C. Kelly, Sandycroft, England.

Tappet formed of two sections, larger having longitudinal gap at least eqnal to diameter of shaft to which it is to be secured aud smaller section forming gate being of size to fit gap and having surface shaped to fit shaft and means carried by gate section for forcing and holding it directly agaiust shaft.

METHOD OF EXTRACTING GOLD FROM REBELLIOUS ORES.—No. 753,822; E. C. Broadwell, Chicago, Ill.

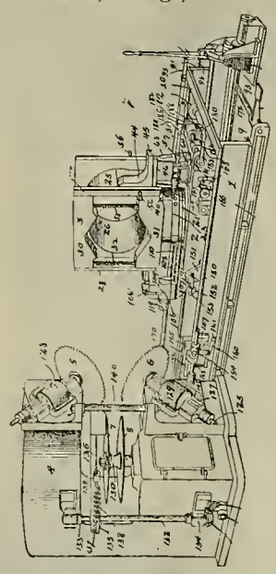
Method of extracting gold or platinum from rebellious ores, comprising first pulverizing ore, next mixing same with alkaline or alkaline earth hydrochlorite solntion to which proper molecular qnantities of oxysalt of heavy metal which can be precipitated by hydrogeu sulphide from its acid solutions has been added.

AIR COMPRESSOR.—No. 753,787; C. S. Dean, Buffalo, N. Y.



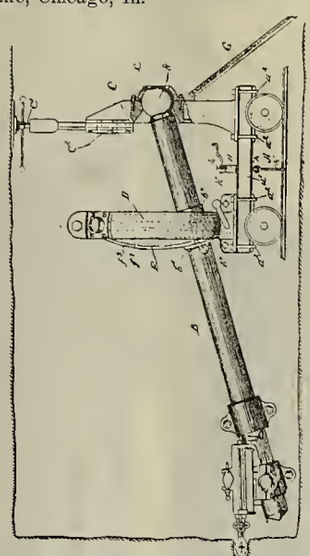
Combination, with power cylinder, and two compressor cylinders arranged at its ends, of pistons slidable in cylinders, pistou rods conuecting pistons together in pairs and having guide slots at middle parts between pistons, guide blocks slidable vertically in slots, crank shaft, pivoted arms operatively connected with guide blocks, and driving connections between arms and crank shaft.

MACHINE FOR SAWING MINING TIMBERS.—No. 753,688; D. W. Edwards, Chicago, Ill.



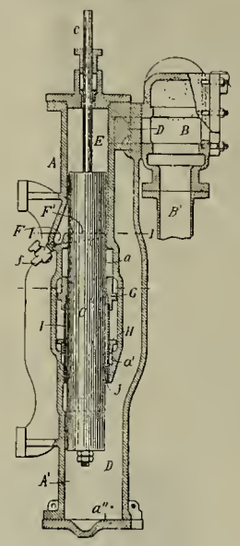
In timber dressing machine, combination of main frame, chuck adapted to grip timber intermediate its length, mounted to reciprocate upon main frame, means for rotating chuck about axis concentric with longitudinal axis of timber gripped thereby, means for swiveling chuck upon axis perpendicular to first mentioued axis of rotation, iudependently operatmg antomatic stop mechanism for arresting rotation of chuck at predetermined points of rotation abont each of axes, and rotary cutting tools mounted adjacent to path of timber carried by chuck.

MACHINE FOR EXCAVATING ROCK.—No. 753,477; C. T. Drake, Chicago, Ill.



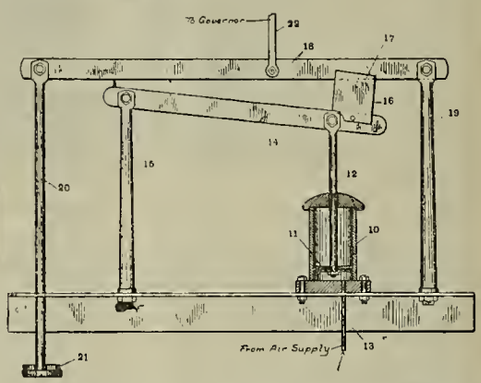
In machine of class described, combination with support of colnmn bar pivoted thereon, means located between snpport and free end of column bar for concentrically adjusting position of column bar with respect to given center and means for rigidly securing same in adjusted position.

VERTICAL PLUNGER SINKING PUMP.—No. 753,550; E. M. Coryell, Monnt Vernon, N. Y.



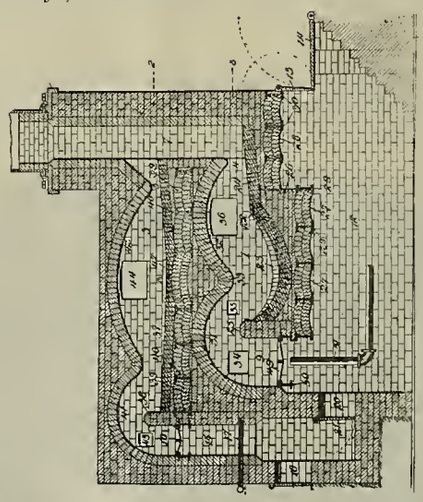
In pump, combination with two-part working barrel contaiuing two water chambers, and double-action plunger extending into both chambers, of conuection for barrel comprising packing adjacent to plunger and closing bottom of upper chamber, second packing that closes top of lower chamber, and tube interposed between plunger aud second packing, whereby plunger encounters friction from one packing only while ready access may be obtained to parts from side.

GOVERNOR FOR AIR COMPRESSORS.—No. 753,633; H. Saam, Mohawk, Mich.



In air governor for air compressors, combination with cylinder communicating with air supply and piston therein, of lever, connection between lever and motor governor, second lever connected to piston, and cam block forming connection between two levers whereby as piston shifts ratio of leverage will change.

METALLURGICAL FURNACE.—No. 753,712; F. Kepp, Brooklyn, N. Y.



Metallnrgical furnace iucluding discharge flue, melting chamber and superposed initial heating chamber, chambers having indepeudent communication with discharge flue at rear ends, separate heating means arranged to direct products of combnstion through chambers to flue, and means for establishing communication between chambers at points intermediate of ends.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

A. N. Nadeau, foreman of the Jualin mine at Berners bay, near Juneau, says the work of the Jualin has progressed satisfactorily this winter, and everything is ready to start the mill as soon as there is water enough. The winter has been mild, with little snow, and mining operations have not been hindered as in former years.

Nome reports say a second paystreak has been found on Dexter creek, which was previously known as one of the rich streams on Seward peninsula. The discovery was made on the Sugar claim, owned by the Pioneer M. Co., which has employed drills to investigate character of its auriferous ground to a depth below that reached by usual placer mining methods. Work was started on a shaft, which, on January 1st, had been sunk 160 feet. Work has been started on its extension, 70 feet farther, to a second level. This shaft required 20,000 feet of lumber.

ARIZONA.

Cochise County.

The February product of the Calumet & Arizona mine, near Bisbee, was 1250 tons of blister copper.

Graham County.

The Arizona C. Co. at Clifton is arranging to equip the Humboldt, one of their best developed and largest producing properties, with electric haulage and electric lights, says the Copper Era. The power will be supplied from the Longfellow concentrating plant and cabled to the mine at Morenci, a distance of 1 mile. A 30 H. P. electric locomotive will be used for hauling the cars, which will have capacity of six tons each, handling thirty-six tons to the trip. There will be 2 miles of track in the mines equipped for electric haulage, and the mines will also be lighted with incandescent lamps. The lower levels will not be equipped for electric haulage as yet, as the bulk of the ore is now coming from the upper levels. The mine is producing 800 tons of ore per day, which requires eight mules and sixteen men to bring it to the surface and dump it into the ore bins. With electric haulage the ore will be handled in one shift. A tunnel has been driven through Copper mountain on the Humboldt workings, after which the track crosses the gulch and connects with a tunnel on the Clay mine, which has been driven in several hundred feet. A plant for air drills is being put in at the face of the Clay tunnel, which will be used in driving this tunnel through the mountain, when it will come out on the other side at head of Queen incline. When this tuunel is completed ores from Queen mine will be sent out over the trolly line and through those tunnels to mouth of Humboldt tunnel at Morenci, and conveyed from there to the Longfellow concentrator by railroad. The tunnel through the Clay mine will also be used for operating the Carasco and other mines on the same mountain. Arrangements are being made in the gulch between the two tunnels to desulphurize the heavy sulphide ores which are coming from the Carasco mine. A hoisting plant is being built on the Humboldt for operating its lower levels, which have reached depth of 450 feet from mouth of tunnel. Work is progressing on a system of dams for storing the tailings from the Arizona C. Co. concentrator, which will be in operation this month. The tailings will be dried, then hauled by cars back to the mines and used for filling the old workings. This will do away with annoyance of tailings in Chase creek. A new hoisting rig is also being arranged for the Yavapai. The work of opening up the new Longfellow at greater depth is progressing, new levels having been run lower down the mountain, which are being connected with workings above. Another tunnel is also being driven in from Chase creek, which in time will be connected with the Longfellow workings, affording new outlet for the ores, doing away with the hoisting plant and also opening the mine at greater depth. Arrangements are being made in all departments to handle an increased tonnage, and at less expense.

Maricopa County.

(Special Correspondence).—J. Anderson and H. H. Gillespie of Wickenburg, owning mining property in the McDowell mountains, have begun development work. F. E. Withey of the Grand Traverse & Arizona M. Co., operating in the Cave Creek district, says the company expects to build a smelter this spring. Development work is progressing on two claims of the group 8 miles northeast of Cave Creek postoffice. A. W. Bennett of Glendale, of the Illinois C. Co., operating west of Wickenburg, reports continued improvement in the ore in the shaft, which is down 70 feet.

Wickenburg, March 5.

(Special Correspondence).—The A. E. Cobb mines have been sold to N. A. Sanders and W. E. Williams of Phœnix.—Manager Swikerath of Phœnix, of the Calamity M. Co., operating on Camp creek, reports work progressing. The ore carries gold, silver and copper. A body of high-grade ore has been opened up.—J. Lamboye and S. Gradio are developing a copper property in Vulture district, 7 miles west of Morristown.

Preparations are being made to work the Union mine, north of Phœnix. An abundance of water has been developed near the mine.—D. Cleberat has sold the tailings at Smith's mill to parties who will cyanide them.

The White Tanks M. Co. has several carloads of high-grade copper ore at Beardsley awaiting shipment to its smelter at Wickenburg. At the smelter they are making alterations and improvements.

There is considerable activity in mining in Buckeye section.—The Hercules C. Co. is shipping high-grade copper ore from Morristown.—B. Ford will develop his prospects in the White Tank mountains.

Phœnix, March 6.

Mohave County.

(Special Correspondence).—The Tennessee drift on the 250-foot level of the Altata mine is cleaned out and work of driving ahead has begun.—Three shifts of men have been put to work sinking for water on the Manzanita mine. The shaft is 103 feet deep and the steam hoist at work.

The Elkhart mine has started work again under new ownership and management. Sinking from the 500-foot level of the shaft is in progress, with a small vein of galena in sight.

The Roger Boy mine will have its gasoline motor hoist set up over the shaft for work by April 1. The wagon road to the mine is half completed.—The Hunrath mine at Acme is having a steam hoist put in. The ore in the bottom of the shaft shows gold values.

The shaft on the Tennessee Hill mine at Snowball, owned by J. D. Jordan, is down 200 feet. Work of crosscutting to the veins will be started.—Two prospectors have made a gold discovery in Stockton Hill district, the vein being 4 feet wide and showing free gold.

W. H. Cushing, president of the Stockton Hill M. Co. at Stockton Hill, says he will start construction work on a zinc plant. The ores are to be separated by magnetic process.

The Buckeye mine at Mineral Park has been taken over by M. Neilson & Co. of Wickenburg under lease and bond. Work has started. The ores carry native silver.—Jacobs Bros. are putting in cyaniding tanks to treat their ores at Gold Basin.—L. Blakely, superintendent of the Virginia and Ramrod mines in Weaver gold district, has taken a year's lease on these two mines and the 10-stamp mill. He has put men to work.

H. H. Smith, part owner of the Great West gold mine in Minnesota district, says the crushers will be started this month on ores of that mine for cyaniding.—The gold and copper ores on the Planet mine on Bill Williams fork are showing payable values.

Chloride, March 7.

Pinal County.

(Special Correspondence).—J. McSherry of Kelvin reports operations resuming at the McSherry mines. F. Marion and L. Gilson have a lease on the upper levels of the Ray mine, and are taking out shipping ore which they will send out as soon as the Phœnix & Easteru Railroad is built into Kelvin. J. Elder reports making a new gold discovery, near Kelvin, showing a vein 8 feet in width carrying free gold.—A contract has been let for a 40-foot shaft on the Calumet mining claim, owned by W. F. Nichols.

Kelvin, March 5.

(Special Correspondence).—L. D. McClure is working on his group of gold claims in Butte district, east of Florence.—C. McCarthy is taking out shipping ore from his mines north of the Gila river, 20 miles east of Florence.

Florence, March 6.

Santa Cruz County.

Oil is reported found 5 miles northeast of Nogales, near Kelsey's ranch, and locations have been filed covering 7 square miles of ground, says the Oasis.

Yavapai County.

(Special Correspondence). — The Ideal mine has a shaft 250 feet, a drift 100 feet each way on the 200 level, 50 feet each way at 250 level. The ore is sulphide, averaging $18 in a 1-foot to 5-foot vein. Manager E. L. Sharpneck proposes to sink another 100 feet for development purposes, but will stope on the present levels. The work was started to test his patent steam stamp. One stamp was installed and has been working some time to the satisfaction of the inventor. It handles ten to twelve tons per day. When stoping begins two additional stamps will be put in. The plant is superintended by Geo. W. Sarano, R. J. Fitzgerald foreman.

The Home Run plant, property of the Douglas-Lacy Co., is another designed to practically demonstrate the value of a patent — this the Nissen process, where every stamp works in a battery by itself. The 6-stamp mill is designed to amalgamate and concentrate about fifty tons of ore per day, employing two new Standard concentrators, which turn out about twenty-five tons per month. The ore is a hematite and quartz, sulphide on lower levels. The shaft is down 400 feet on a 3-foot vein. There are 3000 feet of drifting on the 3rd level and 200 feet on the 4th level.

The Monte Cristo, under Foreman W. J. Casey, is down 400 feet in shaft and drifting to strike the ledge. It has an abundance of water to run the 10-stamp mill and concentrator. The values are in gold and silver, with some lead and copper.

The Cash, owned by the same company, under Foreman Bardshar, is taking out some high-grade gold, silver, lead and copper ore, which is amalgamated and concentrated at its 10-stamp mill. This property adjoins the Senator group of the Phelps-Dodge Co. on the Hassayampa, 3 miles from Walker. It has the advantage of cheap fuel, wood costing only $4 per cord. The mill stands in a forest of pine, and water for its operation is pumped from the 400-foot shaft. Yet another mine, the Catoctin, is being worked some miles farther down the Hassayampa. All are under the superintendence of Harrington Blauvelt.

The Arizona Groom Creek G. M. Co., just above the Monte Cristo, is doing development work and making a trial run of ore at the Gold Basis mill, which has been leased for the purpose. The intention is to install a mill as soon as it is determined what process the ores require. Superintendent Lon Hall is in charge.

Other properties in the vicinity, now idle but expected soon to start operations, are the Chicago, owned by E. M. Clark of New Haven, Conn., Superintendent H. H. Keays, which has a 300-foot shaft; the Midnight Test, Geo. Woods superintendent; the Little Dutchman and the Empire—all having 10-stamp mills and more or less development.

Chas. A. Behm is driving a tunnel into Spruce mountain on a vein of low-grade ore, now 315 feet in, with a like depth, to intercept a point on the ledge where the surface cropping is 20 feet wide, carrying good values in gold. The property consists of eleven claims, eight of which show mineral deposits of good size and value.

A mile west of the Senator, on a slope overlooking for miles the wooded valley of the Hassayampa, is the Century property, owned by Judge E. M. Sanford of Prescott. The property consists of twenty-seven claims. There is a fissure vein 18 feet wide, with 4-foot paystreak. It is the owner's intention to form a stock company, to be known as the Red Mines, on seventeen of the claims. At present there is a 215-foot shaft and 150 feet of drifting on the property.

A mile north of the Senator is the 10-stamp mill of the Gold & Copper Con. M. & M. Co., Manager A. J. Pickrell. The process is amalgamation, concentration and cyanide. The company, composed of New York and Chicago parties, R. A. Sweet, president and treasurer, owns four properties—one on Slate creek produces copper ore, while the Mill group, President group and Montana group, on the Hassayampa side, yield lead and gold. A wagon road leads from the two latter to the mill, a distance of 2½ miles. Transportation costs $1 per ton. There are two steam hoists on the property and a total of some 2 miles of development work. Operations have been suspended for several months, but it is proposed to resume in April.

Groom Creek, March 5.

(Special Correspondence). — The Oro Grande well on the Hassayampa river is completed, and work will be started on the pipe line from the well to the mill of the Oro Grande mine, north of Wickenburg.—The Whipsaw mine, near Briggs, is working men in the Atlanta shaft.—J. Robey is taking out ore from his mine on East Buckhorn gulch, which he is running through an arrastra.

Briggs, March 6.

(Special Correspondence).—At Walker, on Lynx creek, there is a prospect of activity. Within a radius of a mile there are six mills, the Victor, Mudhole, Pine Mountain, Penn M. Co., Milliken and Dixie. Of these only the Pine Mountain and Dixie are running at present. The former is in charge of J. S. Carmichael, and the latter is under lease to C. C. Stukey, who is milling ore from his Eureka property.

The Poland tunnel is being driven through the mountain to connect Walker and Poland by rail. A branch of the S. F. P. & P. Ry. connects Poland with the main line at Prescott, and on this branch line, only 12 miles from Poland, is the Val Verde smelter, which is just now being taken over by the Bradshaw Mountain Copper M. & S. Co., and will be put in operation; capacity, 1750 tons per day.

The Poland tunnel is an interesting bit of engineering. Started originally on the Poland side to tap the Poland ledge at 1000 feet, the first part was hammered out by hand through hard syenite. About three years ago the present company took over the property and projected a tunnel through the mountain, a distance of 8090 feet, designed to tap the hidden ledges and furnish an outlet for Walker, and incidentally to develop water. In all three designs it will be successful. Several ledges of greater or less value have been cut, and Superintendent W. J. Martin estimates that it will yield 300,000 gallons of water per day.

The tunnel on the Poland side for 2000 feet is 7x10 feet, designed for a double track, the same on the Walker side for 1500 feet, the remainder being 7x7 and single track. There is a grade of 1% for 6000 feet on the Poland side, the remainder being 3% in the same direction, so that water will flow from it by gravity.

There yet remain 900 feet to complete the tunnel and work is prosecuted at both ends—on the Walker side by three eight-hour shifts, and two shifts of eight hours on the Poland, giving a total of about 100 feet per week. Sullivan 2¼-inch drills are used, operated by compressed air, which is furnished by a 125 H. P. compressor in the Poland mill. The engineering has been done by I. J. Stauber.

The Poland mine and mill suspended operations last year on account of labor troubles and will not resume until after the tunnel is completed. There is a total of 8200 feet development work in the mine, which has been worked more or less for thirty years. The mill of twenty stamps and nine Wilfley concentrators has a capacity of 100 tons per day.

Other mines working in the vicinity are the Poland Extension under Superintendent J. Gray; the Oriental, Superintendent W. A. Kent, and the Old Mesa, Superintendent B. H. Gray. At present little work is being done in this section.

Walker, March 8.

CALIFORNIA.

Butte County.

The Spring Valley quartz mine, near Oroville, with adjoining claims, has been sold to the United G. & C. Co. for a cash consideration. The United G. & C. Co. is composed of Eastern men with offices at Chicago, Ill. The development work done on the property by the United G. & C. Co. during life of bond which has been taken up, consists of a tunnel 825 feet crosscutting the vein 360 from apex, showing vein 4 feet wide assaying $10 in gold. In addition to this they are prepared to work the placer ground. Ditches have been built and giants placed ready for hydraulic operations. The development work and the preliminary work for hydraulicking is under superintendency of E. M. Wilson.

It is expected the Bay Counties Power Co. will resume operations at French Creek about June 1, says the Oroville Mercury. Superintendent Albert is at Colgate putting in a dam that was washed away by the recent floods. From there he will go to Nimshew and then to French Creek.

El Dorado County.

The shaft at the Ida Mitchell mine, near Placerville, is down 165 feet.—The restraining dam for the Red Hill gravel mine has been inspected and approved by the California Debris Commissioner.—Superintendent A. Anable of the Rescue mine reports work progressing on the hoist.

Mariposa County.

The Champion mine on the Mother Lode, between Coulterville and Penon Blanco mine, is under bond to a company which is developing the ledge. They are down 100 feet and report having struck ore.—The Never Sweat Co. has made arrangements to start work.

Nevada County.

The shoot of ore struck last week in the south workings of the Eddy mine, near Nevada City, is being opened up. The mill is running on day shift. When the shoot is further developed the stamps will be dropped on night shift. The strike was made at a point 150 feet south of the shaft, says Superintendent Kirkham. The Eddy adjoins the Oustomah

mine, formerly the Pennsylvania, west of Nevada City.

The Mountaineer G. M. Co. has been incorporated under Arizona laws, with principal place of business Phœnix, by J. Bender of Hamilton, Ohio, F. Searls, J. C. Camphell and D. E. Morgan of Nevada City, W. T. Farrar, J. M. Duke and Geo. W. Henderson.

Tho aerial tramway connecting the Mayflower ledge at Maybert with the El Oro mill is again in working order and the stamps are dropping.——A cave at the Black Bear mine near Rough and Ready has temporarily stopped operations.

Work on the Round Mountain mine, near Nevada City, has been discontinued hy Huckins Bros. on account of water. The water has been coming into the shaft so rapidly that they were unable to handle it. They expect to put in a pump.

The mill of the Murchie Con. G. M. Co., near Nevada City, is in full operation, says Manager A. Maltman. The company is composed of San Francisco men. The main working shaft of the mine has a depth of 700 feet. It is of three compartments and is on the Big Bluo ledge. There is connected with it a 700-foot drain tunnel, 160 feet heneath the surface aud opening into Deer Creek canyon. Seven levels have heen opened on the Big Blue, and work is heing done in five of them. Over 4000 feet of lateral drifts and levels have heen opened. The 30-light dynamo used in lighting the mill will be supplemented by an 80-light machine for the hoisting works and the underground workings.

Nonsuit was granted on the 10th inst. in the action hrought hy G. E. & J. W. Riloy against the North Star M. Co. for $800,000, the plaintiffs alleging tbat the company had taken ore of that value from their mine at Grass Valley previous to April, 1899. The company stated that it had owned the Massachusetts Hill quartz mine for forty years, and that in working the mine it was entitled to follow to their entire depth all the veins, lodes and ledges containing gold which were embraced within this property, even though they led to the adjoining property of the plaintiffs. It appeared that the ore was taken in following the veins of the Massachusetts Hill mine, the court sustaining this contention. Attorneys for plaintiffs will appeal.

San Diego County.

The work of pumping the water out of the Owens mine shaft, near Julian, has heen completed.——Cook & Marlett report finding asbestos on one of their mining claims near Witch creek.

At Escondido arrangements are heing made for mining and quarrying of pelagonite, which will he used for making paint, talcum powder and ornamental stone for the interior of buildings. There are three claims, covering sixty acres of land, and owned by Oakland men. Thore is said to be a stratum of yellow ochre of good quality in theso mines.

Santa Clara County.

The first shipment of quicksilver from the San Juan quicksilver mine, 2 miles south of San Jose, was made last week. The shipment included 1200 pounds of quicksilver and represents a short run of the furnaces. The owners are Boston, Mass., men. The mine was worked in the early days by the Mexicans, hut has been idle for a numher of years. Men are increasing development. The old tunnel was opened and high-grade cinnabar found. Furnaces are heing huilt.

Siskiyou County.

J. E. Roherts and M. Smitbson are opening up the Know Nothing quartz mine on Know Nothing creek, ahove the Forks of Salmon.

Tuolumne County.

(Special Correspondence).—The Soulshy mine and mining property has heen sold to Eastern parties, who took charge March 1st, and H. L. Huston of Calaveras county is superintendent, with J. L. Cox as foreman. Five more stamps are heing added to the mill, making a total of fifteen stamps. The mine employs nfty men.

Soulshyville, March 7.

The Rawhide mine, near Jamestown, against which a strike is on hy the union, is running with sixty-five men. On the 6th inst. W. A. Nevills, owner, with a party of twenty strike hreakers, on going to the mine was attacked hy a mob of strikers, but they were heaten off hy the company's guards, armed with shotguns.

The Golden West mine, on the Comstock ranch, near Sonora, will he started up again, with F. McPherson in charge.——The Altadena mine, on the hill east of Columhia, is heing equipped with a boiler. When the machinery is set, sinking will he resumed.——The Evalina G. M. Co. has been incorporated hy J. P. O'Brien, C. A. Garter, M. S. Hamilton, W. J. Hayes and W. H. McClintock, of San Francisco.

The Evalina G. M. Co. has been incorporated, with principal place of business San Francisco, hy J. P. O'Brien, C. A. Garter, W. J. Hayes, W. H. McClintock of San Francisco and M. S. Hamilton of Oakland. They have taken over the Slap Jack mine and the Ora Vista mine, near Big Oak Flat.

It is reported that the Cherokee Group G. M. Co. of Boston, Mass., wbich operated the Laura and North Star mines a year ago, has reorganized and will start work in May.

The gravel mine ou the Doyle ranch, west of Columhia, was bonded last week to C. Sawyer of San Jose for $25,000. The Doyle ranch gravel mine is owned hy Doyle Bros. and is on the Tahle Mountain river channel.

Yuba County.

Marysville reports say 700 acres of the holdings of J. O'Brien were bonded last week to Eastern men. It will be prospected for dredge mining. On another part of the O'Brien land two dredging machines are heing built for the W. P. Hammon Co. These two machines Manager Cameron expects to have completed and ready to operate before July 1st, and two more will he started by his company before these are finished. The Whitney quartz mine, near Cabhage Patch, bonded by Marysville men, is being developed.

COLORADO.

(Special Correspondeuce).—Denver men consider the husiness outlook for Colorado is hrighter than for a year past. Reports are of a nature which tend to create confidence and a hetter feeling throughout the city and State. The president of one large manufacturing concern stated: "We feel greatly encouraged over the business we are receiving, and the numher of inquiries coming in for prices on our class of material. The inquiries we are getting to-day are of a different nature than the ones received last year. The ones we received last year were moro on the speculative order, while the ones we are receiving to-day are more stable and indicate renewed activity."

Lyman L. White, State Commissioner of Mines, has charge of the mineral exhihit to he taken to the World's Fair at St. Louis, Mo. He has secured floor space, 43x80 feet, in the Mines and Metallurgy huilding. The cases containing the specimens will he made of mahogany; the fronts will be of Colorado onyx and the sides of Colorado marble and onyx, with plate glass doors. The gold case will contain between $50,000 and $75,000 in gold specimens. One case will contain free silver specimens. There will be three cases of telluride ore from Teller and Boulder counties, heside a general exhihit typical of the State.

A movement is on foot to organize and operate a summer school of mining engineering. A large amount of money has been subscribed hy G. Crocker, through J. H. Hammond, for starting this school. Harvard, Yale, Massachusotts Institute of Technology, Columbia University and the School of Mines of Colorado are expected to take part in this enterprise. Thoy intend leasing a property and running it the samo as any other concern, and thereby give their students the henefit of practical mining experience. The details as to where this mine will be located has not been given out, hut is to be some place in Colorado. Prof. H. S. Monroe of Columhia University is to have charge of it for this summer.

Denver, March 7.

Clear Creek County.

(Special Correspondence).—The Idaho Springs M. & R. Co. has started up its mill under the management of J. J. May. They have several hundrod tons of ore on hand.

The Fostoria G. M. Co., W. Nichols superintendeut, will resume operations next week. Assays show this company has high-grade ore.

Idaho Springs, March 7.

Custer County.

(Special Correspondence). — Considerable development work is heing done and planued in Rosita district on properties which have heen idle. Work is progressing on the Humboldt-Pocahontas and the Merriment, as well as several other properties.

Rosita, March 5.

Gilpin County.

(Special Correspondence).—The Moffat road is within 10 miles of Rollinsville and affairs in northern Gilpin county and southern Boulder county are improving. It is expected trains will be running into Rolliusville by May 1st. The prospects and mines in that section are in about the same position as heretofore—waiting the completion of the railroad which will save a long haul to Black Hawk hy wagou. The mining camps such as Perigo, Gold Dirt, Gilpin, Gamble Gulch, Moon Gulch, Boulder Park, Mammoth Gulch, Phœnix, Baltimore, Eldora, Caribou, Cardinal and Netherlands, are from 2 to 6 miles from Rollinsville. Completion of the road to Rollinsville will mean cheaper coal for the mines. The Gold Dirt mine is opening up the 600-foot level east and west from the shaft. They have received assay returns from ore in the east drift at the 600-foot level which runs $8 gold, $21 silver, $4 copper. At the Perigo they are running the mill on one-half time, hut tbe numher of men will he increased. The Benton mine, which adjoins the Gold Dirt, has its shaft down 75 feet. The vein is 4 feet wide, in the bottom of which 2 feet assay 0.62 ounce gold and 2 feet 0.20 ounce gold. This property is equipped with shaft house, 70 H. P. hoiler, 25 H. P. douhle-geared hoist. Sinking will be resumed April 15th. Ore tested at the Perigo mill from the Benton, taken from the shaft and surface workings, averaged $8 per ton.

Rollinsville, March 6.

(Special Correspondence). — The Blue Grass M. & M. Co. is operating its mill and both tbe properties which it owns at Phœnix.

Phœnix, March 5.

The Black Hills & Denver M. Co. is driving work on its tunnel on the north side of Boulder park to cut a group of claims near Phœnix. The main tunnel is in a distance of 200 feet. J. Peterson, superintendent, says development will he increased. —— Two shifts are at work in the International tunnel up South Boulder canyon, which is in 50 feet. Kansas and local parties are interested and O. P. Caley is superinteudent.——Work is progressing on the tunnel of the Jenny Creek M. & M. Co., up Jenny creek, in Kansas district. The new line of the Moffat road will pass through the territory of the Jenny Creek Co.

Denver and Eastern men are interested in the Gilpin American M. Co., owning a group of seven claims near the head of Eureka gulch on King flats, near Nevadaville. The group has been partially developed with shafts of from 10 to 40 feet in depth, and it is the intention of the company to put up macbinery and sink a shaft near the center of the group.

The Golden Cloud M. Co., operating the Golden Cloud group at Russell Gulch, is increasing development work. The group consists of four claims, all patented and owned by Hawley & Potter of Central City. During the past month machinery has heen put in to sink the sbaft 1200 feet. H. G. Pearce of Denver is manager, with L. E. Tohias of Idaho Springs superintendent.

A two year's lease and hond bas heen given on the Columbine and East Columbine claims, in Pleasant Valley district, near Central City, to J. H. Camphell, of Russell Gulch. Work has been startod up in the main tunnel, wbich has heen driven in 125 feet, in the hreast of which there is a 14-inch streak of iron sulphide carrying values of $25 gold per ton.

Hinsdale County.

(Special Correspondence). — The Red Rover mine, which has heen closed down for several months past pending settlement of litigation, will he in operation again as the company is heing reorganized. Plaus for the smelter to he built at Gunnison are progressing. The Red Rover Co. is at the head of the smelter enterprise. G. J. Bancroft of Denver is consulting engineor for the company.

Lake City, March 6.

Lake County.

Manager J. A. Shinn reports his plans for the tunnel and tramway to he huilt by the Leadville-Denver M., T. & Tramway Co., near Leadville, are progressing satisfactorily. He says work will be started not later than June 1. The mines are in the Iowa gulch section and have heen hampered in their operations by tho conditions which prevail in that region in winter. No shipments have heon made for some time hecauso of snow and condition of roads. The tramway will enable these properties to ship continuously throughout the year.

La Plata County.

(Special Correspondence).—At the Bulldozer mine the number of men has been increased and shipments are heing steadily made to the Durango smelter. In the breast of the drift and stope is a hody of ore 3 feet in average width, which runs twelve ounces gold and twenty-five ounces silvor por ton, requiring little sorting.

Sinking has heen resumed at the Comstock mine and drifting continues on tbe 100-foot level, eight men being employed. Shipping ore is heing taken out, though the values are mostly in silver, the lost gold shoot not having yet heen recovered. The porphyry dike has heen crosscut for distance of 50 feet and is well mineralized. It is thought it will pay to cyanide entire.

The Bonnie Girl mine has discontinued building operations until spring, hut several men are completing excavations for the mill. The frame for the first unit is nearly enclosed and the pipe line has been laid.

The Neglected mine has temporarily reduced its numher of miners while the mill is husy working the dump of several thousand tons, and three shifts are sinking a new shaft.

At the May Day mine thirty men aro employed iu the mine and at the mouth of the proposed tunnel. The air pipe has been laid and the compressor is on the ground. A carload of ore recently taken out in sinking the shaft 3 feet notted $600 at the smelter.

The Chief M. Co., operating across the gulch from the May Day mine, cut tho vein last week and is taking out high-grade oro. The vein is 2 feet in width. Buildings are going up and machinery will he put in.

Mancos, March 7.

Pueblo County.

The numher of men on the payroll of the Colorado F. & I. Co., Puehlo, has heen increased to ovor 2000 hy the opening of the two hlast furnaces of the stoel works. The hins are full of coke and more is on the way. Coal shipments are assuming normal proportions, two trainloads per day arriving at tho plant. The addition of men is not directly at the furnaces. To operate one of these takes a small force of men, says the Pueblo Chieftain. Machinery has made it possible for thirty men in all to operate the largest of the furnaces, which turns out 350 tons of pig iron per day and consumes three times that tonnage in weight of ores, limestone aud coke. The addition to the forco is made hy putting to work yard men and reopening other departmonts dependent on the hlast furnaces. To provide steel for the different plants where the finished product is made, the converter will he started. Raw material will also be furnished hy the open hearth plant.

Rio Grande County.

A strike is reported in the Comet claim at Embargo camp, near Del Norte. The ore was opened up at depth of 51 feet, tbe vein showing 3 feet wide, giving returns of eighty-nine ounces in silver per ton. The Comet is owned by Beere, Smiley & Freman and A. Shippee. The ore is sulphide. Another strike in the camp was made in the Evening Star mine, of the Evening Star, Morning Star and Silver Moon group, owned by Beere and Beere, Smiley & Froman. At depth of 46 feot ore was uncovered assaying $18 across the vein for 3 feet.

Saguache County.

(Special Correspondence).—The owners of the Goldmont M. & M. Co. expect to start operations about April 1st. They will also huild a 150-ton mill.

Alder, March 7.

San Juan County.

E. C. Condit, manager of the Astor M. Co., oporating in Eureka and Picayune gulches, near Eureka, reports machinery and other equipment will be put in and development work increased. The properties consist of the Astor Nos. 1, 2, 3, 4 and 5, Sunshine, Fortune, Grand Mogul and others. The Sunshine has a 300-foot tunnel driven on the vein, made up of yellow and gray copper, iron, etc., and carrying both gold and silver. This ore is said to give average returns of $18 per ton. A shaft has heen sunk on tbe vein to depth of 70 feet, being in ore all the way down. Sinking was suspended hy reason of surface water having flooded the workings. The Grand Mogul, wbich has heen developod hy a 170-foot tunnel driven on the vein, is in 7 feet of mixed galena, copper and quartz, carrying gold and silver. The product of hoth these claims, and also of the entire group, is a milling proposition. A crosscut tunnel, which is in 850 foet, is heing driven to develop tho entire group. Among other improvements that have been put on the group is a powor plant comprising a water wheel, dynamo, a 25 H. P. hoist, one 10 H. P. pump, fau and two power drills. A 40-stamp mill will be put in and is expected to he completed hy Sept. 1st next. As soon as tho main vein is cut in the crosscut the numher of men will bo increased hy thirty additional.

It is reported the Hercules Con. M. & M. Co., on Sultan mountain, at Silverton, will he started up in April. This company owns thirty claims on that mountain which are developed by two crosscut tunnels aggregating 5000 feet, which cut the Hercules, Little Dora, Empiro, Victoria and other veins from 300 to 750 feet vertical depth below surface. The upper, or Montezuma tunnel, is 1800 feet in length, and the Empire, 400 feet below, is 2350 feet, with considerable drifting done on all the veins at point of intersection. The Hercules, where cut, shows an 8-foot vein, says the Times, wbile the Dora, Victoria and Empire veins are from 3 to 4 feet wide. The rock is a milling quartz with lead-copper ore running in gold and silver. Near mouth of Empire tunnel is the company's 100-ton concentrator, which is run hy water and steam power. The mill, mines, hoarding house and offices are heated with steam and lighted by elec-

tricity. The management of the Sunnyside mines, near Eureka, have been increasing their number of men, Superintendent J. Terry having 200 at work. This mine, the product of which is gold, is enlarging its output. The vein of the Sunnyside is 80 feet wide of milling ore, with a 6-inch shoot of high-grade ore. The mill at Eureka is handling 100 tons per day of ore, making daily shipments of concentrates. The management has plans drawn for improvements this summer, among which will be a compressor plant and driving of a tunnel to cut the veins at greater depth. When this is completed the mill will be enlarged to handle the increased output.——The contractors on the Silver Wing mine are pushing ahead the tunnel with air drills. The Eureka Exploration Co. owners propose extending this tunnel No. 2 to the Frederica ground, a distance of 4200 feet, of which 2250 feet has been completed, reaching maximum depth of 2500 feet. This will cut several mines with surface showings. The veins to be cut are either controlled by this company or the owners have contracts with the Eureka Exploration Co. for development of the claims through the tunnel.

Superintendent Umbell of the Henrietta mines of the San Juan M., S. & R. Co., near Silverton, last week put men to work on that group. This mine has been developed for the past three years by seven levels. At 120 feet above No. 7 level, in cutting for No. 6 station, the shoot of ore which the raise follows was opened, showing 5 feet of yellow and black copper ore, containing gold and silver values. The number of miners will be increased April 1st to fifty. Ground is said to be opened at the mine so that 250 men can be put at work to breaking ore. The smelting ore in the Henrietta mine will furnish iron-copper sulphides to keep the 150-ton pyritic smelter in operation, and at the same time give a market for quartz ores of the county. An aerial tramway from the mine to the Gladstone railroad, 5000 feet in length, was completed last fall.

San Miguel County

The output of the mines of Telluride district is at present 75% of the normal product, says the Telluride Journal. Part of this deficit is duo to the fact that a full force of miuers is not yet at work, and partly to a shortage of water for milling purposes.

Teller County.

The Stratton's Independence, Ltd., at Victor, is employing 440 men in two shifts. The company is shipping out an average of fifty tons of ore per day, which goes to the Black sampler at Goldfield. The oro is running one ounce gold per ton.

IDAHO.

Bolse County.

The Boston & Idaho Dredge Co. will build two gold dredgers next summer, one on Cold Springs flat, 6 milos below Idaho City, and the other at the junction of More and Elk creoks, at Idaho City. The latter will work on Elk creek. The dredger is expected to handle from 75,000 to 80,000 cuhic yards per month, says Superintendent R. Winters. The dredge company has been negotiating with the Oxbow E. Co. for electric power.

Custer County.

Smelting was discontinued during two days last week at the plant of the White Knoh C. Co. at Mackay pending alterations. The waters of Warm Spring creek were connected with the city water main, and the pipo line leading from White Knoh creek cut out and connected with the smelter. The new pumping plant which raises water from Lost river was connected with the smelter, and cut off provided for connecting White Knob water with the city water main in case of fire.

Idaho County.

(Special Correspondence). — Considerable snow fell in the district during February, and a number of slides occurred, resulting in death of two men.

Superintendent E. L. Abbott of the Sunnyside mine says the Burr Oak tunnel is in 1000 feet, with the face in granite with quartz stringers. Twenty-five feot per week is made with seven men. It is expected the ore body will be reached in 200 feet. C. L. Lovojoy, treasurer of the company, says it is the purpose of the management to equip the company's mines with machinery, etc. Manager R. W. Purdum writes that he will give his personal attentiou to the construction of the uncompleted wagon road to Roosevelt as soon as spring opens.

The Dowey mill has been running steadily this winter, and Superintendent E. Haug says work has not been interfered with by frost. The December and January clean-ups netted forty pounds of bullion each, the proceeds of milling with ten light stamps.

The Thunder Mountain Pearl M. & M. Co., organized at Pittsburg, Pa., has nineteen claims, extending on both sides of Holy Terror creek, 2 miles northwest from the Sunnyside mine. and three tunnels have been driven—100 feet, 135 feet and 250 feet, respectively. The bulk of the ore is low grade, but shows occasional high-grade shoots. The principal tunnel will be driven to 500 feet this winter. C. M. DeCamp is superintendent.——Tho Planet group of seven claiins, owned by W. H. Padgett and T. M. Shugre, is on Monumental side of divide, botween Monumeutal and Indian creeks, at elevation of 8000 feet. The main trail to Boise City passes through the group. Three tunnels of 45, 35 aud 60 feet have been driven. In the 60-foot tunnel assays show average values of $34. The ore is free milling and is a quartz-porphyry.

J. Pierson, superintendent of the Georgia Holts tunnel, driven for Hendricks & Bernard on Divide creek, says ores for assay wore sent out every 5 feet for tho full leugth of the tunnel, 75 feet, and returns give average of $3 per ton gold.——Development in tho Fairview mine shows the ore body 60 feet wide for length of two claims, averaging $10 per ton gold in value. Several talc soams were crossed. Ono of thom was 3 feet wide and assayed $56 per ton gold.

The tunnel on the First National mine on Trap creok is being steadily driven by Brown & Graham. Blue quartz is being taken out.——B. R. L. Poston & Co. havo driven a 60-foot tunnel on their group (Peak Point claims).——Bartholomew & Choate, in developing their group of three claims on Cinnabar creek, a branch of Sugar creek, have exposed a lead of quartz, carrying iron sulphides, which, concentrated, assayed $400 in gold.

Roosevelt, March 2.

W. D. Brown, manager of the Concord group, near Hump, reports preparations being made to sink on the Mother Lode No. 2, and work will be advanced by spring so machinory can be brought in over the snow and placed.

The Independenco mine, near Roosevolt, has let a contract to crosscut the ledge. This crosscut has already been driven through porphyry into tho vein matter. It is lutended to put in au air compressor. Two miles south of the Crown group, on Logan creek, is the Green property. A 200-foot tunnel has been driven on tho Empress. On the McKenzie group a tunnel has been driven 900 feet, and crosscuts aro heing run.——On the Wordenhoff group twenty men have been working all winter. Three tunnols havo been driven, each tapping hodies of ore. As soon as the nnmber of men on this mine is increased a tunnel will be started at the base of tho hill and driven in to tap the vein at a depth of 2000 feet, says Manager Hunt.

Owyhee County.

The Weaver dredgers on the Snake river, near Grandview, have been started.

Shoshone County.

The suit against the Empire State-Idaho M. & Dev. Co. at Wardner and C. Sweeney and F. L. Clark of Spokane, Wash., was settled on the 7th inst. in favor of K. Hanley hy Chief Justice Fuller of tho United States Supreme Court, who refused to give the Empire State Co. chance to reopen the case and refused the writ of certiorari for which it had applied. Hanley receives $260,241.83, one-eighth of value of ore taken from the Skookum claim, not deducting cost of taking out the ore.

The mines of the Cœur d'Alenes receiving electric power from the Washington Water Power Co., from Spokane Falls, are using something over 1400 H. P., says the Spokesman-Review. Of this the Standard is receiving 500 H. P. Tho electric power is used here principally for operating the compressor, which also supplies the Mammoth mine with power. The power is divided among the other mines as follows: Empire State mill, 160 H. P.; Bunker Hill & Sullivan, 150 H. P.; Empire State mine, 200 H. P.; Hecla mill, 100 H. P.; Tiger-Poorman mine and mill, 350 H. P.; Hecla mine, 200 H. P. At the Bunker Hill tho power is used to operate the electric mine railway, the sawmill and to light both Wardner and Kellogg. At the Tiger-Poorman the olectric pumps aro operated, and at the Hocla mino the compressor and the hoist. The Hecla is preparing to put in two electric pumps, one of which will use a 30 H. P. and the other a 20 H. P. They will have capacity of 150 gallons per minute.

KANSAS.

Wyandotte County

The Standard Oil Co., it is reported, will build an oil rofinery in Sugar Creek valley, on the Missouri river, 10 miles south of the business center of Kansas City, where 120 acres of land havo been bought. Surveyors are at work on the site, and it is expected the plant will be running by October next. Thore will be an acid plant, paraffine works, tallow works and other facilities for the manufacture of products from crude oil. The plant will, it is said, employ 1700 mon. A pipe line that will bring oil nearly 200 miles from Neosha is also to be built.

MICHIGAN.

Houghton County.

The annual report of the Franklin M. Co. at Hancock has been issued as follows: Copper produced, 5,309,030 pounds; selling price, 13.40 cents; yield, pounds copper per ton, 16.0; receipts, $685,841; expenses, $663,255.

The No. 5 shaft at tho Franklin mine was out of service temporarily last week because of a cave-in. This accident reduces the rock supply 100 tons daily.

The Atlantic M. Co., operating near Houghton, report for year onded Dec. 31, 1903, shows production of mineral was 7,670,660 pounds, which yielded 71.77%, or 5,505,598 pounds of refined copper, for which was realized 13.12 cents per pound. The production of minoral the previous year was 6,847,270 pounds, yielding 72.28%, or 4,949,366 pounds of refined copper, realizing 11.88 cents per pound. The copper yielded during the last year sold for $722,386, against $588,201 in 1902. After deducting oxpenses, interest on loans, construction and explorations and land sales, there remained a net profit for year of $150,342, against $1598 in 1902. The average yield of rock treated during year was 12.76 pounds of refined copper per ton, against 11.09 pounds per ton in 1902. The report says present appearance of the mine seems to warrant expectation that yield of rock mined during past year will be maintained during 1904. The explorations on section 16, in search of the Baltic lodo, have not so far been successful, and have heon discontinued, awaiting result of extension of workings in the Baltic mine towards that section. The compauy has sold the surface right to a portion of property on shore of Portage lako, near site of the old stamp mill, to he used as a site for smeltiug works by the Michigan Smolting Co. The company received in payment therefor $25,000 in stock of that company, by which holdings the Atlantic Co. will secure a lower rate for smelting than has hitherto been paid.

The annual report of the Osceola Con. M. Co., operating at Opechee, compared with 1902. shows:

	1903.	1902.
Gross receipts	$2,105,924	$1,594,453
Operating expenses	1,522,770	1,493,654
Construction	129,418	85,327
Tons rock stamped	924,400	836,400
Pounds mineral obtained	21,904,243	18,430,012
Per cent refined copper in mineral	73.317	72.797
Pounds refined copper per ton rock stamped	17.4	16.0
Production fine copper, lbs	16,059,636	13,416,396
Cost per lb, exclusive of construction	8.23c.	9.91c.
Cost per lb construction	0.81c.	c.64c.
Cost smelting, freights, Eastern expenses, commissions and all other charges per lb	1.25c.	1.22c.
Total cost per lb of refined copper	10.29c.	11.77c.
Cost mining per ton of rock, including stamping	17.44c.	21 735c.

The directors' report says the company did not begin to get full benefit of the new developments at the Kearsarge until August. Since it began paying dividends in 1878, the Osceola has paid $4,343,450. The North and South Koarsarge properties are turning out 3000 tons of rock a day, which runs at least 1¼% copper.

The Centennial, near Calumet, is raising from the twenty-fifth and oighteenth levels in B shaft. On March 1 they will start from the surface to sink through the shaft below. It is expected to be opened from the surface to the eighteenth level within six months. Tho hoist from No. 6 shaft in the old Centennial is to he brought over to B shaft when the latter is sunk through.

The annual report of the Franklin M. Co. at Hancock for year ended Dec. 31, 1903, with figures compared with those of preceding year shows:

	1903.	1902.
Receipts	$685,841	$647,964
Expenditures	663,255	508,270
Balance of assets	168,460	100,058
COPPER ACCOUNT.		
Copper produced, pounds	5,309 030	5,259,140
Copper sold, pounds	3,888,775	4,435,527
Copper on hand Jan. 1, pounds	1,420,255	823,613

Of the copper produced, 3879 pounds were taken from the sands. The amount stamped during tho year was 347,458 tons. The amount hoisted was 349,263 tons. The old Franklin still shows good supply of ore, owing to new openings, pillars, etc., discovered in and around old or abandoned workings in the old mine. Nothing of value has been found in the workings on the conglomerate lode east of the Pewabic lode. Franklin Junior is proving up satisfactorily. The No. 2 shaft has been started and both sinking and raising are going on. The No. 4 is installed and working. This and other improvments cost $41,803.68.

The Wyandot M. Co., near Winona, is drifting on a cupriferous amygdaloid bed 650 feet west of the Eastern Sandstone and getting a little copper therefrom, says the News. Winona is sending 150 tons of rock to the Atlantic mill daily and will resume sinkiug in the uew south shaft within a month.

The suspension of operations in the mines of the Copper Range Con. C. Co. at Painesdale is giving the company an opportunity to make repairs at the mill, and when operations are resumed tho company will be in position to secure better results than before the strike occurred, says the News. Work on tho compressor is progressing.

The Dollar Bay smelters shipped fiftoen carloads of refined copper east last week. Winter shipments by rail aggregate 10,500,000 pounds. Blizzards, with heavy snowfall in the copper district, blocked roads and interfered with rock traius.

The Winona C. Co., operating at Wiuona, report for the year ended Dec. 31, shows:

	1903.
Receipts	$247,252
Expenses	192,858
Copper on hand	28,926
Supplies and cash at mine	14,050

President J. Stanton's report says: The cost per ton of transporting rock to mill and treating 175 tons daily is more than it would he if they were ahle to treat 1000 tons daily in a mill of their own, but it has been deemed advisable to test the yield of the lode at various points to obtain a fairly accurate knowledge of tho copper contents in the kind of copper-bearing ground already encountered. Tons of rock stamped during the year at tho Atlantic M. Co.'s mill were 51,434. From this stamped rock 1,687,331 pounds of mineral was produced, yielding 61.45%, or 1,036,944 pounds of refined copper, or 20.16 pounds per ton stamped.

Keweenaw County.

Mohawk's third head at tho stamp mill near Allouez is working and No. 4 shaft is in operation.——The Ahmeek shaft is down 200 feet in copper. Allouez, sinking toward lodo, is down 466 feet and expects to strike tho lode Oct. 1 at depth of 1100 feet. The miners are trying for a record of 100 feet in March ou account of bonus offered by Superintendent Chynoweth.

Ontonagou County.

A mass of copper was struck in the Mass mine, at Mass City, last week which weighs thirty tons.——Sinking below the thirteenth level has been resumed at B shaft at tho Massachusetts mine of the Mass group. The company is confining its energies to development of the Evergreen lode, which is a producer of mass copper as well as stamp rock. The working force has boen reduced, there being hut 175 mon on the company's payroll. The mino is operating twenty drills, and the average cost of production since last June is reported not exceediug 10 cents per pound. The coming year will witness development of C shaft.

The Victoria C. M. Co. at Victoria has won its contention that it has the right to use the system of compressing air by falling water for othor's use as well as its own, says the News, the question having arisen with the owners of the patont. The company will continue sinking the 20x20 main power shaft. The mine is said to have 25,000 feet of openings and sufficient stoping ground in sight to run one head five years at the rate of 300 tons a day. Drifts are being extended to the line of shaft No. 3, which will bo the main shaft of the mine, 1190 feet west of No. 2. The 3000-foot conical drum hoist on the ground for No. 2 will he set as soon as the weather moderates, when the hoist now in use at No. 2 will be set for No. 3, and sinking from the surface and raising from levels will be started simultaneously. The west drifts of tho mine look better than the east, the copper shoot making to the west.

MONTANA.

Fergus County.

It is stated the New Year mine, near Lewistown, will bo started up again the coming spring. Manager Nelson et al. of the St. Paul mine expect resumption of milling. Suporintendent J. Meredith, who has been at New Year since the shut down, has been doing development and assessment work and has opened up bodies of ore.

Jefferson County.

The Gold Bond G. M. Co. has been organized for developing properties in Jefferson county a few miles south of Helena with main office at Helena. They will operate properties 2½ miles south of Helena and the Good Cheer group on Maupin gulch, Jefferson county.

Lewis and Clarke County.

The Gold Band M. Co. has been organized to operate fifteen claims, one group 2½ miles south of Holena and the other 15 miles from Helena. J. Winscot is president and manager, at Helena; G. D. McKay of Aurora, Ill., vice-president, and E. S. Hobbs of Aurora secretary and treasurer. The properties consist of the

Tunuel lode, near Helena, and tbe Good Cheer group, in Maupin gulch, on which work has heen done. There is said to be a lead of payable ore from 3 to 5 feet wide which assays as high as $20 per ton. There is a sbaft 60 feet deep, which will he sunk 200 feet. The Tunnel lode mine is east of the Wbitlach-Union and adjoining the McClellan.

Teton County.

J. Jardine of Great Falls, secretary of the Montana Swift Current Oil Co., reports having struck oil at the holdings of the company at Altyn, near the Canadian line. Oil-bearing shales were found there a year ago, and the company organized, with headquarters at Blackfoot, to develop tbe section.

NEVADA.

Elko County.

Mining at Bullion, Railroad district, 30 miles soutbwest of Elko, bas heen resumed. A company of California men bas bonded the Weston & Frank group and has started development work under Superintendent Knutzen.

Esmeralda County.

W. R. Smith, who has a lease and bond on tbe Copper Contact group near Sodaville, says work is progressing. Bismuth ores have been found.

Tbe owners of the Jumbo mine at Goldfield, Kernick, Taylor, McClelland & McKane, have let leases on their mines. The leases are let in 100x600 feet blocks, the owners retaining 400 feet at the point at which the shaft is sunk. Arrangements are also heing mado to lease tbe other five claims of the Jumbo group, and they will he divided into 200-foot blocks along the ledge, says tbe Bonanza. The royalty being asked is 25%.

Douglass gold camp, 8 miles west of Sodavillo, is again opening up. Adjoining the Douglass group of mines, wbich, witb its 5-stamp mill was recently sold to the Pan-Tonopah M. Co., is the Bounce mine. Tbe Bounce was sold last week to the Silver Star-Tonopah M. & M. Co., a Washington corporation, says Superintendent M. Averill. He will start work tbis montb. Arrangements are being made by which the ores from both companies' minos will be worked by tbe 100-ton reductiou plant to be erected on the ground at Douglass.

Water in Tonopah is said to be selling for 1 cent per gallon or $1 por barrel. There are two puhlic wolls at Goldfield and water is free. Wood is $12 per cord. It costs 25 cents a span to water horses, writes a correspondent to the Lewiston Tribune. There has been no snow tbere this winter. Iu two months they bave seen but four partly cloudy days and not a drop of rain or snow. The dust is heavy. The freight teams can be seen for 20 miles by the dust they make. Values are mostly in gold and higb assays have beon obtained. Thore are no mills thore yet, so all tbe ore is shipped to smelters, it costing $50 a ton to get it sacked and treated. The Combination is the heaviest shipper and their ore nets $300 per ton. They aro down 100 feet and have drifted 50 feet one way and 100 feet the other. The ore of the camp is mostly free milling. Wages are $4 and $5 per day for miners and $6 for carpenters and cooks. Board is $1.50 per day and $1 for a bed iu a tent. It is a tent town as yet, hut a few frame houses are being built. Lumber costs $75 a thousand. There are a great many freigbt teams on tbe road.

Humboldt County.

Superintendent G. Wilson of the Sheba mine, near Mill City, says the mill is again in operation.

Lincoln County.

Tho Frederick Warde G. & C. M. Co. of Salt Lake City, Utah, has been incorporated to operate in the Yellow Pine mining district by F. Warde, M. E. Mulvey, A. W. Rayhould and J. Moyers.

Nye County.

At the Midway mine at Tonopah the shaft has reacbed depth of 635 feet, where a station is being cut, from which crosscuts will be run north and soutb. This depth is equal to 700 feet in the Mizpah. On tbe 535-foot level a raise is being run from the drift in the south cut and ore is heing taken out. A raise bas also been started in tbo drift 35 feet north of tbe shaft, and as soon as enough ground has been opened up stoping will follow. It is expected tbat a run of Midway ore will be put through the custom mill this month.

C. S. Lemon of tbe United Tonopah M. Co., near Tonopah, will resume work on tbe company's group. The main shaft when work suspended was down 300 feet and was in ore. Another ledge has been cut on tho surface 200 foet west of tho shaft house and shows gold values.

The Montana-Tonopah M. Co. bas just received patent for its group of claims at Tonopah, said to be the first patent issued for property in Tonopah mining district.

Storey County.

It is reported the San Francisco men who bold a hond on the Keyes-Graessler mine in Seven-Mile canyon, near Virginia City, will resume operations.——Drill hole No. 7 on the Brunswick lode has been abandoned and the casing is being pulled. The bole was down 807 feet with bottom in porphyry.

White Pine County.

At tbe Rocco-Homestake mine at Hamilton the hoisting works are completed and will be put in operation this week.

NEW HAMPSHIRE.

Carrol County.

Several Boston men have been operating for a year, under the name of the Diamond Ledge G. M. Co., a property in Sandwich, 7 miles north of Center Harbor and Lake Winnepesaukee. The property comprises 100 acres on a hill. The vein is quartz, with a dike on the footwall 100 feet wide on the top of the hill. Five hundred feet below the top a tunnel 9x9 feet bas been run on the banging wall 125 feet. A crosscut is to be run at 150 feet to prove tbe width of the vein. Two bundred tons of gold-bearing quartz are now on the dump. Tbe breast of the tunnel is in ore running $5 per ton.

NEW MEXICO.

Roosevelt County.

The Portales News reports finding gold and copper-hearing ore hy M. L. Moody, 12 miles west of Portales.

Sierra County.

M. H. Steanghue et al. of Charleston, W. Va., bave taken ovor the Good Hope and Bonanza mines at Hillsboro and development work will be started this week. These properties are east of and in the first gulch from the Richmond mines.——Tbe Bigelow G. & C. M. Co., composed of New York and New England men, with W. Buchanan of New York as president, bas been organized and bougbt eight mines at Hillshoro, including the Dell, El Dorado, Opal and Oregon, covoring four parallel fissure veins for 6000 feet. Development work bas been goiug on in tbis group since last Octoher and on a body of ore. In the El Dorado, the soutb extension of the Richmond lode, tbe vein is showing 12 feet in width and of milling ore, with a sboot of shipping ore 1 foot in width that runs $30 per ton. Manager R. H. Hopper is blocking out the oro preparatory to building a mill.

W. W. Williams of Hillsboro, with New York and New England mon, has organized the Black Peak G. M. Co. to take over the Williams, McVey & Pretter group of tbree mines near Hillsboro, on wbich development work is done. He will block out the ore bodies before putting in machinery.——The Empire G. M. Co., composed of Western men, has bought tho Lilly mines of the West group, west of the Richmond group. This company is doing development work hy sinking and drifting on the ledge, wbich is sbowing up 3 feot of shipping ore. J. Kesser is manager.

OREGON.

Baker County.

A reduction plant will be built at the Imperial mine in the spring, says A. M. Paul of Sumpter, manager.

Tbe 20-stamp mill of tbe E. & E. mine at Bourne has been completed and put in operation.

Enlargement of the Friday working shaft, near Sumpter, is in progress, reports Superintendent Jackson. Tbe sbaft is being made double-compartment. The work has progressed down 50 feet.

Josephine County.

F. H. Osgood of Seattle, Wash., who bought the Hammersley mine in Jump-Off-Joe district, near Grant's Pass, reports work progressing in clearing out the mine. Two pumps, discharging 8000 gallons of water an hour, are lowering the water in the tunnels, drifts and stopes of the Hammersley. The timbering is said to be found in good condition. Tbe mine is equipped with a hoist, 5-stamp mill and concentrator. There are three boilers. The ledge of the Hammersley is 1 to 3 feet in width and tbe values are free-milling.

The Copper Eagle M. Co. is clearing a site preparing to huild a 50-ton smelting and matting plant at the Copper Eagle mine of Galice Creek district, near Grant's Pass. There are four claims (oigbty acres) in tbe Copper Eagle group, and the ledge bas an average width of 4 feet, carrying values in copper and gold, with some silver. Some 300 feet of tunnel have heen driven and one tunnel, in 200 feet, will tap the main lodge at deptb of 250 feet. Tbe property is being developed aud equipped under the mauagement of J. C. Mattison of Galice.

SOUTH DAKOTA.

Lawrence County.

A station is being cut at 800 feet in the shaft of tbe Oro Hondo M. Co. near Kirk, preparatory to drifting. The sbaft has during the last two months opened up free-milling ore.

The Capital City G. M. Co., incorporated last summer for operation on property along Deadwood gulch, near Deadwood, is preparing to put in boisting machinery.

Tbe Homestake cyanide plant No. 2, at Blacktail station, near Lead, on the north end of tbe Homestake property, is baving its tankage capacity increased by 1250 tons. There are five vats in tho plant, each of wbich is to receive an addition of 250 tons to its capacity, says the Black Hills Review. Tbis work is being conducted so as not to interfere witb operations of the plant. The Homestake Co. is increasing its entire cyanide plant capacity. For several months cyanide No. 1 at Lead has heen in course of enlargement. No. 1 will receive six additional vats which will double its capacity. The enlargement of No. 1 is for the purpose of giving more time for leaching of tailings from the mills on that side of tbe property, wbile in connection witb the enlargement of No. 2, there is a plan for the re-arrangement of the mill to permit introduction of a special process for tho treatment of some ores that will not admit of the usual metbod with tbe desired degree of success.

TENNESSEE.

Polk County.

Tbe annual report of the Tennessee C. Co., operating at Ducktown, shows the average price of copper which the company sold to have been 12.98 cents a pound. Tbe directors' report says that with the third furnace and the blowing engine, wbich will be in operation the last nine months of the current year, a production of 14,000,000 pounds of copper may be expected, as against 10,000,000 pounds produced in 1903. The company is to smelt "green" ore this year, which will mean a saving in cost of copper of 1 cent a pouud. The smelter will be enlarged from three to six furnaces, which will ho capable of treating 600,000 tons of ore per annum. The mines at present aro being worked only on day shift. Tho new construction will be extended over a period of eighteen montbs and will he provided for out of earnings.

UTAH.

February in the ore and bullion markot closed on settlements aggregating $1,793,500, notwithstanding heavy storms and bad roads, that at intervals made it impossible for producers of some of tbe camps to reach the bins, says the Salt Lake Tribuno. During tbe same period there was forwarded from the independent copper furnaces of the valley 2,921,642 pounds of coppor bullion, containing gold and silver, and of value of $876,492, without reference to bullion piled up in each of the storobouses. In addition to tho ores reduced at home, thore wore 6000 tous shippod to furnaces witbout the State. At every plant in tbe valley, witb one exception, enlargements aro in progress. The Yampa smolter at Bingham is getting into full operations, and the concentrators at the Utab C. Co., tbo Honerine and tho Ohio Co. are in commission. The output of copper bullion reached the total, from all sources, of 3,651,642 pounds, as comparod witb 2,736,590 pounds for tbe corresponding month of 1903, being as follows:

Bingham Con	742,682
Utah Con	1,206,000
United States	972,960
Total for independent plants	2,921,642
American S. & R	730,000
Total	3,651,642

Tbe total daily tonnage of ore handled by tho smelters was 3200 tons, making aggregate of 88,700 tons of ore reduced to bullion or matte during the month.

Beaver County.

Dovelopment has been resumed at the properties of the Galena M. Co., 3 milos north of tbe O. K. group in Beaver Lake district, near Milford. Ore has heen sbipped netting the company $60 per ton, witb silver-lead values. Tho management is drifting on the ledge at tbo 100-foot levol, and opening bunches of ore, wbich show forty-one ounces silver and 30% lead.

The management of tbe Horn Silver mine of Frisco closed month of February with an output of 1600 tons of ore, divided between lead and copper, and of whicb there were eighty tons of concontrates. Tho lead ore contains 3% coppor, witb some silver. The concentrator at the mino is idle at present, but will be oporated again as soon as supply of milling oro justifies.

Grand County.

In Miners' basin, near Basin, iu the La Sal mountains, the Grouse Mountain M. Co. is arranging for building a 100-ton plant in the spring, says W. R. Wbeat. He bas started work on the mill foundations and will have the machinery in transit at tbe appointed time. The Grouse Mountain mill will be similar to the Interstate cyanide plant in tbo same section, with provisions for increasing the capacity if required. Work in the Grouse Mountain tunnel in Miners' basin has heen progressing all winter. A number of small veins havo been crosscut. —— In Gold basin, where tbo Interstate M. Co. is operating hy tbe erection of a cyanide plant, as woll as developmont in its mines, J. H. Clark, manager, says they are getting out lumber for tbe buildings and making otber preparations for completing the mill in the spring. Two shifts are at work on the Iuterstate mine blocking out ground by tunnels and drifts. It will be brokon down and transportod to the mill by a tramway. Manager Clark says he has 3000 feet of development work done on tbe Interstate, wbereby two veins have been opened up, and from two sources a hody of cyaniding ore is exposod for 450 and 350 feet respectively. The mill will bave a daily capacity of 100 tons. He expocts to havo his mill in oporation by July 1st. The principal part of tho machinery is on the ground. The Interstate M. Co. is composed of Centerville, Ia., men.

Juab County.

Manager M. C. Fox of the Euroka Hill mino of Tintic, noar Eureka, says the mill on the property will bo put in operation again.

The Eureka Hill M. Co. mill at Tintic, near Eureka, will bo put in operation again, says Manager M. C. Fox. Low-grade ore has been blocked out in tho mine since the plant was closed down.

Piute County.

Work of running tho new tunnel on the L. & N. ground of tbe Franklin group, near Marysvale, has started. This tunnel will be driven 3000 feet to tap the ore body ou the othor sido of tbo ridgo from that in which the striko was made.——McCullough & Newton have hought the Cottonwood Spring mineral ground, 2 miles south of Monroe. Tbe work of same parties on tbe Independence mino, in Dry creek, is progressing.

Salt Lake County.

As soon as tho roads are in condition to permit of hauling over tbem, the Dowey mill at Bingham will be started up again. Tho Red Wing Extension and tbe Butler-Liberal mines will send their ore of milling grade to this plant to keep it running steadily. The Dewey is a custom mill and bas aided greatly in the development of tbe smaller mines of the Bingham district, as it bas provided a market for ore that would not pay to ship, and which otherwise would have remained in the ground or on the dumps.

Tbe tunnel of the Old Evergreen mine in Big Cottonwood canyon, near Alta, has heen completed to length of 1100 feot.

W. Ochs of Salt Lake City, who has a bond and lease on tho Rob Roy group of claims, near Bingham, says extonsivo development work will begin on the Rob Roy this spring. It is soutb of and adjoining the Bingham & New Haven ground.——Work will he resumed on the Congor group, near Bingham, this spring. A new pumping plant will be put in, as the mino is filled with water.

Summit County.

The daily output of concentrates from the Kearns-Keith mill at Park City has been increased from twenty to forty tons, by putting on a night shift.

The J. I. C. mine at Park City closod down last week for an indefinite time, says Secretary Wilkinson. Tbe pumps have been taken from the mine, leaving tbe shaft and workings below tho 400-foot level to be filled by water. The shaft is down 600 feet, with considerable development on the 400 and 600-foot levels.

Tooele County.

Manager J. J. Trenam of Salt Lake City, of the Stockton G. M. & M. Co., operating at Stockton, says large bodies of milling ore have been developed, but no steps as yet have been takon towards providing facilities for treatment. The matter of providing water supply has received attention in the meantime.

The Honorine West M. Co. bas been incorporated to develop a group of twenty-three mining claims, covering 200 acros of mineral land, which adjoins that of tho Honerine M. Co. at Stockton on tho west. The Bunker Hill, the Little Jessio and several others of tbe Honerine West's group were formerly worked till water interfered in depth. Tbe ground has been uuwatered hy the Honerine tunnol. It is intondod to tap and explore tbe ledgos hy which tho territory is traversed tbrough a main shaft on Jossie ground. In tbe system of veins within tbo Honerino West are said to be included the Ada, tbe St. Patrick and Hercules on the north of the Honerine, with four cross fissuros on the soutb. The waters in the Jessie's old

workings have receded so far that the management expects to reach the Honeriue tunnel level, 700 feet below, without need of pumps. B. F. Bauer, F. C. Richmond, M. H. Soules, S. V. Ham and E. J. Raddatz are directors.

Washington County.

Two cars of copper bullion were forwarded to market last week by the Dixie smelter, near St. George. This company is employing seventy-five men at its mines and smelter, and the shaft has reached depth of 775 feet.

WASHINGTON.

Okanogan County.

The Ruby mines' tramway at Similkameen, near Loomis, is completed and in operation. The Ruby is sending forty tons to the mill at the Golden Zone mine to be concentrated. The Prize Co., whose mill building is partly up, has its sawmill cutting 3000 to 4000 feet of lumber a day under Superintendent W. Fishburse.

Whatcom County.

Mining companies operating in Mount Baker district, east of Whatcom, will install an aggregate of at least forty-five stamps and a cyanide plant this year. The companies are the Great Excelsior, Mount Bakor and Nooksack. The first-named will put in forty stamps, the Mount Baker five; and the Nooksack will put in a cyanide plant. The American Eaglo is considering a 20-stamp mill. The First Chance mino proposes putting in a 10-stamp mill before the closo of the year and the Red Mountain G. M. Co. has also been considering such a proposition. The Mount Baker & Shuksan M. Co. may begin work on a reduction plant before end of year. It is claimed enough work has been done on its Red Crest group to show that a 10-stamp mill will yield $400 per day in free gold and $600 in concentrates. Some of theso improvements are dependent on railroad extensions into that district. The Mount Baker M. Co., H. Hahn president, has headquarters at Portland, Or.; the Red Mountain Co., C. Campbell manager, has offices at Everett, Wash.

WYOMING.

Carbon County.

J. Ranking has men at work in bis copper mine north of Rawlins. The ore is boiug sacked and shipped to a Denver, Colo., smelter.

FOREIGN.

AUSTRALIA.

Western Australia.

Bewick, Moreing & Co. report the following December output and costs for Western Australian mines of which they are managers:

Cosmopolitan Proprietary.—Cost per ton mining, 7s 4d; cost per ton treatment, 7s 4d; cost per ton general expenses, 1s 2d; total working expenditure, £6388; total development expenditure, £3501; total other capital expenditure (machinery, plant, etc.), £326; total expenditure treating accumulated slimes, £466; total receipts, £20,064.

Bollevue Proprietary.—Cost per ton mining, 12s 3d: cost per ton treatment, 7s 7d; cost per ton general expenses, 2s 1d; total working expenditure, £2225; total development expenditure, £2381; total other capital expenditure (machinery, plant, etc.), £1486; total receipts, £5488.

Sons of Gwalia.—Cost per ton mining, 11s 11d; cost per ton treatment, 5s 11d; cost per ton general expenses, 2s 2d; total working expenditure, £7869; total development expenditure, £1975; total other capital expenditure (machinery, plant, etc.), £820; total receipts, £21,221. Ore treated, 7869 tons; yield, 4136 ounces; tailings cyanided, 4350 tons; yield, 915 ounces, concentrates treated, 116 tons; yield, 574 ounces; total return of gold, 5613 ounces.

Vivien.—Cost per ton mining (including pumping), 9s: cost per ton treatment, 6s 9d; cost per ton genoral expenses, 1s 7d; total working expenditure, £1050; total development expenditure, £401; total other capital expenditure (machinery, plant), £1122; total receipts, £2344.

Lake View Consols.—Output, 8245 tons for 4248 ounces of fine gold; working expenses for month, £11,521 (£1 7s 11d per ton); estimated profit, £3446; expenditure authorized for new plant, £1155.

Oroya-Brownhill.—Working expenses, £9015 (£1 5s 8d per ton); development and capital expenditure, £4757.

Great Fingall.—Working expenditure, £7377 (17s 2d per ton); development and capital expenditure, £6742; receipts, £48,374.

The Ivanboe Gold Co.'s December output and costs were: Battery, 12,223 tons for 4247 ounces gold; sands, 6500 tons for 2164 ounces; slimos, 5652 tons for 2203 ounces; concentrates, 671 tons for 1832 ounces; telluride ore, 247 tons for 396 ounces; total, 12,476 tons for 10,842 ouncos; mining expenditure, 12s 0.9d per ton; reduction, 11s 8.5d per ton; general expense, 2s 2d per tou; total working cost, £1 5s 11.4d per ton, or a total of £16,180; development, £3060; machinery and plant, £400; London and Melbourne expenses (estimated), £425.

At the Queensland Menzies mine at Menzies the new 10-head battery is crushing ore, says the Western Australia Journal. The stamps weigh 1250 pounds each. There is but one mill on the fields with heavier stamps, the Millionaire, at Mount Morgans. The two drifts have been connected.

BRITISH COLUMBIA.

Boundary District.

The management of the Granby is working on plans for an eight-furnace addition to the Granby smelter at Grand Forks, which would increase its capacity from 2100 tons to 4800 tons a day, says J. P. Graves, manager of the Granby Con. M., S. & P. Co. H. N. Caler, assistant manager, has completed the surveys.

In No. 4 tunnel of the Granby mines at Phœnix, which was started last month, work is proceeding steadily, and the face is in 160 feet. The tunnel, which is being driven on a 5% incline, is expected to reach the 300-foot level of the Old Ironsides mine.——With plenty of cars available, ore shipments from the Athelstan mine, in Wellington camp, are heavier than previously. Twenty horses are used in bauling the ore from the mine to the Winnipeg spur, a distance of 1 mile, whonce shipments are made to both the Granby and Greenwood smelters. G. H. Collins is superintendent, with twenty-five men at work.

G. W. Rumberger and T. Rodorick of Phœnix have bought one-half interest in the Summit, Hopeful and Mayflower claims in Summit camp. D. McInnis, also of Phœnix, owns the other half interest in the group. Work will be started this month.

East Kootenay District.

Fort Steele reports say developments will be renewed this year on Wild Horse creek. Since the English companios abandoned operations the ground has been worked by a number of Chinese with success. It has been decided by the Bong Quong Placer Co. to work the ground abandoned by the Thompson Co. on the Invicta claim. The bank upon whicb it is proposed to start is 100 feet high, and most of the pay is said to be on the bedrock. An upper line of sluices will be put in to run off the surface, with a fall and a dump that will cbeapon the work. This work will occupy nearly two years, after which the line of sluices will be lowered to work out the bottom of the pit. Fifty-two thousand feet of lumber has been bought to carry out the improvements on the Invicta claim.

The annual report of the Crow's Nest Pass Coal Co., Ltd., shows progress made during the year in the permanent development of the company's properties at Coal Creek, Michel and Morrissey. It was not until Feb. 1, 1904, that the mines at Coal Creek, wbich had been damaged by the explosion of May 22, 1902, were fully restored. During the year nearly $1,000,000 have been spent on plant, development and machinery, adding to the efficiency and capacity of the mines and of the operating and coking plants.—— Coal produced during 1903 amounted to 661,118 tons, as comparod with 442,049 tons in 1902. Of this tonnage 279,334 were sent to the coke ovens, and produced 167,989 tons of coke, as against 121,000 tons made in 1902, while the balance, 381,784 tous (with the exception of 22,833 tons consumed under the boilers) were disposed of as merchantable coal.—— The mines opened during the year were: At Coal Creek three, at Michel two and at Morrissey two.—— Construction of 492 ovens was started during 1903, being 252 at Michel and 240 at Morrissey. Of these, 198 at Michel and 148 at Morrissey were completed, bringing the total number of finished ovens up to 982. The remainder of the ovens will be completed this spring.—— Net profits as a result of the year's operations amounted to $310,492.28.——It has been found desirable to acquire the branch railroad between the main line of the Crow's Nest Southern at Morrissey Junction and the company's mines, a length of 5 miles, for which a charter was obtained from the British Columbia Legislature last year. The holdings of the company cover 250,000 acres of coal and timber lands. The company has installed three water-works systems, besides electric lighting plants and a telephone system. T. R. Stocket is manager.

Nelson District.

Developments on the Gold Cup mino at Ymir are progressing. The winze has been sunk to 65 feet below the 125-foot level. This winze is in oro, the vein averaging 4 feet in width, with shoot of high-grade ore. The adit which taps the shaft at the 125-foot level is 260 feet long, and is in ore for greater part of distance. The ore varies in width from 6 inches to 6 feet, and contains bunches of telluride. The experimental mill has made a trial run of eighty-five tons with satisfactory results. The ore is a white quartz, impregnated with iron oxides and copper sulphides. These are saved on concentrating tables. Wollle & Dawault, who have the property under bond, propose building a larger mill, to be driven by water power from the Salmon river, on which water rights bave been obtained. They will also put up au aerial tramway.

West Kootenay District.

Placing of machinery at the Silver Cup reduction works, near Forguson, is going ahead. The electric plant which will supply motive power and light will be ready for operation next week. Tho outdoor work, except stretching of wires, is done.

The Great Northern Mines, Ltd., at Poplar Creek, will increase its milling capacity to 100 stamps this summer.

KOREA.

Seoul reports say work continues in the mines operated by American companies at Unsan and Mia Bong. Assurances have been given the State Dopartment at Washington that the invading troops will not interfere with the miners. However, the families of the miners and somo of the men have witbdrawn.

MEXICO.

Chihuahua.

L. Davis of El Paso, Texas, intorested in the Homestead mine near Montezuma, says they are preparing to put in milling machinery and otber improvements.

A. G. Varney is developing tbo Igualdo lead-silver mine at Buena Vista, in Santa Barbara district. He is also working the Bronze mine, near the Cuadras mines of the Guggenbeims. The Bronze carries gold values.

The Tecolotes M. Co. (Guggenheims) is pushing the work of changing its power from gas to electric at its mill at Santa Barbara. The gas power is to be used to generate olectricity.

F. Howard and E. M. Parrish of Parral have bought a group of properties in the Guazapares district, in the silver-gold belt of western Chihuahua, for St. Louis, Mo., men for $400,000 Mexican. Operations will start this week under the management of J. R. Harbottle, manager of tbe Guazapares M. & M. Co. The mines taken over are the Ptacmk and others. Tho ores are silver and silver-gold.

Durango.

A company of wbich Hildebrandt & Co. of Durango are principal owners is working 200 men, developing the Cobre mines, 3 miles below Bacis.——Cushing & Walkup, owners of the La Trinidad mine, near Bacis, have built a 25-ton concentrating plant for experimental purposes. L. Walkup is manager and T. Breidenbacb superintendent.

Jalisco.

A reduction plant will he built by W. Wheeler and J. B. Mulhall at Amatlan de Canas.

Lower California.

C. Dudet of San Diego, Cal., manager of the French Co. of the City of Mexico, which has a concession on Cedros island off the west coast, reports work progressing. They have had surveyors, miners and prospectors working on the island for the past four months, and he says they have made several discoveries of gold and copper. He says Cedros island is a promising field and his company will put in machinery and soveral bundred men at work.

G. Gerger, J. Johnson, J. W. Beatty, W. R. Nicholson and R. F. Hartley of Philadelpbia, Pa., owners of the Esperanza mines on Cedros island, who have been on a tour of inspection, are preparing to put in improvements at the mines. There aro fifty men employed at present.

Nuevo Leon.

At La Mina de Agua, near Monterey, E. L. Swazy et al. of Monterey are preparing to put in pumping and other machinery.

Sonora.

Cananea reports say Los Amigos group of mines, near Ures, have been sold to M. P. Wright.

J. L. Shephord, president of the Tri-Metallic M. Co., which is developing a group near Tonichi, near the Yaqui river, says work is progressing favorably. The shaft on the ledge is down 150 feet and the tunnel is in 300 feet, running to cut the ledge at depth of 1000 feet.

G. B. Earnshaw, manager of the Zubiate M. Co., oporating near La Colorada, says the reduction plant at the mine is in course of dismantling, to put in another process, that herotofore in operation having failed to secure all the values in tho ores. A set of revolving roasters to chloridize the ores will be put in, also two dry pulverizers, and from the roasters tho pulp will go to the mill. D. R. Oliver of San Francisco, Cal., is president.

PERU.

Tbe Government of Peru has withdrawn saltpeter aud horax deposits from acquisition by private persons by denouncement, writes I. B. Dudley, United States Minister at Lima.

Personal.

W. H. KNOWLES has returned to Denver, Colo., from a trip to Mexico.

L. A. McINTOSH of Chico, Cal., is in Sau Francisco, Cal., on miniug business.

WM. SHARWOOD has retired as superinteudent of the Soulsby mine at Soulsbyville, Cal.

S. T. ELLIOT of the Smuggler-Union mine at Telluride, Colo., is in San Francisco, Cal.

H. F. GEAR is superintendent of the May Day mino, uear Eureka, Utah, vice Garnick, deceased.

J. C. DOBBINS has resigned as superintendent of the Whipsaw mine near Briggs, Yavapai county, Ariz.

A. GUIONNEAU of Denver, Colo., is erecting a cyanide plant for Dover, Frank & Co. at Grover, N. C.

C. E. ANDERSON, formerly of Aspen, Colo., is superintendent of the Bassick mine at Quorida, Colo.

E. L. LABADIE has resigned as superintendent of the Green Mountain mine, near Grass Valley, Cal.

E. K. SMART of Grass Valloy, Cal., interested in Nevada county mines, is in San Francisco, Cal., on business.

W. CRANZ, manager of the West Mexican Coast Oil Co., has returued after two years' absence to Nogales, Ariz.

W. OCHS, wbo has been in Boston, Mass., on mining business, returned to Salt Lake City, Utah, last week.

J. H. KINKEAD of Virginia City, Nev., superintendent of the Kentuck mine, is in San Francisco, Cal., on business.

J. F. GROESBECK has returned to Salt Lake City, Utah, from a trip on mining business to Peru, South America.

H. M. LOVE of Cbicago, Ill., is in Arizona on business connected with the Vulture mine near Wickenburg, Ariz.

J. S. LAWTON, superintendent of the Sheha M. Co., near Ibapah, Utah, is in Chicago, Ill., on company business.

W. C. MINGER has returned to Denver, Colo., from California and will open an assay office at 1759 Arapahoo street.

M. B. KERR, superintendent of the Jumper mines near Stent, Tuolumne county, Cal., is in San Francisco, Cal.

S. K. THORNTON, superintendent of the Shenandoah mine near Plymouth, Amador county, Cal., is in San Francisco, Cal.

W. H. CUSHING, president of the Stockton Hill M. Co., is at the company's mines at Stocktou Hill, Mohave Co., Ariz.

W. A. WILSON of Salt Lake City, Utah, is in Wood River miniug district, Blaine county, Idaho, on mining business.

M. CHRISTOPHERSON returned to Salt Lake City, Utah, last week from examination of nickel mines on the coast of Norway.

H. H. SMITH, part owner of the Great West mine in Minnesota district, near Chloride, Ariz., is in Pomona, Cal., on business.

G. C. GILL, president of the Shannon C. Co., and J. W. Hazen, treasurer of the same company, are at Clifton, Ariz., from the East.

B. F. PYLE, manager of the Jenny Creek mine, Gilpin county, Colo., has returned to Denver, Colo., from Pittsburg, Pa.

M. AVERILL is superintendent of the Douglass group of mines of the Pan-Tonopah M. Co., at Douglass, Esmeralda county, Nev.

J. MCGREGOR of Salt Lake City, Utah, manager of the Pinion Ridge M. Co. of Park City, Utah, is in the East on company business.

J. DERN of Salt Lake City, Utah, president of the Con. Mercur G. M. Co., returned there last week from a trip to Mexico and Cuba.

J. R. DUFFIELD of Tonopah, Nev., has boen appointed superintendent of the Goldfield M. Co. properties at Goldfield, near Tonopah, Nov.

G. W. BARTCH of Salt Lake City, Utah, president of the Sheba G. M. Co., operat-

ing in Humboldt county, Nevada, is at the company's mioes.

F. WILLIAMS of Ashland, Or., has been appointed assistant superintendent of the Oregon mineral exhihit at the Louisiana Purchase Exposition.

SUPERINTENDENT R. WINTERS of the Boston & Idaho Dredge Co., at Idaho City, Boise Co., Idaho, has gone to San Fraocisco, Cal., on busioess.

MANAGER C. DUDET of gold and copper mines on Cedros island, off coast of Lower California, has returned to San Diego, Cal., from the mioes.

E. A. HARDY, assistant manager of the New York & Honduras Rosario M. Co., has gone to the mines at Sao Juancito, Honduras, Central America.

H. L. HUSTON is superiotendent of the Soulsby mine at Soulshyville, Cal., vice W. Sharwood, resigned, and J. L. Cox has been engaged as foreman.

JOHN HOWELL, late manager of the Broken Hill Proprietary mines, Broken Hill, Australia, will proceed from San Francisco, Cal., to St. Louis, Mo.

L. MORRISON of Salt Lake City, Utah, has gooe to the Indian Queeo property, near Milford, in Beaver county, to take charge of development work.

W. Y. WILLIAMS, superintendent of the Granby mines at Phœnix., B. C., returned last week from a two months' tour of the United States and Mexico.

J. L. SHEPHERD, president of the Tri-Metallic M. Co., returned to Nogales, Ariz., last week from the company's mines, near Tonichi, Sonora, Mex.

SMELTER SUPERINTENDENT A. B. W. HODGES of the Granby C. Co. at Grand Forks, B. C., returned last week from a business trip to Montreal, Canada.

E. M. RAY of Parral, Chihuahua, Mexico, manager of the Perros Bravos mines, in Saota Barbara district, Chihuahua, has gone to Alaska on mining husiness.

E. M. WILSON is superintendent of placer mining operations of the United G. & C. Co. of Chicago, Ill., operating the Spring Valley mines, near Oroville, Cal.

SUPERINTENDENT W. E. SHARON. of the Crown Point, Belcher aod other mines, at Virginia City, Nev., returned there last week from San Francisco, Cal.

D. H. PEERY AND C. K. MCCORNICK of Salt Lake City, Utah, are at the Gold Roads mines and mill, near Acme, Mohave county, Ariz., making mine examinations.

O. BERGSTROM, for eleven years with the Colorado Smelting Co., is smelter superintendent for the Cataract C. M. Co., near Basin, Jefferson county, Mont.

H. T. POWER, manager of the Hidden Treasure-Mountain Gate drift mines on the Forest Hill divido, near Michigan Bluff, Placer county, Cal., is in San Francisco, Cal.

BURDETTE MOODY, formerly chief engineer for the Homestake M. Co. at Load, S. D., is superintendent of the California Gold King M. Co. at Picacho, San Diego county, Cal.

G. H. MARTIN, presideot of the Hanoa M. Co., is at Lake City, Hinsdale county, Colo., from Chicago, Ill., and has resumed personal control of matters at the mine aod mill.

L. KILLEEN, assistant manager of the Bulene C. Co., operating at Copete, Sonora, Mex., returned to Phœoix, Ariz., last week from a trip to Copete and Hermosillo, Sonora.

F. J. NAGEL, assayer for the Bassick G. M. Co., Querida, Colo., has resigned to accept a similar position with the New York & Honduras Rosario M. Co., San Juancito, Hooduras, Central America.

E. J. ROBERTS has resigned as Reno, Nev., manager for the Montana-Tonopah M. Co., and has gone to Guadalajara, Mexico, to examine mines for Eastern men. From there he will go to Central and South America for the same parties.

G. J. BANCROFT JR., consulting mining engineer, has hecome associated with the Engineering Company of America, aod will take charge of their dopartment of mine managemeot. His headquarters will be in Denver, Colo.

Commercial Paragraphs.

A NEW Durkeo olectric drill has heen installed on the London Twist M. & M. Co.'s property at Alma, Colo.

C. M. FUELLER, 1752 California St., Denver, Colo., reports ronowed activity in his line of ore testing. Besides a large amount of work coming in, he has had inquiries for three first-class cyanide men to take positions, hut has only heon able to fill two of the positions.

THE Sullivan Machinery Co., through their Denver, Colo., hranch, report sale of one 20x20x12½x20 Sullivan straight line air compressor to the Montana Ore Producing Co., Butte, Mont.

THE Colorado Iron Works Co., Denver, Colo., have moved their downtown office from 721 Seventeenth street, to the McPhee building, 515 Seventeenth street. The floor space they now have is larger than former space, and hesides office space they will use a portion of same for display purposes.

ON March 1st a change was made in the management of The Mine & Smelter Supply Co., Denver, Colo., as the interests of J. S. and R. J. Cary have heen taken over by their former associates—J. and A. H. Seep and J. H. Fennessy. The new officers and directors of the compaoy are as follows: J. H. Fennessy, presideot and treasurer; A. H. Seep, vice-presideot; H. E. Fiske, secretary; C. N. Tibbitts, general manager. J. Seep is a director. The business of the company will be carried oo aloog the same lines as heretofore. There will be no change in the branch houses. J. S. and R. J. Cary have retired from this line of busioess and will give their attention to development of their ranch and coal lands in Routt county, Colorado, which are in coal tracts which will bo opened up io that county by the entranco of the Moffat Railroad.

Trade Treatises.

Of standard size, Catalogue No. 31 of Woodin & Little, 312 Market street, San Francisco, Cal., shows a variety of pumps for hand, windmill, irrigating, steam, fire aod power purposes, with their fittings. Gasoline engines and horse powers for pumps, and hydraulic rams are also illustrated.

Catalogue No. 16 of Union marine engines made by tho Union Gas Eogino Co., of San Francisco, Cal., is at hand, with numerous illustratioos of launches, tugs and schooners, large and small, equipped with Union engines of from 4 H. P. to 85 H. P. Cuts of engines, hoists and ships' windlasses are also showo. The vessels include both single and twio-screw propeller types, and a variety of craft for hoth business and pleasure.

Latest Market Reports.

SAN FRANCISCO, March 11, 1904.

METALS.

SILVER.—Per oz., Troy: London, 26 7/16d (standard ounce, 925 fine); New York, bar silver, 57⅜c, refined (1000 fine): San Francisco, 57⅜c; Mexican dollars, 46½@47½c San Francisco, 44½c New York.

COPPER. — New York: Standard, $12.50; Lake, 1 to 3 casks, $12.50; Electrolytic, 1 to 3 casks, $12.62½; Casting, 1 to 3 casks, $12.37½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 15s spot per ton.

There appears to be little confidence in higher market for copper. A New York commercial paper says "the stocks of standard copper in Europe are light and the statistics show that the consumption during the past month has heen very good. The heavy shipments during the past two months have possibly in a measure satisfied the immediate requirements of that trade, though reports emanating from Europe do not show that consumers are as anxious to place orders as they were a short time ago." Following are the exports of copper for February in long tons: United Kingdom 4883, France 2871, Germany 1628, Holland 4864, Belgium 120, Austria 1261, Italy 948, Russia 165, sundries 102, a total of 16,842.

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4⅜c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £12 ₱ long ton.

SPELTER.—New York, $5.10; St. Louis, $5.00; London, £22 5s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.00@28.40; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 31c; less, 32c; har tin, ₱ lb., 32½@35c. London, £123 15s spot.

PLATINUM. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum waro, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ₱ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumhers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.15@2.40 ₱ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ₱ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.60 @13.85; gray forge, $12.60; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 00@14 25
Northern 2	13 50@13 75
Northern 3	13 00@13 25
Southern 1	13 85@14 35
Southern 2	13 35@13 85
Southern 3	12 85@13 35
Forge	12 10@12 60
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 40@ 1 45
Bars, stoel	1 46@ 1 46
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 50@13 00
No. 1 cast, net ton	11 00@12 00
Iron rails	17 00@17 50
Car wheels	14 00@15 00
Cast borings	4 50@ 5 00
Turnings	8 00@ 9 00

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; Sao Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one too, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kogs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11¼c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, johbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¼@5¾c; chloride of ..me, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumherland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Aothracite, $14.00. Coke, $10.50 per ton in hulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, hoiled, hhl., 49c; cs., 54c; raw, bhl., 47c; cs., 52c; Lucol oil boiled, bhl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in hulk, 14c; Mineral Seal, iron bbls., 19c; wooden hhls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bhls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—$2.00 ₱ lb.

CHROMIUM.—90% aod over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 75c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING MARCH 1, 1904.

753,652.—DECORTICATING MACHINE—W. H. Allison, S. F.
753,532.—BOOTHEEL — F. F. Anderson, Oakland, Cal.
753,655.—SEAM RIPPER—M. J. Bacon, S. F.
753,465.—SPOON—B. H. Bennetts, Tacoma, Wash.
753,468.—PLOW—G. L. Bradley, Pataha, Wash.
753,541.—WINDMILL—W. A. Butler, S. F.
753,825.—OIL BURNER—L. E. Coleman, Santa Ana, Cal.
753,549.—BRAKE LEVER—R. W. Cooke, Condon, Or.
753,672.—CIGAR CUTTER AND LIGHTER—Coombs & O'Connell, S. F.
753,693.—NURSING APPLIANCE—A. S. Dixon, Los Angeles, Cal.
753,479.—WINDOW—A. F. Enquist, S. F.
753,790.—ROTARY ENGINE — A. F. Ford, Colfax, Wash.
753,565.—SAW FILING GAGE—S. J. Galloway, Hillsboro, Or.
753,697.—MOWING MACHINE—J. T. Gillaspy, Union, Or.
753,828.—PUMP—J. Hahn, Los Angeles, Cal.
753,489.—WRENCH—A. Heberer, Alameda, Cal.
753,493.—TELEPHONE—S. C. Houghton, S. F.
753,709.—BASE FOR POLES—G. H. Jones, Salem, Or.
753,716.—CARBON RESISTANCE — G. I. Leonard, Pasadena, Cal.
753,722.—FISH CLEANING MACHINE — Manula & Carlson, Astoria, Or.
753,602.—STAMP MILL—W. A. Merralls, S. F.
753,604.—MATRIX — W. G. Middleton, Phœnix, Ariz.
753,419.—BEVEL—W. V. Morrow, Los Angeles, Cal.
753,301.—LOCK NUT—F. Ohiols, Winnemucca, Nev.
753,427.—VALVE — Parker & Castleberg, Leavenworth, Wash.
753,737.—FRUIT DRIER — A. A. Quarnberg, Vancouver, Wash.
753,529.—TOILET KIT—Anna M. Schneider, Sacramento, Cal.
753,529.—DENTAL BRIDGE — F. Teague, Oakland, Cal.
753,763.—ROTARY ENGINE—F. P. and B. F. Uhrig, St. Johns, Or.
753,771.—PUMP—J. C. Whitmer, Lordsburg, Cal.
753,458.—DRAWING INSTRUMENT—J. C. Willmon, Los Angeles, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

READING STAND.—No. 752,977. Feb. 23, 1904. A. Howe, Olema, Cal. This invention consists of a frame or rack having turnable supports at the bottom upon which the book or paper may rest, extensions to either one or hoth sides removably attached, so as to regulate the width of the rack to the book or paper, a lamp or candle bracket with attachments by which it may be adjusted upon either side of the rack or its extensions for convenience, and means for supporting the rack in various positions and angles either hy specially prepared stands or hy means of attachment to beds, chairs or otber furniture.

SEAM RIPPERS.—No. 753,655. March 1, 1904. M. J. Bacon, San Francisco, Cal. This invention relates to improvements in devices for severing the thread or stitching by which the meeting surfaces of two parts of a fabric are united to form a seam. Its chief object is to provide a simple practical tool for rapidly accomplishing shis work and one which will require but little tkill and occasion but a minimum amount of fatigue on the part of the operator to manipulate

MINING AND SCIENTIFIC PRESS

Whole No. 2278.—VOLUME LXXXVIII. Number 12. SAN FRANCISCO, CAL., SATURDAY, MARCH 19, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Economy in Construction.

In designing head frames the main objects to be attained are strength and economy of materials. In the ordinary construction the strength of timbers used is generally much greater than actually required, but the fault is not a bad one, perhaps. Better too strong and massive than too weak. An instance of what may be done in the way of economical construction is found at many of the zinc-lead mines of southwest Missouri, where the miners build a frame of 2x8 plank. The corners are formed of two planks spiked together at right angles, the edge of one plank overlapping the other. The base of the frame is square, the corners sloping inward to form a smaller square at the top, where the sheave is set on square timbers 6x8 inches—the smaller dimensions upward. Crossed 2x6 plank, spiked to the corners, give the necessary stiffness. Often a head frame like that here described is seen perched upon a high sub-structure, or trestle, of similarly light and apparently flimsy construction, yet, notwithstanding the insecure appearance of the frames of this design, thousands of tons of ore are hoisted from the mines, the load weighing 500 to 1000 pounds. It is claimed, and with reason, too, that expensive frames are usually inadvisable, as the ore deposits do not extend to great depth, not over 300 feet, and the most of them are within 150 feet of the surface, and as the deposits are exhausted with comparative frequency and operations must be resumed elsewhere, expensive head construction is not justified. The striking feature of the light, quickly built frames, is that "they do the work," which is all that could be desired of them. They are easily removable to another site, or if the timber is unsuited to this purpose of reconstruction, a portion of it at least can be used for braces and the balance for lagging, for shoveling boards, and in other uses about the mine.

In the mining regions of the Pacific and Rocky mountain States, however, the miners have little faith in frail constructions, and their head frames are noticeably massive and well constructed, and, as previously stated, the strength of materials used is usually much greater than is necessary. Thus, a sound yellow pine timber, 12x12 inches, 20 feet in length, supported horizontally at the ends, will sustain a weight in the middle of about twenty tons. Timbers of these dimensions are frequently seen in head frames, and, as they stand in a vertical position or one approaching the vertical, the stresses are in the nature of compression, rather than of transverse strain, to which the main members of a head frame are subjected. A frame composed of four massive timbers and tied together by braces and crossties to minimize vibration, is capable ordinarily of sustaining from 40 to 100 times the load it will ever be called upon to carry. In many frames of massive construction there can be discovered incongruities in construction, such, for instance, as a frame capable of sustaining 200 tons, with the back braces within the line of strain resulting from the lifting of the load, when the tendency of the pull of the engine is to overturn the entire structure; or a massive frame with weak and insufficient support for the sheave. One mine superintendent known to the writer built a heavy four-post frame, each post standing vertical, joined at the tops with caps and ties, and otherwise strengthened by diagonal braces; but the frame had no back-angle brace, the designer depending wholly upon the weight of the structure to hold it in place. It is in successful operation still, but a better frame might have been built with less than one-half the material.

Novel Style of Head Frame.

The accompanying engraving is that of a strong, well-built, four-post frame in El Dorado county, Cal., in which less material was used than is generally found in structures of this type. The two back members are also the braces which resist the thrust due to the pull of the engine and weight of the load. Instead of crossing angle pieces to stiffen the frame, sections of old mine cable have been employed for this purpose and the tensile strains are all taken by these. The pieces of cable are run through eye bolts, threaded for adjustment to the proper tension. The guides extend from the top of the frame vertically downward into the mine. A cross-head is in use, being secured by a clip about 6 feet above the bale of the bucket. This prevents the bucket from swinging in the shaft. A hole through the upper and lower cross-piece of the cross-head, through which the cable passes, allows the bucket to go to the bottom of the shaft when sinking, the cross-head resting upon lugs temporarily nailed to the guides. When the bucket is hoisted, a clip on the cable catches the cross-head and carries it above the bucket to the surface, as shown. The shaft is also supplied with a railing about the collar to prevent accident—a precaution too often neglected—and it also has a door, or apron, fixed on hinges and balanced by counterweight that buckets may be dumped without danger to men working below. The bucket is dumped by means of a trip rope and hook, the load falling on the inclined surface of the door from which it runs downward into the car placed to receive it. The entire construction is on scientific lines, is cheap, safe, common-sense and a type of the better class of woodeu head frame construction. When building, it was the intention, when sinking was discontinued, to build an ore bin in front of the frame.

THE several engineering societies having headquarters in New York City having decided to accept the offer of Andrew Carnegie to build a suitable building for the joint use of the societies, Mr. Carnegie has placed $1,500,000 at the disposal of the joint committee to be used for this purpose. The site chosen is between Fifth and Sixth avenues, and on West Thirty-ninth and West Fortieth streets. The societies benefited by this donation of the noted steel manufacturer are The American Institute of Mining Engineers, American Society of Mechanical Engineers, American Institute of Mechanical Engineers and the Engineers' Club of New York City.

Home Run Mill, Groom Creek, Yavapai Co., Ariz.

(See Page 196.)

Monte Cristo Mill, Groom Creek, Yavapai Co., Ariz.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:
NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MARCH 19, 1904.

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A NOTABLE feature of the report of the Mine Commissioner of Colorado for the year 1903 is the large increase in zinc output, nearly $2,000,000, due to the success of the electro-magnetic separator. For years in the mining regions of the world the complex ores of lead, iron and copper, which also contained zinc, have remained to a great extent in the mines or have accumulated to the amount of hundreds of thousands of tons on the dumps throughout the mining regions, the zinc being an undesirable constituent of the ores upon which reduction works placed a penalty for excess over a stated percentage. The magnetic separator has changed this and ores containing zinc are now successfully treated, the zinc becoming a separate and valuable product. The more extensive introduction of machines of the class will not only largely increase the zinc output, but also make available a class of ore which heretofore has been avoided, as unremunerative and undesirable.

THE strike of great veins and mineral zones is merely an incident in their occurrence. The veins of the Rand in South Africa strike nearly east-west. The gold belt of California has a northwesterly trend, while numerous single veins and vein systems within it strike north-south, north-east and even east-west. The general course of mineral zones is usually observed to be parallel to the mountain system to the greater movements of which it owes its existence. Isolated veins or mineral zones will be found to have a strike due to local conditions. The dip as well as the strike is due to geological conditions which in no manner have any influence upon the amount or value of the ore deposition, although the dip may have a direct bearing upon the economy of ore extraction. There are those who have endeavored to formulate a theory which may be used to pre-determine the location of ore shoots, or the direction of their trend along the vein, but these are falacies so far as any rule thus far discovered can be applied.

Where Technical Education Counts.

In no pursuit in life is the technically educated young man afforded better opportunities to apply the knowledge gained in the University, or wherever he may have acquired it, than in the industry of mining and metallurgy. If two young men start for themselves upon a career in mine, mill or smelter, the one with several years' practical experience at one place under direction, the other with little or no practical experience, but with a technical education as a foundation, the race will be at first altogether in favor of the former; but not for long, for within a few months the advantages possessed by the latter, who is untrammeled by preconceived and possibly erroneous ideas, and has not fallen into a groove, as it were, is enabled to see clearly and to adapt some method, known to him in theory, to a condition which for the first time confronts him in practice. During the first year of the race the student gradually overtakes his more experienced neighbor, and during the second year the former has become the better and more valuable man. There are practical men who have had good opportunity at some mine, and they have mastered its every detail; but should it become necessary to go elsewhere, after years of service at the one place and with little or no knowledge of the conditions and methods at some other, the practical man, thrown now on his own resources, must go back and "learn it all over again" in a new and, to him, untried and unheard of way. He attempts the old and peculiar schemes used so successfully at home and finds to his surprise that they are inapplicable to the new condition. Here the young man with technical knowledge, but with fewer years of experience, forges ahead. He promptly recognizes a condition of which he has heard or read, and he knows the remedy to apply with the best chance for success. Should the first attempt fail, he tries another method, for he is versatile and is not limited to the one method known only to those whose experience has confined them to the rut. In metallurgy particularly is this true, for the diversity of ores is much greater than the peculiarities of mines. If a man once learns the principles of mining and learns them properly he can apply this knowledge anywhere in the world, but the millman and smelter requires a more diversified knowledge than the man who removes the ore from the vein or deposit. The miner can take out the ore, even if he does not do it in the most practical, up-to-date and economical manner. His shortcomings may be overlooked by the manager or owner, but the millman is expected to recover the value from the ore sent to the mill, and if he is unable to do it he must step aside to make room for some one who can. If ores were treated in the same manner everywhere there would be no difficulty and all millmen would be good men.

The Reward of Optimism.

In many oil fields a common experience has shown that often the early operators were too much inclined to discount the probability of a wider extent of the oil-yielding formation than that developed, and the known limits have been defined by well-known bore holes for long periods of time. Later others, either more optimistic or less experienced, have sunk a well far beyond the recognized limit of the field and "struck oil." At once the value of the find is appreciated and a renewed impetus is given the industry in that direction. An instance in point is the recent striking of oil in a bore hole west of the village of Coalinga, Cal., where the oil stratum was cut at 1100 feet from the surface, the well having a natural flow. This is said to extend the known limits of this field 1½ mile to the southward from where it had been established. Oil men, like miners, are sometimes controlled by prejudice, and nothing places a greater restriction upon the development of a section than the notion that there is nothing there worth seeking for.

Another instance is noted in northern Santa Barbara county, Cal., where a company had a good flow of 20° oil at a depth of 2000 feet. Another company operating in the vicinity struck what was evidently the same sand at about the same depth, but concluded to bore deeper in hope of finding improved conditions, and as a result at 3000 feet they struck a flowing well of 28° oil. There are cases where the geological conditions are such that it is known to be useless to search in a certain region for some particular mineral, such as beds of coal or oil sands in granite or greenstone schist, but often there exists an uncertainty, and it is then that the element of uncertainty should suggest that a trial at least be made to determine what conditions do exist.

Difficulties in Cyaniding.

The chemistry of the cyanide process is well understood by those who have made it a specialty, although there still remain differences of opinion on minor points. If an ore is amenable to the process the proposition is worked out along a line of well-known experiments, both in the laboratory and in the plant. In some instances the dissolution of the gold is accelerated by the addition of certain chemicals, or by the introduction of air. Some of these ideas have been the subjects of patent. On the whole the difficulties of dissolving the gold and securing a satisfactory extraction are not numerous, but the mechanical manipulation of the various materials handled still presents unsolved problems. The great diversity of practice and the variable results obtained are evidence of this. At one plant impalpable slimes are treated satisfactorily, at another little success results upon what is assumed to be similar material. Agitation, either mechanically or by means of compressed air, does not give equally satisfactory results at different plants often in the same region. One operator mixes slimes and sands and announces success; another tries the scheme and declares it a failure. Numerous cyanide operators declare that agitation and filter pressing are means to the attainment of success in treatment of slimes. Others maintain that flocculation of the slimes and decantation of the clarified solution are the only pathway to the desired end. Some favor dry crushing, others say it is unsatisfactory and more expensive than wet crushing. There are numerous other subjects of contention and some of uncertainty. Still the process goes on and is improved from time to time, though these betterments are mostly of a mechanical kind. The present practice, as compared with that of the early years of cyaniding, cause one to wonder that we could have been so stupid, but the cyanide process is not unlike other processes of the past and newer processes to come. Each successful process in ore treatment is the result of increasing knowledge due to scientific experiment and intelligent application of the result to the operation of the plant on a commercial scale. All of these variations in the operation of the process merely represent the widely varying condition found in the ores treated, as well as the individual experience of the operators, and also, possibly, some prejudice. The principal difficulty in the process is that of precipitation. If the gold in a solution does not precipitate readily the cyanide operator finds more difficulties to overcome than are found in all of the balance of the process. Zinc in various forms, charcoal and electricity each are used in the process at various places, but the cyanide expert is still in search of a better method.

THE mining laws of the United States are not without uniformity, and Land Department decisions, while having force as precedents, do not supersede the statutory laws, nor the decision of the courts. States, and even mining districts, may make laws governing the acquisition and holding of mining claims, but these laws are void if in conflict with the federal statutes. It would, no doubt, be an advantage to have uniformity of law throughout the mining States, instead of a variety of laws representing the opinions of various powers in the several States, and in this respect Mexican mining laws are superior to those of the United States, as they are uniform throughout that republic, and they embody many things which might be adopted in the United States to the advantage of the mining country throughout the West, not excepting the square location and abolishment of the extralateral right.

CONCENTRATES.

THE mineral from Pollasky, Cal., is augite andesite. It contains no valuable mineral, though there is in it abundant magnetite in grains.

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IN AUSTRALIA the wood of the red gum, a variety of eucalyptus, is used for battery guides, and for this purpose is said to be superior to any other wood thus far tried for that purpose.

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LARGE spur wheels should be provided with a metal sheeting or an iron rail to protect workmen who are obliged to pass. Such preventives of accident are inexpensive and worth far more than they cost.

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THE iron mines of Tepustette are on the peninsula of Lower California, near San Quentin. The ore is chiefly hematite and is high grade in iron. No large amount of development has been done. The outcrop is large. The deposit is near the sea.

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BITUMINOUS materials are soluble in chloroform, turpentine and carbon di-sulphide, and not in water. By this means the presence of bituminous material may be distinguished from organic substances which it somewhat resembles in appearance.

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A CONVENIENT method of determining whether crude petroleum contains sand or not is to pour the oil on one end of a sheet of glass, and holding it at an angle allow the oil to run over the plate, when grains of sand, if present, will be plainly visible.

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THE mineral specimens from Forest Hill, Cal., are: No. 1, serpentine; No. 2, also serpentine, but sheared (essentially talc schist); No. 3, diorite, partly altered; No. 4 is schist altered from No. 3. The serpentine may contain gold, but none is visible in the specimen.

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THE cheapest engineer is not always he who receives the least pay, but he who understands his craft and knows how to economize on fuel and steam and who gives the machinery in his charge the proper attention. The cheap man may prove a most expensive one.

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THE mineral specimen said to come from Siam is cassiterite, the oxide of tin. The specimen appears to be nearly pure cassiterite, there being only a little iron oxide present. In this specimen the mineral occurs as an aggregate of crystals, many of which are translucent.

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THE turbine wheel may often be employed with satisfactory results where a large volume of water is available under comparatively low head, and utilized to run mills and other machinery where a high head, sufficient to supply the necessary power by means of an impact wheel, is unattainable.

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FROST AND ICE may usually be removed from pipes by pouring alcohol in the pipe. Pipes frequently choke up with ice at the point of entering the ground, due to freezing of moisture within the pipe. If water pipes be well wrapped with gunny sacks they will not freeze except in extremely cold weather.

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THE United States census for 1900 showed that about 75,000 men were occupied in the mining and reduction of gold, silver, copper, lead and zinc ores, and that the value of the output averaged $1800 for each individual thus employed. This was the highest per capita output of any of the industries, including agriculture, forestry and manufacturing.

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OIL was discovered in eastern Wyoming in 1875, and was used as a lubricant by the Homestake mine at Lead City, South Dakota, as early as 1879. Salt was also manufactured in Weston county, Wyoming, near Jenny's stockade in 1879–'80, which was hauled to Galena, in the Black Hills, for use in chloridizing the silver ores of the Sitting Bull mine.

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SILVER CHLORIDE occurs in ores in the form of minute scales, in sheets and veinlets, and in masses up to those which weigh several pounds. Some of the Fryer Hill mines at Leadville, Colo., produced masses of horn silver (chloride), upwards of a foot in diameter, and the mines of White Pine, Nev., and some of those of Arizona and Mexico, also produced large masses.

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IN underground mining, machine drills are generally mounted on bars placed either horizontally or vertically, though occasionally the tripod is used in setting up the machine. The tripod is used more in Butte, Mont., mines than in any other camp in the West. The tripod is a necessity in quarrying and it may be used to advantage in some stopes underground.

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THE rock specimen from Santa Clara county, Cal., is sandstone and consists of both angular and rounded grains of quartz. The cementing material is clay and silica. It may be employed as a structural material in low buildings. The rock is too coarse and incoherent to withstand very great pressure. It should be placed in such position as to bring the pressure perpendicular to the planes of bedding.

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IF the shaft "squeaks," stop the mill and relieve the shaft, and rebabbit the boxes, if necessary, and, if the shaft is out of line, rebabbitting is generally required. If the covers have been removed from the cam shaft boxes, at least cover the bearings with canvas aprons to keep out dust and grit. A bearing is not improved nor is friction lessened by allowing grit to fall upon the revolving shaft, to be carried into the bearings.

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SOME ores containing copper in the form of carbonate and silicate (chrysocolla) and fine gold have been successfully treated by the cyanide process, by first leaching out the copper with a dilute solution of sulphuric acid, and subsequently treating the pulp with cyanide solutions. The success of this operation depends to a great extent upon getting rid of the copper solution and free acid, which must be accomplished by means of wash water, and, in some instances, by neutralizing the remaining acid by means of alkali.

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THERE is a distinction between the "weight" of water in pipes and the "pressure" of water in pipes. Thus, a pipe 10 inches in diameter and 100 feet in length will contain a volume of water weighing 3404.75 pounds. If lying horizontally and closed at both ends, there will practically be no pressure on the pipe. If the pipe be lifted up and stood vertically, then the pressure at the bottom of the column will be 43.35 + pounds per square inch, or a total pressure at that end of the pipe of 3404.75 pounds, while the pressure at the top will be nothing.

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ATMOSPHERIC PRESSURE at the sea level is nearly 15 pounds per square inch. At 5000 feet altitude it is about 12.27 pounds per square inch; at 10,000 feet about 10 pounds per square inch, and at 15,000 feet but 8.33 pounds per square inch. The atmospheric pressure may be found approximately by multiplying the barometric reading in inches by 0.4908. The atmospheric pressure is not diminished in direct proportion to the altitude. At sea level the first inch increase in pressure represents 917 feet. As altitude is gained it requires an increasingly greater height to reduce pressure 1 inch.

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PIPES made to convey water under pressure are required to be stronger than those conveying air under the same pressure, for the reason that air, being elastic, is not subject to shock like that caused by the sudden stoppage of water when in motion, flowing through a pipe, and which is known as "water hammer." Air pipe must have equal strength throughout as the pressure is practically equal on every square inch of its inner surface. In the case of a water line along an uneven surface, the strength of the pipe must be proportional to the amount of pressure it will be required to stand, which is determined by the height of the column of water.

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BY "free air" is meant the air as it exists in nature, its density varying with the altitude above or below sea level. When compressed mechanically, the pressure increases as the volume of air, as it originally existed, is diminished. At 60 pounds pressure a cubic foot of air is equal to 5.08 cubic feet of free air. That is, if 5.08 cubic feet of free air be compressed to the space of 1 cubic foot, its tendency to expand will be equal to a pressure of 60 pounds upon each square inch of the foot cube. At 100 pounds pressure a cubic foot of compressed air is equal to 7.802 cubic feet of free air. The efficiency of the pressure is dependent upon the elevation at which the compressor runs.

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ANTIMONY is found in metallic state, but is usually combined with sulphur as the sulphide stibnite. The metal is obtained from the sulphide by melting it with wrought iron scrap, when the sulphur combines with the iron, freeing the antimony. Another method of reduction is by roasting the ore, burning the sulphur to dioxide, the antimony being converted to oxide, from which it is reduced to metal by mixing with charcoal and fusing the mixture. The metal is poured into a mould, when, upon cooling, beneath the slag, the metal crystallizing first, it assumes a peculiar fern-shaped surface, and this is evidence by means of which purity may be judged by those having experience.

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IN the construction of small two-post head frames it is sometimes economy to frame the opposite sides and erect them separately by means of a "gin" pole, or to erect the two uprights with cap and tie, and after guying them securely, to put up the angle braces. In an instance in Amador county, Cal., the entire frame was joined and bolted together on the ground, a post, sill and angle brace being first joined for one side, and a similar set for the opposite side. These were then turned on edge, the posts lying on the ground, and then joined by cap and tie, and the entire frame then tilted backward, bringing the sills in place upon the ground, when it was forced into its exact place at the shaft.

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THE cost of monthly repairs on machine drills depends upon many things. If the drills are new and in good condition, the repairs naturally should be far below that required on old well-worn machines. If high pressure is employed—100 pounds, instead of 60 or 65 pounds—the wear and tear will be greater, but so will the amount of work. Machines do not require repairs proportional to the hardness of the ground. Much depends upon the man running the machine. If he fails to feed up properly, he runs the risk of breaking the front head. If he feeds too fast, he accomplishes loss work. Beating the drill, the chuck or the machine with a hammer is bad practice—particularly the latter—though machines sometimes show evidence that this is done.

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WHERE air is to be introduced under the charge of ore in a cyanide tank, the futility of placing the perforated pipes beneath the canvas filter of the false bottom has been proven. When this is done the air invariably seeks outlet around the edges of the false bottom, bubbling up around the inner periphery of the tank. Where air is introduced through perforated pipes to supply oxygen to the charge, experiment has shown that if air is pumped in for twenty to thirty minutes every two hours the result is as effective as if pumped in continuously. By arranging a system of valves along the pipe line running to the tanks, this may be controlled. The result of following the above suggestion is that a smaller compressor may be employed and a larger number of tanks aerated by the intermittent system.

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IN roasting ores, if too high a heat be employed, the metallic particles will have a tendency to agglutinate, which would, in most cases, unfit the ore for further treatment. The cost of treating ores by the chlorination process will depend first upon situation, which will have a bearing upon cost of fuel, supplies and labor; second, character of ore treated, whether easily roasted or treated with difficulty; third, the process employed, of which there are several, each having modifications. The barrel chlorination process is probably the most satisfactory, as it is continuous and treats a wide range of ores successfully when manipulated by experienced hands. In some of the southern States the treatment of gold-bearing sulphides is done at a cost of less than $5 per ton, while in the rest the cost is from 50% to 100% greater, and in some instances more.

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THE cyanide process cannot be applied successfully to the recovery of coarse gold from ores or placers. Where an ore contains both fine and coarse gold, amalgamation should be tried, and if the tailings from the stamp mill still contain values sufficient to justify the treatment, cyanide may be found serviceable in extracting a large percentage of the remaining gold. In some mills the ore is crushed with the cyanide solution in the battery, but where this is done amalgamation on outside copper plates is impossible, as cyanide of potassium renders amalgamated plates very hard and brittle and unfit for the purpose of holding gold. To be good amalgamators the copper plates must be soft and as porous as possible. Plates spoiled by the use of too much cyanide in dressing, or by the flowing over them of large amounts of cyanide solution, should be annealed and replated with silver, when they will be as good as before.

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IT is doubtful if the courts would accept work done to maintain a ditch and flume line originally built to supply power to a mine and mill, but which are now idle, as annual assessment work on the mine, and this doubt is enhanced where a portion of the water is sold to others for domestic or other purposes while the mine remains idle. The statute clearly requires that assessment work upon unpatented mining claims, whether upon the claim or on other land outside the boundaries of the claim, must be of such a nature as to actually promote the extraction of mineral from the claim. The original cost of the ditch and flume might be charged as assessment work—that is, $100 of such cost for each claim for the year only when the work was performed—but money expended for a survey for such ditch line would not be accepted as money expended for the benefit of the claim.

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NO EVIDENCE has ever been produced to indicate that gold nuggets "grow." When a mass of gold, great or small, is freed from its matrix and is carried by drainage water into the neighboring gulch, it at once begins to lose weight by reason of abrasion to which it is subjected among the sand, gravel and cobbles which move along with it. The greater the distance a nugget travels the more will it be worn and battered by the rocks. In the first few yards of its travel it may still retain many angular faces and ragged edges, but, moving farther and farther from its source, the amount of drainage water is likely to increase, with the result that larger and still larger rock masses move with the gold, or over it, should it chance to become lodged in a crevice, and the scouring action constantly reduces it in size, and pounds it out of all semblance of its former shape. Often nuggets are found having quartz and iron within the mass. These particles have undoubtedly been caught by the folding over them of a portion of the nugget, which is quite possible in the case of leaf-like or filiform masses of gold, and as the nugget is abraded and pounded by the rocks the evidence of the metal having been folded, as it were, becomes obscure and may be destroyed entirely. Doubtless by this process of abrasion good-sized nuggets have been entirely worn away, and thus lost to the miner. From the moment of its release from the vein the golden mass grows smaller and never adds a particle to its weight. Dental gold is a mass of specially prepared porous metal, and gold in this form does not exist in nature. In any other form gold cannot be built up to a larger mass by pounding.

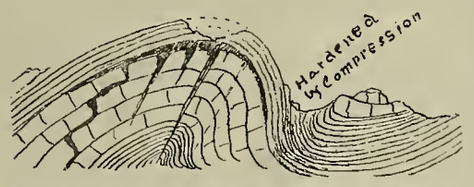
Ore in Anticlinals, as at Bendigo, Australia, and Tombstone, Arizona.

Written for the MINING AND SCIENTIFIC PRESS by ARTHUR LAKES.

The descriptions of the anticlinal and synclinal form and occurrence of ore deposits in the saddle reefs and "inverted saddles" of Bendigo, Australia, by T. A. Rickard and W. H. Cundy, are of much interest to those who have worked among ore deposits in regions of folded slates, schists, or other ore-bearing sedimeutaries. It has seemed to me that the occurrence of ore bodies on the tops of anticlines and their general absence in the synclines may have some analogy with the occurrence of oil, gas, and water iu the oil fields. Anticliues, as is well known, are the favorite habitats of oil and gas, the theory being that compression of strata has forced the oil and gas on top of the water into the summit of the arch, the propelling agent being the hydrostatic pressure of the water, back of the oil. It is generally supposed that by lateral pressure, on folding, a cavity is formed on top of the arch (as in folding sheets of paper) where oil and gas find a ready receptacle. It is also recognized that anticlines open in cracks or faults at or uear the summit of the arch. In an anticline, too, there is commonly a short, steep side and a "long leg" or gently sloping side. The pressure has been exerted from the steep side, and water, oil and gas have been forced up mainly on or from that side to the summit of the arch and collected there, either in the arch cavity or in the fault fissures. If the water pressure back of

Toughnut Anticline, Tombstone, Arizona.

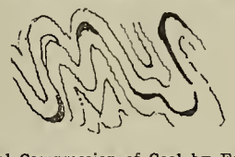
the oil is very great it may even force those lighter materials over the arch and down the long leg. While the anticlinal is the seat of the oil and gas, the synclinal or trough is commonly destitute of these, but often abounds in water. Now, in place of oil and gas, if we substitute metallic vein solutions forced upwards by hot waters and steam in the anticlinal slates and schists, and depositing or precipitating there both ore aud vein stuff, we may form an idea why the anticlines of saddle reef formations are so



Folds Showing Ore in Anticline and None in Syncline.

liable to carry lenses of quartz and ore, and why the correspondiug synclinal basins, or "inverted saddles," are so geuerally barren, as also why loops as well as fracture zones occurring at the tops of these saddles and on the sides are filled with quartz and ore.

The general absence of oil as well as ore in the synclines may be due, especially in pliable strata, like shales, to a compacting by pressure in the re-



Unequal Compression of Coal by Folding.

entraut curve of the fold or the general compacting by pressure of strata crushed and squeezed between two parallel folds preventing free circulation of liquids at that point.

It has been observed that the strata between anticlines is so pressure hardened that by erosion, synclines often form hills, and anticlines, valleys. Synclines, however, may occasionally carry oil or ore bodies, as observed in the former case in the oil region of Florence, Colorado, and in the latter in the "inverted saddles" of Bendigo, as described by Cundy.

In some cases bedded veins have been folded up with the strata iuto anticlines or saddles, but in those which we have in view (in contorted schists), the ore bodies entered the cavities subsequent to or at most contemporaneously with the folding of the rocks. That great compressive force was exerted in forming these folds, and that cavities, loops or arched zones of weakness were produced near their summit, is shown by Geikie, who says:

"In strata which have been intensely crumpled the same bed is reduced to the smallest thickness in the arms of the folds, but swells out at the bends as if squeezed, laterally, into loops. Into these loops soft substances, like coal, having least resistance, are sometimes squeezed or thrust."

In cases of segregative veins, formed contemporaneously with the folding movement when the strata was in a plastic or semi-plastic condition, we can understand how a soft, gelatinous quartz might similarly be squeezed, forced, or molded, or ooze into these loops.

Besides the noted cases of the saddle reefs of Australia, we have a good example of these phenomena at Tombstone, Arizona, as lately described as follows by A. Church, in Trans. A. I. M. E., XXIX, p. 511:

"Twenty years ago, Tombstone was the most noted mining camp in Arizona. It represented a combination of fissure veins and bedded deposits in relations which were most puzzling and impossible to make out until the extensive development of the mines permitted every detail to be observed. The sedimentary beds associated with the ore deposits are Lower Carboniferous limestones, shales and quartzites, folded and traversed by igneous dikes.

In the Toughnut claim the outcrops lie in an irregular horseshoe which has a deformation near the point of the curve, suggesting pressure against a big eruptive mass of grano-diorite. The sedimentaries are especially rich in dikes at their contact with the grano-diorite. The grano-diorite shows a fault face against which folds of the strata have been developed.

The structural conditions show that the ores from some underlying source ascended through fissures to be deposited in the cavity and in the strata which had been prepared by folding for the entrance of solutions. The rocks owe their ores to the combined results of pressure, folding and fissuring.

The folding is in two directions, producing anticlinals with axes varying in direction.

Monoclinic flexures also lie across the anticlinals. They are usually of gentle slope, while the anticlinals are highly compressed and sometimes faulted.

The bedded deposits lie in the anticlinals, sometimes on the flank, sometimes in the apex, but the synclinals are barren. The monoclines have not limited the deposition of ore.

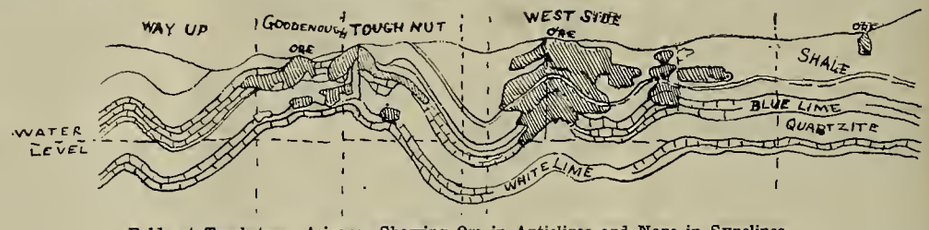
The compound surface produced in any stratum by these cross folds was a controlling factor in the distribution of ore, which is found in all shapes from long, narrow tongues to broad sheets. The simple anticlinal structure of the "saddles" is disturbed by the monoclinals resulting in the formation of numerous vertical crevices, sometimes receiving enough ore to join two overlying bodies together. The ore body may occupy the flank of an anticlinal which dips towards the spectator. Two lines of vertical fissures lie across the system of anticlinals, in both of which are important ore deposits and mines. The largest ore bodies of the fissures are found within the lines of the anticlinals whether the fissures reach the limestones which contain the bedded ore deposits or are still in the overlying shale.

The water level in the Contention and Grand Central mines is 150 feet above the blue limestone contaiuing the highest ore bodies of the Toughnut series, but the influence of the anticlinals upon the deposition of ore in the fissures is as marked in the overlying shales through which the fissures pass in these upper levels as in the limestones of the bedded deposits.

The second result of dynamic action was the production of vertical veins or "compression fissures." In the West Side mine the principal ore body of the fissure is confined to a strongly compressed anticlinal 450 feet long. This fold is succeeded north by a broad, barren synclinal and on the south by a narrow synclinal aud a gently rising anticlinal. The fissure passes through shale for the first 200 feet of its depth and there is a small ore body within the synclinal in the shale.

There are three parallel fissures within a width of 400 feet at the West Side mine, two of which yield ore. The walls do not indicate faulting. The ore bodies of the Goodenough and Toughnut are also exclusively anticlinal. The synclinals are here also barren. The steeper and sharper the anticlinal the greater the size and better the grade of ore. The Grand Central and Contention mines show very clearly the combination of inclined anticlinal deposits and a vertical vein. The two classes of deposits dip in opposite directions. The compression fissures have been the most prominent factors in the introduction of ore as the anticlinals have been in its distribution. Nowhere is ore found in the shale except in the fissures in it. This shows the controlling necessity of crevices as a preparation for ore. Torsion cracks occur in the limestone and quartzites. The igneous dikes seem to have had only an indirect influence on the ore deposition. The Tombstone ores are the product of replacement both in the crevices, fissures and anticlinals. Anticlinal faulting preceded the deposition of ore and no ore bodies were faulted after their deposition.

Roughly speaking, about half the gold and silver produced in Tombstone has been taken from the upper shales, about a third from the blue limestone and the white limestone, and the remainder from the "Lucky Cuss" limestone. The mines of this old and well known camp are being revived and the anticlinals searched for, and followed on scientific geological principles.



Folds at Tombstone, Arizona, Showing Ore in Anticlines and None in Synclines.

The Genesis and Character of Ore Deposits.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

The most important matter in the operation of a mine, aside from the mechanical problems involved, is a study of the varied phenomena which accompany the geuesis or formatiou of the vein or deposit as the work of exploration proceeds. This class of observation has been reduced to a science and is known as mining geology, a term employed in contra-distinction to structural or stratigraphical geology.

Ore bodies have many features peculiar to themselves, and may be studied within themselves independently of any extraneous phenomena. The study of ore deposits, with a view to classifying them, has received much attention, and the abundant literature on this interesting and important subject indicates that there are still different opinions entertained on various matters in this connection by those considered high in authority on the subject of mining geology. Mineral deposits and veins have been described by various geologists in terms calculated to convey an idea of their characteristics. Thus there are fissure veins, bedded veins, contact veins, mineral zones and numerous other forms of mineral deposit. The occurrence of a vein always conceives a pre-existing cavity, or a zone of fracture or dissision, within which there were innumerable interstitial spaces through which mineral solutions might pass more readily than through the pores of a solid rock. When mineral solutions are passing through such veins, spaces, or zones of fracture, certain chemical reactions are supposed to take place, and as a result the various minerals held in solution are precipitated and deposited usually, if not always, originally as sulphide. Under the varying changes of temperature and pressure, as the surface of the earth is approached, various minerals are deposited independently of others which may be present. It is thought that zinc is one of the first minerals to be differentiated from such solutions arising from great depth through the fissures or zones of dissision, and deposited on the walls of the fissure or in the spaces of dissision. At higher levels, copper, irou and lead sulphides are deposited, though there is usually found more or less of each kind of mineral throughout the entire depth of the fissure. It is a well-known fact, however, that iu many veins zinc is unknown until considerable depth has been reached. The disappearance of some minerals from the upper portion of veins is due in many cases to secondary causes, and has been accomplished by descending currents of cold water and not hot ascending solutions. The processes of ore deposition, together with its possibilities, are most fully appreciated by those who have had an opportunity to visit geysers, boiling sulphur and hot mud springs. There are numerous places in volcanic regions where acres are essentially a seething cauldron of boiling water and mud. Great volumes of steam aud sulphurous gases fill the air, while under foot may be heard the murmur and threatening rumble of the escaping steam and scalding water. In some instances these hot springs, sulphur deposits and geysers, occur aloug the line of a fault, as may be seen by the relative position of the surrounding beds of rock—usually of volcanic origin. This is the case at some of the hot springs and solfatara in the vicinity of Lassen peak, Cal., where in Hot Spring valley, on Warner creek, this type of volcanic action is still in strong evidence. About

many of the vents sulphur is being deposited and about others iron oxide, while at others near at hand neither iron nor sulphur deposit is visible. The hard andesitic rocks in the vicinity of the springs are found altered to kaolin, or silica, and in some places both occur, as well as calcium carbonate. In some of these places boulders of comparatively fresh rock have within recent years rolled down the hillside and have lodged in the immediate vicinity of one of these sulphur-steam vents. The result is invariably that the rock most directly exposed to the action of the hot sulphurous gases is already kaolinized to a depth of an inch or more, showing how rapid is the decomposition of massive rock under such conditions of heat and moisture in the presence of sulphurous gas. Were it possible to drain this fault fissure of its scalding solutions and divert the steam and other vapors elsewhere that the fissure might be exposed, it would, without doubt, be found to resemble in a marked degree a mineral vein in many respects. The hard andesite forming the walls of the fissure or fissured zone would be found altered to a mixture of kaolin, calcium carbonate and silica, and doubtless iron sulphide would be found deposited in the fissures and in the clay walls. Whether other minerals would be discovered it is impossible to say. At Steamboat Springs, about 6 miles from Virginia City, Nev., which somewhat resembles that above described, G. F. Becker reports an essentially similar condition, but here careful and exhaustive chemical analyses have demonstrated that at Steamboat Springs are now being deposited "gold in metallic condition, sulphides of arsenic, antimony and mercury, sulphides or sulphosalts of silver, lead, copper and zinc, iron oxide and possibly, also, iron sulphides; and manganese, nickel and cobalt compounds, beside a variety of earthy minerals. The sulphides which are most abundant in the deposits are found in solution in the water itself, while the remaining metallic compounds occur in deposits from springs now active or which have been active within a few years."

The occurrence of these minerals in active solfatara indicate in an unmistakable manner the origin of a certain class of mineral deposits—those occurring in fissured zones, in massive rocks, and it may also be considered as an indication of the possible manner of occurrence of all mineral veins. There are veins in which the walls have been but little altered and in which the vein filling is chiefly quartz, with the several more commonly occurring sulphides of the base metals, together with native gold, silver ores and tellurides of gold and silver. Many veins in slates, granites and schists are types of this character. It may be that these veins were formed by deposition from cold solutions. No evidence of unusual heat is noticeable in mines of this class, while in veins like the Comstock, which are of the former type, great heat of the workings and of the water are characteristic, and indicate the probable genesis of the ore deposits. It is unlikely that all ore deposits, whether occupying fissures, zones of dissision, or occurring as the result of metasomatic replacement of soluble mineral in certain rocks (as lead and zinc deposits in limestone), are formed by the same processes. The conditions as observed in ore deposits indicate that they are formed in various ways. Some of the most noted and profitable deposits are the result of secondary processes and not due directly to the primary deposition of mineral in the veins, or zones of mineralization. Among this latter are certain copper deposits where the normal deposit is composed wholly of iron sulphide, with a small amount of copper-iron sulphide sparingly scattered through a large rock mass. The decomposition of this ore, due to oxidation, results in the leaching out of the greater part of the more soluble copper which is carried downward by percolating surface waters, and redeposited in convenient localities in those places best fitted to receive it, generally zones of fracture and crushing, until the leaching out of the small copper content of a large rock mass results in the formation of rich concentrated deposits of ore of relatively small mass. If 1% of copper were leached by atmospheric or other agencies, such as oxidation due to drainage, from a million tons of slightly mineralized rock, and the copper were concentrated in a zone of crushing of only one twenty-fifth the mass of the rocks from which it was leached, the result would be an ore body of about 50,000 tons containing 20% of copper. If the size of the ore body were smaller the grade of ore would be correspondingly richer. This is known as secondary enrichment of ore bodies, and is particularly noticeable in copper deposits. Among the ores due to this secondary enrichment are azurite and malachite, the carbonates of copper; cuprite and the black oxides; and at deeper levels chalcocite (copper glance), chalcostilbite, tetrahedrite and other complex ores of copper, often rich in silver, and sometimes also in gold.

As a rule the miner is less interested in the mineralogical characteristics of his ore deposit, except as to its richness, than he is in its size and form, and the economy of its removal and reduction into coin. Unquestionably the form, size and position of an ore deposit are most important considerations in its equipment, development and eventual removal. The various forms of ore deposits have been classified partly according to their supposed genesis, and partly in accordance with their form or manner of occurrence. There have been numerous writers on this interesting subject, both in Europe and America, and in many respects these authorities agree, but in minor details there is much variance.

J. F. Kemp, in his ore deposits, has adopted the following classification which has been accepted by many geologists. Briefly, this classification is as follows:

I. Deposits of igneous origin. Extremely basic developments of fused magma. Peridotite forming iron ore at Cumberland. R. I.; titaniferous magnetite, Jacupiranga, Brazil; iron ores in numerous gabbros; nickel-bearing pyrrhotite, chromite in serpentine, etc.

II. Deposited from solution. Surface precipitations forming beds, due to:

1. Oxidation—bog iron ores.
2. Sulphurous exhalations from decaying organicmatter—pyrite.
3. Reduction by carbonaceous, organic matter—pyrite from ferrous sulphate.
4. Evaporation, cooling, loss of pressure in hot springs deposits, as at Steamboat Springs, Nev.
5. Secretions of living organisms—iron ores by Algæ.

Disseminations in particular beds or sheets, due to:

1. Selective porosity, as silver ores in porous rhyolite; in sandstones, and copper in conglomerate.
2. Selective precipitation by calcareous matter; the telluride gold ores of the Black Hills, S. D.

Filling joints caused by cooling or drying; veins in Mississippi valley.

Occupying chambers or caves as at Cave mine, Utah. (Also at Santa Eulalia, Mexico).

Occupying collapsed brecciated beds, caused by solution and removal of support. Occupying cracks at bends of monoclines, anticlinal summits, synclinal troughs, often with replacement of walls.

Occupying shear-zoues or dynamically crushed strips along faults, as at Butte, Mont.

True veins occupying exteuded fissures, often with lateral enlargements (vein chambers).

Occupying volcanic necks, in agglomerates, as at the Bassic mine, near Rosita, Colo.

Replacements iu troughs, as the hematites of Lake Superior.

Contact deposits, where igneous rocks always form one wall.

Segregations formed in the alteration of igneous rocks (chromite in serpentine).

Deposited from suspension, as residual deposits. Metal bearing sands and gravels (beach sands placers, ancient and recent).

Residual concentrates left by weathering of the matrix.

The above are practically all of the various forms of ore deposit that have been recognized, and a knowledge of their occurrence is essential to the best methods of development and extraction. Many miners lacking this knowledge have run lengthy and expensive tunnels to reach flat beds of ore lying at a higher altitude on the mountain sides, which were never cut by the tunnel, and in some instances shafts have been sunk through such beds and extensive exploration carried on below without encountering ore of value, as was done at the Running Water, Wyo., silver-bearing quartzites.

Every prospector and miner who is workiug for himself, as well as those who are employed by others, should have some knowledge of the elements of mining geology, for it may save the one possessing it great unnecessary expense, and may bring success where without it failure only may result.

Some Laboratory Work and Cyaniding.

To the Editor:—There are some slight inaccuracies in J. J. Macdonald's recent letter in your columns of the issue of March 12 to which I should like to call attention.

Of course, every well posted chemist ought to know "there is more alkali in NaOH than in $CaCl_2$," the latter (calcium chloride) being practically a neutral salt, but chloride of lime, while it consists essentially of calcium hypochlorite and chloride ($Ca(OCl)_2$ $CaCl_2$), often contains a large proportion of calcium oxide, some of the lime used in its manufacture having failed to absorb chlorine. Further, in actual practice it does not always increase the consumption of KCy, and it has been used in some instances with advantage, even without a subsequent wash.

Also the substance which sometimes coats zinc shavings is not zinc potassic cyanide (K_2ZnCy_4), which is a readily soluble salt. In cases which have come to the writer's notice, the coating has consisted of basic zinc cyanide—a mixture of ZnO and $ZnCy_2$—which will dissolve in a solution of free potassium cyanide, or in a moderately strong solution of caustic potash.

W. J. S.

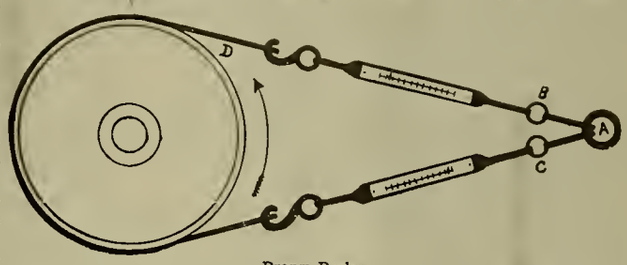
Berkeley, Cal.

The Russian Government has authorized the establishment of two branch banks in the Caucasus, for the special purpose of making advances on ore shipments and regulating the sale of manganese ores.

To Determine the Horse Power of Gas Engines.

Written for the Mining and Scientific Press by Wm. H. Kritzer.

There is no method by which the exact power of a gas, gasoline or oil engine may be determined, except by measurements with a "Prony brake," which gives the actual or available horse power at the engine pulley, at any given speed and any given brake load, this brake horse power being less than the corresponding indicated horse power required to drive the engine itself at the given speed.



Prony Brake.

Take two spring scales and a piece of belting. Hook a scale at each end of the belt, the latter is then passed around the driving pulley.

Next fasten the thumb ring of each scale by a cord to a suitable piece of wood A. After the engine is started by means of the lever A, both scales are drawn back until the friction of the belt slows the engine to its proper working speed.

The readiug of the scale C being the least, it is subtracted from that on the larger, B, which will give the net pull in friction of the brake in pounds.

Next multiply the distance around the driving pulley in feet by this net pull, and we get the number of foot pounds per revolution. And if we multiply the number of foot pouuds per revolution by the number of turus per minute of the wheel we get tbe number of foot pounds the engine gives per minute.

As an illustration, suppose the reading of the scale B is 70 pounds and that of C 10 pounds, and the speed of the driving pulley is 500 revolutions a minute.

If the diameter of the driving pulley is 35 inches, its circumference will be $35 \times 3.1416 \div 12 = 9.163$ feet.

So the power of the engine would be $70 - 10 \cdot 60 \times 9.163 \times 500 = 274{,}890$ foot pounds a minute; and as 33,000 foot pouuds a minute is 1 H. P., the eugine would be giving $274{,}890 \div 33{,}000 = 8.33$ H. P.

In practice it is well to keep water ruuuing on the belt at D and have an assistaut iu makiug the test.

The approximate power of an engine can also be computed very much the same as a steam engine, i.e., the horse power formula being $\frac{P \times A \times L \times E}{33{,}000} =$ H. P., viz.: Mean effective pressure (P) $\times$ pistou area in square inches (A) $\times$ length of stroke in feet (L) $\times$ number of explosions per minute (E), and the result obtained $\div$ by 33,000.

In the ordinary single cylinder engine known as the four-cycle type, the number of explosions can never exceed one-half the number of revolutions, while in the two-cycle type there can be an explosion every revolution.

After deducting all losses, the four and two-cycle types have been fouud to give nearly the same power for the same size, the average useful pressure being about sixty-six pounds per square inch in a well designed four-cycle engine; aud in the two-cycle approximately one-half of this.

Notes on the Construction of Mine Bulkheads.*

Written by W. Thompson.

The writer was recently called upon to design and erect a number of mine bulkheads which required to be absolutely free from danger of collapse and fracture and possibilities of leakage. After consideration of the many classes of material available for this purpose, and various designs of construction, the following general design was decided upon and followed:

Materials.—Materials chosen for tbe erection of the bulkheads were hard burned, repressed brick, manufactured from clay fouud at Claytou, in the State of Washingtou, U. S. A., Portland cement, and clean river sand found locally. Before being used, samples of all materials were tested in the laboratories of J. T. Donald and McGill University, Montreal, Quebec.

Design of Bulkheads.—In each case the pressure exerted from the head of water to be retained was in one direction. Bulkheads were, therefore, erected in the form of an arch set against footings cut into the solid rock, footings also being cut into the roof and floor of the workings to remove loose or fractured material and make perfect seal against leakage at point of contact between brick work and walls

*Paper read at the Annual Meeting of the Canadian Mining Institute.

of drift. The first arch was reinforced by a second arch of similar design and the space between the intrados and extrados of the two arches filled with strong cement concrete. The extrados of the fiual arch was also sealed by strong cement concrete faced with 2-inch cedar plank. The strougest and most perfectly shaped brick were chosen for the construction of the main arches and the mortar used consisted of two parts saud to one cement, freshly mixed as required.

STRENGTH OF MATERIALS.—Brick: Transverse test: Distance between centers of support in each case, 6 inches; specimens tested on flat; breaking load at center in pounds, arch brick, 6500 pounds; breaking load at center in pounds, face brick, 3900 pounds.

COMPRESSION TEST.—Load in pounds per square inch at initial failure, arch brick, 6600 pounds; load in pounds per square inch at initial failure, face brick, 2117 pounds; maximum load in pounds per square inch, arch face, 8320 pounds; maximum load in pounds per square inch, face brick, 3242 pounds.

CEMENT.—Tensile strength in pounds per square inch: Neat cement 20% water, at end of sixty days, 699 pounds; one cement and one standard quartz sand, same period, 540 pounds; oue cement and one sand used, same period, 498 pounds.

A 3-inch wrought iron pipe was laid through each bulkhead to carry off water accumulating during construction, this pipe being sealed when water was allowed to accumulate against the face. Bulkheads were maintained free from pressure until material had become thoroughly set.

RESULTS.—Results obtained proved eminently satisfactory, bulkheads proving water tight, and owing to large factor of safety are free from any danger of collapse or fracture.

The Maximum Evaporation.

The United States Geological Survey has been engaged for some time past in making an exhaustive series of investigations on the Colorado river in connection with the proposed reclamation of arid lands along that river. In the course of these investigations a careful record of evaporation has been kept at Yuma, Arizona, under the direction of J. B. Lippencott, engineer in charge of the hydrographic branch of the Geological Survey.

The record for 1903 is given in the following table, together with the precipitation during the same period. It is probable that this represents the maximum evaporation on this continent, unless it be slightly greater in the Salton basin, San Diego county, Cal., or in Death valley, Inyo county, Cal.:

	Evaporation, Inches.	Rainfall, Inch.
January	3.32	.00
February	3.48	.23
March	5.28	.00
April	7.31	.00
May	9.84	.00
June	10.25	.00
July	10.75	.04
August	10 70	.00
September	9.05	.67
October	5.79	.04
November	3.80	.00
December	3.39	.00
Total evaporation	82.86	
Total rainfall	.98	
Net evaporation	81.88	

This gives au average daily evaporation of 0.224 inch throughout the year. The tests were made by placing an evaporating pan in a suitable position on a hill overlooking the Colorado river.

An Advertising Device.

Herewith is a representation of a "Power" steel rope pin which Broderick & Bascom Rope Co. of St. Louis, Mo., are sending to their agents, S. B. Hicks & Sons Co., Seattle, Wash., to deliver to all large buyers of Power steel rope. The pin is of sterling silver, with a gold strand running through the rope, and is a facsimile of the Power steel rope with the yellow strand.

CINNABAR occurs usually in connectiou with metamorphic sandstone and serpentine—at least, this is the condition at the largest and most important miues of the world thus far discovered; but it also occurs in other formations, though more sparingly. In southern California cinnabar occurs in an altered eruptive rock in Orange county. In Mariposa county, Cal., it is found in the gold belt associated with altered diabase; in Utah in limestone; in Yavapai county, Ariz., in rhyolite with hematite; in Yuma county, Ariz., in quartzite; in Texas in sandstone, etc., showing that the occurrence of the mineral is not confined to any particular kind of rock.

Extracts From a Mining Engineer's Pocket Diary.

A little nonsense, now and then,
Is relished by the best of men.

In the practice of his profession the mining engineer is frequently called upon to leave a comfortable home and office to go to distant points to make examinations. At such times there are feelings and emotious aroused by the change which must be experienced to be appreciated. To those who have had this experience the following paragraphs, taken verbatim from an engineer's diary, will appeal directly. Upon leaving home there is little to cheer or console, other than the hope of a speedy return, but a few days of keen mountain air, several hours of vigorous exercise daily, aud time and mind fully occupied, work wondrous changes:

January 24—Left the city at 11:30 P. M. by —— railway. J. accompanies me for the sake of the trip. How stuffy and uncomfortable these sleepers are and what "back numbers." The company should be ashamed of them—an imposition upon the traveling public.

January 25—Arrived at C—— at 6 A. M. Porter roused us in plenty of time. Had a wretched breakfast at a miserable "high-stool counter" restaurant in the rear of a bar room. Immediately after took the mule team and buckboard, which were waiting for us, and drove over the finest mountain road I have seen in California. We lunched at H——, a typical, old fashioned, California mountain town. Straight, up and down, two-story boxes for houses, with small windows, and eaves so short that they look as if there were none; lean-to porches, with lazy old men sitting about upon them hoping that some one will ask them to drink. After feeding ourselves and the team we drove on through V—— and 4 miles beyond to the mine camp, reaching our destination about 6. Distance from railway about 40 miles. Patches of snow here and there en route. Watchman tbo only man employed about the property. His name is F——. It appears that I knew him in Mexico. Nice steady fellow. He has with him another man—for companionship, I judge. The other fellow very loquacious—promises to be a nuisance. Says his name is "Mr. Aloysius Gatherwait;" but people call him "Nick" for short. Camp well stocked with food; fresh meat consists of venison, which, as it is "close season," is called "prospectors' mutton."

January 26—Nick even talks in his sleep. Several times during tbe night we heard F—— wake him up and tell him to "shut up." Up early and inspected mill, tramway and surface improvements at tbe camp. Find a fairly good assay office; but there are no supplies for it on hand. It will save time and trouble if tbe samples can be assayed here. Set Nick to cleaning up tbe assay office. In the afternoon drove down to V——, where we found five cans of gasoline, which we bought. We also telephoned to the city to have fluxes and crucibles sent by express to C——. The air is fino and most invigorating at this elevation, which, by aneroid without temperature correction, is 4000 feet above sea level.

January 27—Started Nick for C—— with tbe buckboard to fetch the assay supplies. Wbile F—— was rounding up two mules I started to walk up tbe mountain to the mine. The trail is good, but rather steep. The difference in elevation between office at camp and tbe portal of the main adit is about 1000 feet, wbile the distance between the two points is only half a mile. It is surprising bow soft one gets about town for a month or so. I was fairly dripping sweat and blowing like a "roaring" horse when J—— overtook me with bis mule about half way up and let me ride the rest of tbe way. I note tbat F—— is wise enough to mount the slower mule and keep discreetly behind. I find there is no plan of the workings; so that is the first thing to be done. I have started on this work—it will have to be "needle work." There is no local attraction I discover which helps, as I will only have to "set up" at every other station. The work was a trifle awkward at starting, as surveying was new to both J—— and F——. J—— is very good about "pitching in" and helping. Put in a good, long day's work. Very tired at nigbt. I note that the vein is soft and well defined; so that the sampling will be comparatively easy of accomplishment.

January 28—Slept like a brick last night and felt like a "fighting cock" this morning. Got an early start; took tbe precaution of securing the fast mule and tbe first start on the way to the mine, tbus leaving J—— and F—— to settle the "ride and tie" question between them. To my amusement J—— was a close second to me and F—— walked all the way. It will do him good, as he rode all the way yesterday. Finished everything connected witb tbe underground work by noon. The lunch looked rather nasty, but it tasted very good. I must say that tbe "prospectors' mutton" begins to pall a trifle. In the afternoon connected all tbe surface openings—cuts, pits, etc.—with the main lines of tbe survey. Also ran a "closing" line to point of beginning as a check.

Platted the survey in the evening. The work closed very well, which is satisfactory. Having no drawing paper, used tbe back of an old blue print, which served tbe purpose. No drawing board, of course; but the dinner table answered. Nick returned, improved in appearance by a bair cut and sbave, but wonderfully drunk. He brought the supplies, and tbe team was all right, and be is speecbless; so it is all for the best.

January 29—It is wonderful how one feels in this fine, bracing air. I am actually hungry for work. Spent the time till 3 P. M. taking samples and notes; then returned to camp and instructed Nick in the mysteries of mortar, buckboarding and sieves. I am singularly fortunate in being quite free from fear of "salting" on this job. Nick is a positive comfort, being repentant and also shamed into absolute silence.

January 30—At mine all day with F—— finishing up the sampling and studying the conditions of the shoots of ore and going over the surface and croppings. The problems are simple, but rather interesting. Nick, under the watcbful and intelligent eye of J——, has been employed all day in reducing yesterday's samples to pulp.

Spent the evening noting points at which samples were taken and the vein widths upon the plan. No "eight-hours" rule apply to jobs of tbis kind.

January 31—Spent the whole day assaying. Nick broke up yesterday's samples. J—— helped me, weighing pulp and mixing fluxes. By night had all the samples fused and the buttons cupelled. A good, satisfactory day's work. Nick still silent—he does not feel quite well. His only remark was elicited by my remonstrance upon bis taking down a quarter pint bottle of castor oil. He said he "knew what was good for him." The "prospector's mutton" has grown repugnant to me.

February 1—Up early. Parted and weighed up all the assays. Finished by 1 o'clock. After lunch hitched up and started to tbe railway, taking advantage of sublime moonlight. Passing tbrougb H—— noted that my first impression was erroneous. It is a pretty little place, and the wbite frame houses, with their comfortable verandas, are in keeping with their surroundings. The old men sitting about are picturesque and venerable patriarchs and their philosophy has, no doubt, brougbt them to a quiet and congenial resting place. Reached C—— at 9 P. M. It is a live and bustling, even though small, railway station. Enjoyed an excellent supper of eggs and beefsteak at the lunch counter. The food is surprisingly good and well cooked and clean. Caught the train at 11. Fine sleeper. It is astonishing how luxurious railway travel is in these days. The —— railway, particularly, seems to do everything for the comfort and convenience of its patrons.

February 2—Reached tbe city at 7 A. M. After breakfast started upon my report. Made a new plan upon tracing cloth, also sections; took these to be blue printed.

February 3—Finished rough draft of report. Blue prints came in. They look very nice. After all, very few can get up such a set of drawings as I can when I try.

February 4—Revised report and had it typewritten.

February 5—Turned in report and drawings to clients. They seemed pleased and asked me what my fee was, and paid me by check. All very satisfactory. Next!

Safety Devices in Hoisting.

TO THE EDITOR:—In your editorial of February 6th you say:

"The second count, that 'no safety device was attached to the cable to prevent overwinding,' is a suggestion of doubtful utility. A hoisting engine usually possesses power far in excess of that necessary to lift the load it hoists from the mine. A clip, or other device on the cable, would scarcely have the effect of stoppiug the engine, while the strain on the cable would probably cause it to part the moment the safety device on the cable came in contact with some firm obstruction. The provision of bumpers ou the guides to prevent overwinding would seemingly be a better device, when if the cage were provided with the usual safety clutches these would immediately operate, should the cable break, if the clutches were in good working condition, with a chauce of holding the cage, as it had acquired no momentum."

A device to "prevent overwinding" is, as you say, of doubtful utility—you might have said, entirely useless. The clip or bumpers you suggest would probably be unsatisfactory. When making recommendations the jury seem to have overlooked or forgotten the devices made, and in use, for detaching the cable from the cage in case of overwinding. I have for years used at several mines a detaching clamp, which never failed to work. If the cage is brought within danger distance of the sheave the cable is automatically released from the cage. At the same instant heavy lugs are throwu out which rest on a thick iron plate, holding the cage securely. The ordinary safety dogs, or catches, will also be thrown into use and grip the guides.

For several years I have tested this device once a month. At the tests the throttle on the engine was opened wide and the cage allowed to rush to destruction—or be saved by the detaching device. Never did the appliauce fail to work. The cable was invariably detached and ran over the sheave, and the lugs held the cage securely. Then to complete the testing the cable was brought back and reattached, aud the cage hung by a short piece of rope between the cable and cage. The rope was cut and the cage allowed to drop. I never knew it to go more than one-fourth or one-half inch before the dogs took hold.

This detaching device can be bought from machinery houses.

The recommendation of the jury for "a safety device to attach to the cable to prevent overwinding" was conceived in ignorance. No successful device has been made to prevent overwinding—whether attached to the cable or not.

To avoid serious results from such accidents provide a device for detaching the cable, and also good safety clutches. Test once a week by overwinding and dropping the cage. Accidents may occur from other causes which might also be prevented, but that is not the subject under discussion.

Referring to the broken valve on the hoist of your Middleton correspondent, I would say I always equip hoists with two throttles—one just above the other—one being always open and idle, but ready to use in just such emergencies, as your correspondent mentions.

G. A. SINGER.

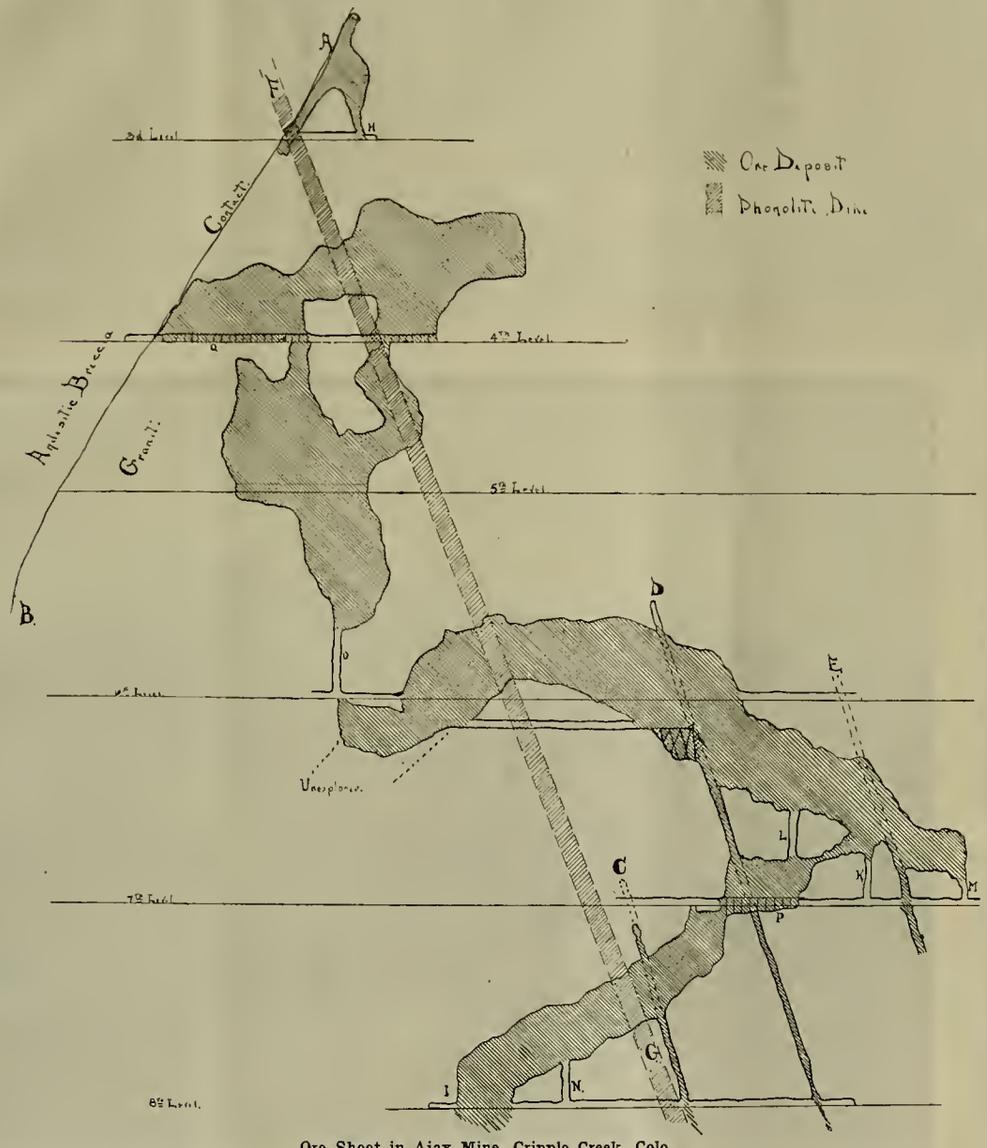
Woedsky, Alaska, Feb. 29.

A Peculiar Ore Deposit.

Written for the MINING AND SCIENTIFIC PRESS by E. A. COLBURN.

One of the main ore shoots of the Ajax mine, Victor, Colo., is located in the granite, near and in some places touching the main southern contact (A–B) between the granite and the audesitic breccia of the Cripple Creek volcano, on or near which contact most of the larger mines of the district are located.

As may be seen in the accompanying sketch, the ore shoot has a very irregular course, in some places even "jumping," as it is locally called, for a number of feet, with no connection other than the joint planes in the intermediary granite. These joint planes are often filled with a white or grey gouge, probably composed of kaolin and other decomposition products, and do not, in most cases, carry appreciable values. It being impossible, on account of its winding course, to make an accurate section along one line, a sketch was made of the deposit as it would appear from the side.



Ore Shoot in Ajax Mine, Cripple Creek, Colo.

At intervals veins, three in number, leave the main ore body and follow the joint planes downward (C, D, E), carrying a good grade of ore as far as prospected, but in no case do they carry sufficient values above the main deposit to warrant their being worked. Neither the main ore shoot nor the smaller veins have any definite walls, but fade into the surrounding granite in a way which often deceives the miner into passing by a good body of ore. The width of the ore is from 15 to 30 feet, averaging, as a rule, about 20 feet; the height is a trifle greater than the width and is usually in proportion to it. The small veins are from 2 to 3 feet wide and 50 to 100 feet in length.

Three dikes cut this ore shoot, two phonolite and one basalt. The larger phonolite dike (F–G), which is about 10 feet wide, cuts the ore diagonally in three different places and was probably forced through the country after the ore was deposited, as it shows no sign of mineralization other than a small amount of iron pyrites. The second or smaller phonolite dike follows the ore from the 800-foot level all the way up to the 300-foot level; it was probably intruded later than the larger dike, which it cuts, and in its course through the ore often pinches to a seam, never having a greater width than 6 inches except when the country rock is reached, where it widens to 3 or 4 feet. The basalt dike cuts the ore only in one place between the 500 and 600-foot levels, but lies quite close to the body throughout its whole vertical distance.

The ore was first discovered at the 300-foot point in 1894 (H), and was not supposed to have any great extent as it pinched out after about 75 feet of stoping and did not appear to go down. In 1896 the main shaft was sunk through the ore at the 500-foot level, but it was not until 1901 that the ore was again located by a crosscut on the 800-foot level (I), below which it has not yet been opened.

The ore is partially altered granite, the ferromagnesian minerals (mica, hornblende, etc.) being replaced by quartz, in places associated with fluorspar, the whole mass being stained a light green by the protoxides of iron. Of course this leaves small quartz-lined holes or vugs all through the ore, which give it a cellular or honeycombed structure very characteristic of this deposit. These cells are often, in the richer ore, occupied by crystals of calaverite, picked samples of which have assayed as high as $180,000 per ton.

One of the most remarkable features of the ore is that the phenocrysts of orthoclase feldspar in the original granite have remained unchanged, both in color and in form, as far as the unaided eye can determine. There is no indication of a vein structure other than the joint planes that are continuous through the ore from the country rock, and the drusy, quartz-lined vugs about 3 inches in diameter which occur here and there in the ore. The ore was probably formed by slowly percolating mineral-bearing solutions which impregnated and partially replaced the country rock through which their movement was directed. E. W. Brooks of Cripple Creek says of this deposit: "There are some reasons which, to my mind, indicate a "contact" origin to this class of deposits in the district. That is to say, the genesis of the ore may be traceable to the mineralizing effect of the contact between the granite and the breccia at points where intruded dikes have furnished not only heat, but gases for pneumatolitic effects. The irregularity of the deposit seems to indicate either a crushed or sheared zone, which at certain points was accompanied by much shattering of the granite, or previous action of thermal waters furnished the necessary porous, cellular condition, afterward sought out by the mineralizing solutions."

As the surrounding country rock is very hard and does not slack off or cave, the deposit is worked without any timber other than the first course of square sets on each level (P, Q), only enough ore being drawn off to give the miners room to work next the back. On account of the low pitch of the shoot, raises often have to be run from the levels to avoid shoveling in the stope (K, L, M, N). As soon as the stoping is completed the ore is "drawn," leaving a great untimbered chimney, which is never filled with waste on account of the probability of ore being found in the immediate vicinity.

Colorado Mineral Output for 1903.

The mineral output of the State of Colorado for the year 1903 has been issued by Mine Commissioner E. L. White, and is given in the following table:

COUNTY.	Gold, Fine Ounces.	Silver, Fine Ounces.	Lead, Pounds.	Copper, Pounds.	Zinc, Pounds.	Total Value, Dollars.
Arapahoe	8	.....	.....	.....	.....	165 36
Archuleta	3	6	.....	.....	.....	65 22
Boulder	20,879	61,833	115,100	6,154	.....	470,300 94
Chaffee	8,192	129,900	249,308	79,581	3,000	260,017 92
Cl'r Creek	22,838	851,683	3,451,849	289,876	656,000	1,147,329 95
Conejos	59	46	.....	.....	.....	1,244 12
Costilla	48	179	.....	.....	.....	1,087 81
Custer	4,006	169,175	387,301	52,212	.....	191,741 71
Delta	12	8	.....	.....	.....	252 32
Dolores	2,093	103,096	143,417	147,588	.....	123,976 97
Douglas	2	2	.....	.....	.....	42 41
Eagle	776	27,054	677,730	32,863	.....	63,565 12
Fremont	307	223	2,091	20,777	.....	9,303 32
Garfield	5	3	.....	.....	.....	104 95
Gilpin	65,124	375,238	945,975	611,988	.....	1,667,755 36
Grand	60	12	.....	.....	.....	1,432 64
Gunnison	2,348	65,447	127,661	15,000	55,600	93,911 23
Hinsdale	799	33,139	459,462	11,263	106,900	60,910 19
Jefferson	12	5	.....	218	.....	279 56
Lake	64,827	4,973,033	36,353,239	2,556,583	76,566,000	10,011,274 73
La Plata	6,807	7,627	3,017	819	.....	145,012 35
Larimer	79	10	.....	56,700	.....	9,142 52
Mineral	8,658	1,608,788	8,600,646	133	2,634,000	1,515,521 02
Montrose	136	2,061	.....	10,920	.....	5,357 98
Mesa	17	8	.....	.....	.....	355 07
Mont'zuma	224	89	.....	.....	.....	4,677 65
Ouray	105,056	417,343	3,350,560	380,499	.....	2,586,888 09
Park	6,593	52,128	802,580	5,805	.....	198,921 39
Pitkin	230	2,569,862	33,269,852	11,683	.....	2,789,535 22
Rio Grande	626	3,410	.....	5,098	.....	15,436 77
Routt	1,008	117	.....	.....	.....	20,897 90
Saguache	143	22,424	376,711	67,419	44,600	42,232 80
San Juan	82,758	781,358	6,909,993	2,939,018	.....	2,812,503 21
San Miguel	56,933	737,928	3,704,201	466,264	.....	1,789,403 62
Summit	10,753	220,543	1,523,703	41,447	550,800	439,032 75
Teller	572,824	41,605	.....	.....	.....	11,862,509 95
Totals	1,945,242	13,245,483	191,513,514	7,809,920	80,616,000	38,377,999 75

NOTE.—In the above table the calculation of value is on the average market price of the metals for the year: Gold, $20.67; silver, .5345; lead, .04237; copper, .13235; zinc, .054.

The report shows a decrease in mineral output of nearly $6,500,000. This decrease is chiefly in gold, the output for 1902 being nearly $7,000,000 greater than in 1903. The falling off in the gold output is due largely to labor troubles. The decrease in the output of silver was about $1,200,000, though the average price of that metal was higher than in 1902. The copper production remained about the same, but, owing to the newly discovered method of separating zinc from the complex ores of many of the most important districts, notably at Leadville, the zinc output was raised from $2,544,993.48 in 1902 to $4,353,264.00 in 1903.

The Mines of Groom Creek, Arizona.*

There has been unusual activity on Groom creek, in Yavapai Co., Ariz., the past few years, and a number of mines of importance are developed, equipped and in operation there. Groom creek rises near Spruce mountain, about 10 miles southeast of Prescott, and, flowing in a southwesterly direction, joins the Hassayampa creek, 8 miles south of Prescott. The greater part of its course is through a granitic area in which are some small veins of high-grade ore; but in its upper portion it cuts through metamorphic rocks, and in that vicinity is found the greater mineralization.

Among the mines on Upper Groom creek, the Monte Cristo is in operation. It has a shaft down 400 feet and is equipped with a hoist and 10-stamp mill. The mill is illustrated in engraving on front page. The ores contain gold, silver, lead, copper and some zinc. Above the Monte Cristo, the Home Run Company has developed a mine 400 feet deep on a vein 3 feet wide. On the 300 level the vein has been extensively drifted, and on the 400 level the drift is in over 200 feet. The property is equipped with steam hoist and stamp mill. The Home Run mill is also illustrated on the front page. Beside these, there are other properties on the creek which are attracting attention.

Over the divide from the head of the creek are the mines of Upper Lynx creek, described herein in the issue of March 12. The entire section of country east and southeast of Prescott drained by the Hassayampa and its tributaries, Lynx creek and the streams flowing easterly from Las Barretas, Mount Union and the neighboring spurs is mineral country, in which some prospecting has been done to a depth of 400 or 500 feet. The results having proven satisfactory, an era of deeper mining may now be anticipated. The ores usually contain gold and copper; silver, lead and zinc also occur in most of the sulphide ores, but in some instances iron sulphide is the chief carrier of precious metals.

*See Illustrations on front page.

A New Town on the Mojave Desert.

A large portion of the southern portion of California—that portion south of the Tehachapi mountains—is desert—a vast arid territory covering tbousands of square miles, and extending eastward into Nevada and Arizona, in which the annual rainfall is a minimum, and where the range of temperature is represented by 140°, while the mean temperature is far above the average of the rest of the Pacific coast. The range of temperature within twenty-four hours is sometimes nearly 100°. The effect of such uuusual climatic couditions is to produce a desert—rugged serrated mountains separated by broad, flat valleys with no sign of verdure other than sparsely scattered sagebrush and greasewood. An occasional clump of mesquite is the only really beautiful thiug to be seen in desert valleys. Often the central portion of a valley is flat as a floor, and is composed of a broad expanse of fine silt or clay as hard as pavement and glaring white in the fierce sunlight—the bed of a dry lake.

The vision may clearly distinguish mountains 150 miles distant through the clear, dry atmosphere. The distant mountains seem near, and those near at hand are startling in their barren ruggedness. Out of this laud of silence and death rise scorcs of such ranges, isolated buttes, and rounded hills, and few of them there are which do not contain mineral veins or deposits of value. Among these the names of many have already become familiar to the miner and prospector—the gold mines of Randsburg, and those of the Panamint section, of Slate range and of Death valley; the silver veins and borax deposits of Calico, the gold, silver and copper of Providence mountains, and the gold of the Cargo Muchacho range; the silver and copper of Lava Beds district, and the gold of Pinon mountains. These are only a few of those already noted in the Mojave and Colorado desert region. And now a new camp has sprung up in a new district, that of Rochester, in San Bernardiuo county, about 40 miles east of Daggett, and 8 miles southwest of Ludlow station on the Santa Fe railroad. The accompanying engraving presents a characteristic picture of desert mountain and long, low valley slopes, with the scanty sagebrush with intervening patches of barren sand. At the lower eud of the village on the left are the Bagdad mines, owned by the Bagdad-Chase Mining Co. of New York, E. H. Stagg, manager. Immediately behind the observer aud half a mile distant are the mines comprising the Chase group, owued by this compauy. To the right of the Bagdad group in the middle background of the picture are the mines of the Roosevelt group, a separate property owned by the Roosevelt Mining & Milling Co. The Bagdad mines produce ores containing gold and copper. The company owns a 50-stamp mill at Barstow, 60 miles westerly from the mines on the Santa Fe, and near the Mojave river. A new 10-stamp mill and cyanide plant is being built at the mines. The Roosevelt Co. are also building a 10-stamp mill. The water for these mills is to be pumped from wells sunk in a dry lake some distance from the mill sites. Within a radius of 10 miles of this camp are several extinct cinder cones of typical form, marking the site of as many volcanic vents, which are the seats of the dying volcanic activity whicb has in the past been such a promiuent characteristic of this portion of the desert. The oldest rocks of the region are iutrusive—diorites and quartz porphyries, and later, ofteu overlying these, are rhyolites, rhyolite tuff and breccia, andesites, etc., and still later the black olivine basalts, wbich coming up through the volcanic vents, spread over many square miles of the country. The indications are that the most recent eruptions were of a quiet kiud, in which the lava rose in the craters aud overflowed, the molten rock extending in some instances 10 or 12 miles from the craters. Later the cinder cones were built up about the vents and the interual fires slumbered. How long these volcanoes have been silent no one knows, but the lava looks startlingly fresh to one who walks over its rough, twisted and gnarled surface. The large amount of ashes aud tuff formiug hills iu the region south of Lavic, a statiou west of Ludlow, indicates that prior to the basalt flow the volcanic activity of the region was of a violent type, in which vast amounts of matcrial were ejected.

None of these signs of former disturbauce have deterred the owners of these mines from expending a large amount of money iu their development. Among other improvements is a standard gauge railroad 8 miles in length, connecting the mines with the station on the Santa Fe railroad at Ludlow. The establishment of this camp will doubtless do much toward stimulating prospecting and mine development in tbe mountains of the vicinity, in some of which there are mineral deposits of proven valuc, notably in the Lava Beds hills, a few miles west of Rochester, where are veins of gold, silver and copper ores, and farther westward large deposits of irou ore—hematite and maguetite of good quality. The vast region of the desert has only bcen superficially prospected as yet, aud it is more than likely that with increasing knowledge of its resources, and improvemeut in means and cost of trausportation the desert will be robbed of its terrors aud many other mines will be opeued in the future.

Some Notes Concerning Tin.

Written for the MINING AND SCIENTIFIC PRESS by JOHN W. GRAY.

Mines of this metal iu Cornwall, England, have been worked since long before the Christian Era. It is extensively mined now in various countries, and it is difficult to overestimate the value of the metal in the ordinary uses of life, many of which are so well known to us all.

Tin is said to be found in the native state in small quantity in the alluvial gold deposits of Siberia, Guiana and Bolivia. The great commercial ore of the metal is called cassiterite, or tinstone. The ore washed out of its veins and deposited along with gravel, sand, etc., is called "stream tin," or black tin, and "wood tin" is a variety resembling petrified wood. There is also a sulphide ore called stannite, or tin pyrites, containing about 26% of tin, usually associated with pyrites of iron and copper, and called "bell metal ore," because of its frequent bronze appearance, but it is not usually a plentiful or valuable ore.

Cassiterite is an oxide of tin and has a hardness of 6 to 7 and a specific gravity of 6.4 to 7.1. When pure, which is rare, it is colorless or transparent; but it is usually brown to black, though sometimes gray, white or red. Transparent red or colorless specimens are quite rare. It crystallizes in square prisms and octahedrons, with high luster, and also occurs massive and in grains. Before the blowpipe, with carbonate of soda on charcoal, a button of tin is obtained. This, dissolved in hydrochloric acid with metallic zinc added, will be deposited in sponge form. On the charcoal a white deposit is formed, which can not be driven off aud which moistened with nitrate of cobalt solution becomes bluish green, a distinguishing test.

Cassiterite frequently resembles the common brown garnet, black zincblende and some varieties of tourmaline. It occurs in veins in the primary rocks and in alluvial and drift deposits. It is usually associated witb quartz, mica, fluorspar, apatite, feldspar, tourmaline, topaz, chlorite, sulphurets of various metals, mispickel, specular and magnetic iron ores, wolfram and molybdeuite, and appears to find a very congenial home in granite or between vein walls of granite.

In workable quantities tin seems less universally distributed than many of the valuable and useful metals. In a table below will be fouud mention of the countries which produce in quantity the tin which supplies the markets of the world.

Some reference to the occurrence of tinstone aud the methods of extraction will probably be of interest, as indicating, in a geueral way, the distribution and production of the metal. About one-half of the present production which finds its way to the general markets comes from the Straits Settlements, or, more properly, the Federated Malay States, of which the State of Perak is the largest producer, and nine-tenths of the total production is from the alluvial workings. Many lodes, however, are known to exist and some are profitably worked. The lodes are said to vary from 2 feet to 10 feet in width, and one lode is reported to yield a considerable amount of ore averaging 3.5% tin. The prevailing rocks are quartzites, scbists, sandstones, clay slates and granite—geology of lodes somewhat similar to those of Cornwall, granite with overlying slates and schists. The ore in lodes and wash is cassiterite, averaging from 68% to 77% tin. The alluvial deposits occur on the hills, at the foot of the mountains and in the low valleys in areas of varying extent. The ore occurs from fine dust to large pieces of several hundred weight. It is sometimes distributed uniformly, but often in layers and on the bedrock, and at depths from the surface to as much as 150 feet. Usually there is quite a depth of overburden. The wash in producing layers is a mixture of granite and some other rocks, and the impurities which render dressing troublesome are magnetic and titaniferous iron ore, mispickel, iron pyrites, tourmaline and wolframite. The yield of the alluvium is from ½% tin ore up to as much as 50% in the concentrated layers and pockets in the bedrock. One per cent is a profitable yield and 3% or more is considered very rich. The ore comes from the disintegration of the rocks. It has been found in quantity as a constituent of the granite, but the granite itself has not been successfully worked. The method of working is by open cuts or pits, and, when the overburden is heavy, by shafts. The ore is separated by crude methods of puddling and such other hydraulic methods as local conditions suggest. The gravel is run into sluices with riffles, and, when it has been washed away, the residue caught is treated in pans or sbort boxes. Of late, by proper hydraulic equipment, very successful methods of work have been established. The country being well watered affords opportunity for this method of operation. It is also proposed to utilize dredgers on the streams.

CAMP ROCHESTER, SAN

The next largest supply of tiu comes from the Dutch possessions in the Indiau Archipelago. Extensive fields exist in the islauds of Banca, Billiton aud Sumatra, and it is said that the production of tin from these sources can be largely increased at auy time at the will of the Dutch Government. The present production is mainly from the alluvial deposits, but the ore has been traced to its sources, which are veins in the granite and gneiss, and in the overlying quartz schists, clay slates and sandstones. A typical alluvial deposit is said to be somewhat as follows from the bedrock up: An average of 3 feet of tin wash, then coarse sand followed by layers of differeut colored clays, then sand with a little ore, and then tbe overburden of vegetable mold. This overburden is from 25 to 30 feet deep. The cassiterite or black tin recovered is said to average about 71% metal. In Sumatra the gravel deposits are found on the west coast and are said to average about 1% tin. The localities, however, are hard to reach, and the dense vegetation makes prospecting difficult.

Next to the East Indies comes Bolivia as a producer of tin. The deposits are found in a stretch of land several hundred miles long and of a considerable widtb in the southwestern part of the country,

chiefly in the departments of Potosi, Oruro and La Paz, the larger number of mines being in the department of Oruro. The veins are reported to occur in the granite or cutting through the country shales. The mines are at a very high altitude and lack transportation and other facilities for the very best results; but the field is promising, and with more capital and improved methods of work it is thought profitable production could be largely increased. The veins are of good width and of satisfactory richness. The average contents of the best ore is reported to be from 10% to 12% tin, the concentrates averaging about 69%. The lode matter is silica, alumina and iron oxide. The veins are richest when the filling is soft material, the ore occurring in grains and nodules, but the veins are usually solid and the country rock hard. The Potosi production is chiefly from the tailings of silver mines, and in the department of Oruro many of the silver mines carry from 2% to 4% tin. This tin is separated by concentrating the lixiviated tailings.

Next in production comes Australasia. Here tin is produced in West Australia, Queensland, New South Wales, and also from Tasmania, the latter being the largest producer. Both lode claims and alluvial deposits are worked successfully, and in some cases both together, as at the Mount Bischoff mine, Tasmania. The sources of the stream tin are river and creek beds and drift deposits. The gravels are composed of the eroded rocks, enriched by portions

ARDINO COUNTY, CAL.

of the old drifts cut by the younger drainage lines. The beds of old streams lie below the alluvial wash, and claims have been found richer by sinking to these channels. The deposits are sometimes covered by lava. The veins are found in the granite and overlying rocks. At the Mount Bischoff mine the ore is found in alluvial beds, in lodes and in stockworks or pockets. A dyke of eurite and porphyry is described as having broken through the slates and sandstones, and the latter rocks at the contact are cracked and broken and the fissures filled with tin ore and arsenical and copper pyrites. The yield is variable. For six months in 1902 the average value of concentrates from ore was reported at 1.312%. Extensive hydraulic operations are carried on in Tasmania, and by this means very low-grade material is worked at a profit. In Tasmania, Queensland and New South Wales dredgers are said to work with success, and it is believed in suitable locations steam shovels could be profitably used. In Queensland several extensive and unusually rich lodes are reported, and some veins have been successfully worked to a depth of 800 feet. The field for the production of tin in Australia is large, and it is thought the industry of tin mining there will be greatly extended.

Cornwall, England, follows Australia in production. This region has supplied tin, as before stated, since before the Christian Era, and both stream and lode tin have been largely produced. The lodes occur chiefly in granite and traverse the granite and overlying slate. It is a common occurrence for the veins to carry copper in the slate and tin in the granite beneath. The tinstone is described as mostly associated with quartz, with some chlorite, fluorspar, oxide of iron, clay and iron and copper pyrites. The veins vary in occurrence and size and in the amount of tinstone contained. The mines have been very extensively worked and the concentrates contain about 66% tin. Some figures for the Dolcoath and Wheal Grenville mines in 1902 gave a yield of 51.8 pounds tin per ton for the former and 43.6 pounds for the latter. Cornwall presents the best types of the operations of mining for tin, but the production is decreasing.

A certain amount of tin is produced in some other countries, but not sufficient to be of much commercial importance.

In the United States there is no production. Tin ore has been found in California, South Dakota, North Carolina, Texas and some other localities; but so far very little tin has been produced. Large sums of money have been spent in attempts to mine the ore, notably in California and South Dakota, and smaller sums in North Carolina, Virginia, Texas and other places, but all without success,* notwithstanding the fact that some of the deposits seem promising. In Alaska, at several points on the Seward peninsula, tin ore has been discovered, and geologists assert the region to be attractive. A certain amount of stream tin has been collected, and in one instance, near Port Clarence, it is reported the ore has been traced to its source, a large granite dyke cutting the limestone of that region and containing the tinstone in payable quantity. It is also reported that a large area of ground near York has been discovered, of an average depth of 6 feet, the whole containing more or less tinstone. Nothing very definite, however, about the region is yet known; but it appears certain that in some places tin ore has been found in quantity, and the section of country is reported as promising by good authority.

It also has been lately asserted that in Burmah, where some tin deposits were already known, new fields of large extent and more than usual richness have been discovered.

In the operation of reducing tin from its ore, the material is crushed and then concentrated by some approved method. The ore is then roasted, smelted in reverberatory or stack furnaces and afterwards refined.

The production of tin for the year 1903 by those countries from which practically the supply of the world is obtained is given as follows by a trade publication, based upon the trade statistics:

	Tons.
Malay Peninsula	54,797
Banca	15,070
Billiton	3,653
Bolivia	9,500
Australia	4,991
Cornwall	4,150
Miscellaneous	375

An unknown amount is produced in China, variously estimated by different authorities, but it is mostly consumed in that country. A few other countries also have a small production, but the amount is insignificant.

The consumption of the United States during the year is estimated at about 39,000 tons, all of which comes from abroad, mostly from the Malay Peninsula.

The world's production is increasing very slowly, if at all. The supply does not exceed the demand. New fields are needed, and should they be discovered within the jurisdiction of the United States, it would be of distinct benefit to this country and a most desirable extension of our mining industry.

The price of tin for the past year in New York City ranged from 23.54 cents to 29.85 cents per pound, and in London the price varied from $111.10 to $133.10 per ton.

As has been stated, tin is a most important metal, and it is in almost universal demand. It is used in castings and for the coating of other metals, especially iron and copper. It is needed for various alloys, such as solder, the different kinds of bronze, gun metal, bell metal, etc. It is consumed extensively in the manufacture of tinfoil. With quicksilver, it is used to cover glass for mirrors. Its oxide is used as a paste for sharpening fine-cutting instruments; its chlorides are important in dyeing and calico printing, and its bisulphide, which has a golden luster, is used for ornamental painting, paper hangings and various other purposes.

*No information regarding tests being made at Tinton, S. D., have yet been made public.—Ed.

Bore Holes for Pumping Purposes.*

Written by Edward S. Wight.

The writer is induced to lay before the members a description of a method by which a bore hole can be used for pumping purposes; not as an engineering feat, but rather to show that the water in the distant workings of a mine may in many cases be delivered direct to the surface, thus saving long ranges of pipes underground, and probably several handlings of water.

At one of the mines under the writer's charge the pumping was done in three stages: No. 1 pump being adjacent to the shaft bottom, No. 2 being 1200 feet inby (distant from the shaft), and No. 3 pump a farther distance of 330 feet inby. No. 2 is 60 feet lower than No. 1 pump, and No. 3 is 50 feet lower than No. 2 pump. The water was pumped from one pump to the other, and No. 1 pump forced the water direct to the surface. As No. 1 pump was far too small to deal with the water made at its own level, and also that delivered to it by No. 2 pump within eight hours, this involved a second shift of pumping.

To avoid using a larger pump instead of No. 1 pump, and also a larger column of pipes to the surface, it was resolved to put down a bore hole on the west side of Waikato river, so as to enable No. 2 pump to force the water direct to the surface. The necessary survey being made, a contract was let to put down a bore hole and line it with a pipe, 5 inches in diameter, the price being 4s 6d per foot for labor only for a depth of 242 feet.

It was known that down to a depth of about 100 feet the bore hole would be made in quicksand, consequently a pipe 6 inches in diameter was driven through this, and through it a pipe 5 inches in diameter would be telescoped. To enable this to be done, it was necessary to slightly turn down the couplings of the pipes, 5 inches in diameter, in order that they might pass through the pipes, 6 inches in diameter. At the bottom of the quicksand, 115 feet deep, a log of wood, 18 inches thick, was struck on one side; and, to prevent the sand from running, it was necessary to drive pipes, 6 inches in diameter, through the log, after it was chipped away sufficiently. It was afterwards found that the driving of the pipe past the log had deflected the hole slightly, and to such a degree that after the hole was pierced into the workings the pipes, 5 inches in diameter, would not travel past the deflection, on account of the couplings being so neat a fit. An endeavor to procure pipes 4½ inches in diameter in the colony proved fruitless; the hole was therefore lined with pipes 4 inches in diameter. These slipped down with freedom, so that the deflection of the bore hole could not have been very great.

The water from No. 2 pump is now forced direct to the surface through the bore hole, and it is intended shortly to work No. 3 pump, at which station there is only a small quantity of water, as a hydraulic, taking the power from the column of No. 2 pump. By this arrangement the water is now easily pumped out in eight hours, and the services of two men dispensed with, effecting a saving of 17s per day. Probably the same result could have been obtained by increasing the size of No. 1 pump, but, considering the circuitous route of the pipes from the pumps to the shaft bottom, and other conditions prevailing, it was considered best to adopt the bore hole, sufficient pipes being released in the distance of 1200 feet to No. 2 pump to almost pay for the work.

The boring machine used for putting down the hole was a percussive rotary machine, using an ordinary chisel on pipe rods, through which water is pumped to bring up the debris, the stroke obtained by a hempen rope wound around a friction drum, the attendant holding the rope end until the necessary lift

*Abstract Trans. N. of England Ins. Min. and Mech. Engrs.

is attained, theu suddenly releasing it and allowing the rope to surge on the drum, and thus any length of stroke cau be obtaiued. Thc turuiug motion of the drill is produced by clamping a toothed wheel upon the rods, the wheel geariug iuto a fluted column, about 5 feet high, and this column is made to revolve at a speed of one revolution of the rods to about every five strokes of the chisel. When starting, the toothed wheel is set near the top of the fluted column, so tbat 4 feet or more can be bored before it need be raised again. It is claimed that the machine is capable of boring almost through any rock, and it has done rapid work when boring for water, where a record of the section of the strata is only a secondary consideration. In Auckland the machine has bored a hole 3 inches in diameter, through the sandstones of the Waitemata 1135 feet deep in eight weeks; in the same locality, a hole 6 inches in diameter was bored to a depth of 400 feet in fifteeu days; at Otahuhu, 9 miles from Auckland, a hole was bored to a depth of 945 feet at a cost of £105, exclusive of coal; and at Huntly, a hole 145 feet deep was bored in one and a half days through quicksand and 30 feet of coal. The best record, however, was through alluvial at Turua, Thames valley, where a hole 3 inches in diameter was bored to a depth of 214 feet in six hours, 74 feet of which was done in one hour. In each instance, eight hours constituted a day's work, the labor attending the machine being a man and a lad.

Although this particular instance of the use of a bore hole for pumping water is only on a small scale, the writer is of opinion that there are many instances where a bore hole might be used to advantage, and long ranges of pipes dispensed with.

The Palma Gold Deposit of Minas, Brazil.*

Written by L. FERRAZ, E. M.

Since 1839 the aboriginal Indians bave been in the habit of paying merchants for their purchases in gold dust. Iu 1842 Father F. S. Linhares, a fugitive from the Minas insurgents, founded the parish of S. Francis de Assis do Capivara, and since then the Indians have occupied themselves in gold washing in the Capivara brook, from which large amounts of gold dust are knowu to have been extracted. The methods employed have been the most rudimentary, shallow holes or shafts being dug in the pay dirt panned. It is stated that as much as $\frac{5}{8}$ to $\frac{1}{2}$ ounce has often been separated from a single panful of gravel. The gold is of high assay, carrying but little silver. Such was the abundance of the output that it served as money for all local transactions. Later on, however, coffee replaced gold as tbe staple product, and mining fell into desuetude.

A short time ago Dr. Alvim, having purchased a small property on which some excavations were needed, was surprised during the course of the work to notice visible gold in the gravel. He commenced panning, recovering twenty grams of gold at slight depth in flakes and small nuggets. This was the motive for the present survey.

TOPOGRAPHY.—The Matto Deutro plantation, which lies about 500 feet above sea level, lies somewhat to the east of the city of Palma (once called Capivara), and about a mile from the station of that name on the Leopoldina Railway. The lands lie on the headwaters of the Capivara brook, which rises in the Serra of thc same title, a spur of the S. Antonio and S. Joao range, the divide between the R. Muriahe to the south and the R. Pomba to the north.

The Capivara is the most important tributary ou the left bank of the R. Eugenho da Serra or Batatal, and it receives the waters of a number of small rills on its left bank. The region recognized as auriferous is limited to the headwaters of these streams, comprising the plautations of Matto Dentro, Praia and Lavras, all on the left bank. The right bank and bed of the Batatal does not contaiu even traces of gold.

GEOLOGY AND MINERALOGY.—The plantation of Matto Dentro is characterized by the crystalline character of the rocks, gneiss predominating, with granites and syenite, and may be referred to the Laurentian age. The writer encountered one Huronian quartzite, no schist at all, no mica schist or limestones. The gneisses are varied in structure, but generally granitiform. The lower beds are of common foliated gueiss, amphibolitic and syenitic gneiss. The granites, some typical, some with amphibolite, pyroxene and garnet, form a series tending towards a true syenite. Veius of granulitic black tourmalines, in prisms of various sizes, separate or agglomerated, and veins of pegmatite, commou or of graphic structure, cut into the primitive masses. The mica of the granites and gneisses is generally biotite, some of it lithia-bearing; some of the gneisses contaiu both biotite and muscovite. Both orthoclase and plagioclase occur. The quartz is white, black, yellow, violet, red and hyacinth.

Two distinct types of rock occur—the miascitic, rich in black mica and ilmenite, and the zirconian, containing a certain proportion of zircon and monazite.

Among the residuary minerals found in the pan-concentrates are the following: Sphene or titanite, rutile, garnets, black tourmalines, graphite, zircon, oligist (hematite), magnetite, disthenite, staurolite aud monazite.

The gneisses have a N.E.-S.W. strike, some dipping to the S.E., others to the N.W., the angle between the two masses beiug about 65°.

The micaceous-pyritic quartzitic outcrops have a N.W.-S.E. direction, dipping S.W. On account of the decomposed state of the superficial blocks, the dip could not be measured.

THE GOLD DEPOSIT.—Gold is found in a state of great purity, as flakes, grains and small nuggets, in alluvial gravels which cover the river beds and the area subject to floods, as well as the country surrounding the headwaters of the streams previously detailed. The pan-concentrates consist chiefly of quartz graius, titaniferous minerals, such as ilmenite, titanite and rutile; almandine and pyrope garnets and melanite; black tourmaline and monazite. Oligist (hematite) and magnetite occur in diminished proportion. Wherever the gravel be panned, more or less gold is found. The average value of this gravel per cubic meter is not less than five grams, equal to 9s per cubic yard. It would only be possible to estimate the mass of auriferous gravels present by means of methodical soundings, which time considerations did not admit of.

Proceeding through the various surveys carried out in the auriferous basin, the writer found:

1. Visible gold in small grains, in a scbistose granitoid pyritic gneiss, which crops out about 500 meters from the river at a spot called Fazenda Velha.

2. Gold, not visible, in two outcrops of quartzite of a greyish color, containing specular iron, mica and mispickel. These quartzites are traversed by narrow stringers of white quartz and occupy the superior part of the headwaters of the Porteira and Pasto brooks, seemingly forming part of the main auriferous basin. All the gravels of these streams are auriferous.

3. Gold, uot visible, in small pyritic nuclei, in a granitoid syenitic gneiss.

MONAZITIC SANDS.—Monazite constantly appears in greater or less amount in the pan-coucentrates. It is possible that rich and important beds exist, seeing that one pan residue contained 20% of this mineral. The value of this mineral has considerably increased of late years, owing to its high thoria content. From the geological character of the district, it is probable that this is one of the monazite centers, and may possibly be of future industrial importance.

VARIOUS MINERALS.—The writer found in one pan-concentrate a small crystal of beryl of clear green color, and fragments of white quartz with galena.

LOCAL DETAILS.—Extensive forests exist in the neighborhood, with an ample supply of timber for fuel or constructional uses. Water power sufficient for working on a large scale is not available close at hand; but, at a small cost, power could be tapped at no great distance.

In the writer's opinion, the auriferous gravels could be industrially developed by modern dredging and hydraulic methods, by which small mineral values give satisfactory results.

It is advisable to ascertain, by means of sounding or excavation, what mass of pyritic mineral exists, and what its assay value may be.

*Brazilian Mining Review.

New Mining Law in Japan.

The new mining law of Japan contains the following among its provisions:

No persons other than subjects of the empire, or companies duly formed in accordance with the laws thereof, are entitled to acquire mining rights.

The right of mining may be canceled if operations are not commenced witbin one year from the date of the record iu the Mining Register.

Mining taxes will be imposed upon persons entitled to mining rights, but no business tax. No tax upon the mining of iron ores will be imposed.

The tax on mining areas is 40 sen per year for every 1000 tsubo (about 25 cents per acre).

The amount of tax imposed on mining productions shall be 1% of the value thereof.

An additional mining tax may be levied by Hokkaido, Urban and ordinary prefectures, as well as cities, towns and villages, uot exceeding 15% of the principal tax.

THE export of diamonds to the United States in 1862 amounted to only $2080; in 1863, $4971.84; in 1864, $1689.80; in 1872, $520—all Brazilian stones. In 1874 Cape of Good Hope diamonds appear in the list of exports, and amounted in that year to $32,739.90. From 1882 on the exports of diamonds to the United States attain prominence, being in that year $539,740. In 1892 it had risen to $4,765,353, and in 1902 to $5,802,655. In 1903 this large amount was further increased by $8,403,222.

LIGNITE, or brown coal, is a soft coal found in the later geological formations (Cretaceous to recent). It usually contains a large amount of volatile matter. It is inferior in quality to either anthracite or bituminous coal. The lignites shade into the bituminous coals.

Mineral Wealth of Peru.

Peru is one of the richest countries in thc world iu minerals of all kinds; gold, silver, copper, mercury, iron, lead, sulphur, coal, salt, petroleum, etc., being found in abundance, says U. S. Consul Cree, at Callao, and only requires capital and labor to make the Republic renowned for its wealth.

The distribution of minerals in Peruvian provinces is as follows:

Gold fields.—Paucartambo, La Mar, Union, Angaraes, Cajamarca, Otuzco, Luya, Huamachuco, Arequipa, Aymaraes, Huamalies, Carabaya, Sandia, Tayacaja, Ica, and Huanuco.

Gold placers.—Maranon, Inambari, and in almost all the rivers and streams of the eastern region.

Gold quartz.—Pataz, Huamalies, Union, Chumbibilcas, Canete, Paucartambo, Quispicanchi, Convencion, aud Paruro.

Silver.—Hualgayoc, Recuay, Yauli, Huancavelica, Pallasca, Pataz, Cailloma, Castrovirreyna, and Cerro de Pasco.

Copper.—Huaylas, Huaraz, Camana, Yauli, Cerro de Pasco, and Ica.

Mercury.—Huancavelica, Chonta, Dos de Mayo, and Puno.

Iron.—Piura, Larez, Calca, and Huaraz.

Lead.—Huari, Huaraz, Cajamarca, Pallasca, Dos de Mayo, Puno, Huancavelica, and Huarochiri.

Sulphur.—Tumbez, Paita, Chancay, Huaraz, Huarochiri, Camana, Cangallo, Arequipa, Monquegua, and Tarata.

Coal.—Huamalies, Dos de Mayo, Yauyos, Huarochiri, Canta, Tarma, Huaylas, Cerro de Pasco, Caylloma, and Puno.

Salt.—Chancay, Huacho, Pasco, Moquegua, Cuzco, and in nearly all the proviuces on the Pacific coast.

Petroleum —Tumbes, Piura, Lambayeque.

PRODUCTION OF MINERALS.—Gold—It is difficult to give the exact total of gold produced annually in Peru, as the owners of mines do not give out any figures.

Silver and Copper—The main production of silver and copper is obtained at Cerro de Pasco. For several ceuturies this district produced a large amount of silver, although the workiug of the mines was superficial and the system of amalgamation deficient. The depth of the mines very seldom exceeds 150 feet. It is ouly in recent times that the existence of copper in quantities was discovered at Cerro de Pasco. The Cerro de Pasco M. Co. will export within two years 60,000 tons per annum, representing a value of $14,500,000.

Quicksilver—The quicksilver mines of Huancavelica are being developed.

Iron—The exploitation of iron at present is of no great importauce in Peru. A considerable area of this metal is found at Tambogrande (Piura); also in the Provinces of Calca and Larez.

Lead—The lead mines have not been worked up to the present with any profit, owing largely to cost of transportation.

Sulphur—Sulphur exists in abundance in all the volcanoes of the cordillera of the Andes, and occurs in layers. It also occurs extensively near the sea, on the peninsula of Aguja, near Paita, in the Department of Piura.

Coal—Coal produced in this country is anthracite, lignite, pit coal and peat. As no records are kept, it is not possible to state the amount of coal produced in the country, but an estimate places it at about 55,000 tons per annum.

Salt, Nitrate, etc.—Salt is widely distributed in differeut parts of Peru, although the principal salt pits are on the coast and are of easy and cheap exploitation. Owing to the dry atmosphere of the Peruvian coast, different classes of salt have accumulated, as well as nitrate, and other springs of carbonate of soda, magnesia, sulphate of soda, etc. The importation of salt from abroad is prohibited by law. There is an internal revenue tax of 5 cents (Peruvian) per kilogram (2.2 pounds) on salt for domestic consumption and 1.5 cents (Peruvian) per kilogram on salt for industrial purposes.

Petroleum—The whole coast of the Department of Piura produces petroleum, which is the only part of Peru where it is worked. Following was the output for the year 1902:

Talara—Crude petroleum produced about 39,375 tons at 47s per ton, amounting to £92,531 5s ($450,257); the quautity refined produced about 60,000 cases of ten gallons each of kerosene at 8s per case ($117,000), and a small quantity of benzine at 10s per case. A contract has been made to supply the nitrate oficina at Agua Santa at Caleta Buena, Chile, with crude petroleum, which is being used with great success—2000 tons per month being consumed. The steamers owned by this company are the Azov and the Circassian Prince, which carry a cargo of 3000 tons and 2800 tons of crude petroleum each. Drilling continues.

Zorritos—Crude petroleum produced about 8027 tons at 47s per ton, amounting to £18,863 9s ($91,789); the quantity refined produced is about 37,325 cases of ten gallons each of kerosene at 10s per case ($90,814); 1290 cases of gasoline at 14s per case ($4399), and 1302 cases of benzine at 12s per case ($3802).

Mining and Metallurgical Patents.

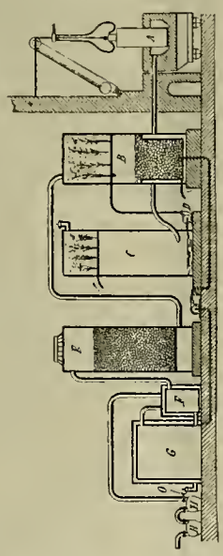
PATENTS ISSUED MARCH 8, 1904.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

Oil Well Packer.—No. 754,138; C. M. Heeter, Butler, Pa.

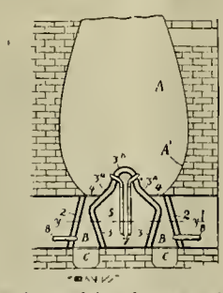
A deep-well casing or tubing, and packer connected thereto by frangible joint, and inner sealing gasket for casing.

Electrical Manufacture of Iron Alloys.—No. 753,875; G. Gin, Paris, France.



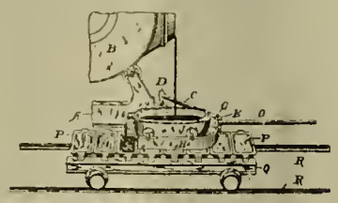
Process for electrically producing an alloy of iron with simultaneous production of oxides of alkalies, consisting of mixing silicic acid with sulphate of alkali, adding carbon to mixture heating same in electric furnace with production of silicate of alkali, then introducing alkali silicate into second furnace, adding oxide of iron and carbon thereto, heating same with production of ferrosilicon and oxide of alkali, and collecting oxide of alkali in form of sublimate of same.

Blast Furnace.—No. 754,337; J. W. Pack, Berkeley, Cal.



Combination in smelting furnace of vertical stack, exterior water jacket and crucible in lower portion, interior hollow water jacket having surrounding space, jacket having upper end entering lower part of stack and having greatest diameter intermediate of ends, whereby downwardly converging passages are formed between inner and outer water jackets, and inner jacket supports and arrest ore passing through bosh or neck of furnace.

Copper-Pouring Spoon.—No. 753,465; B. H. Bennetts, Tacoma, Wash.

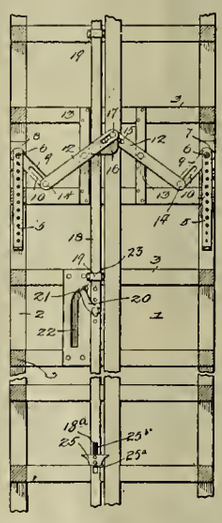


In copper-pouring spoon, combination of horizontal receiving bowl intermediate between converter and molds, U-shaped supporter engaging and supporting bowl, and horizontally-jointed arm secured to and carrying supporter in such manner that bowl may be moved in any direction in horizontal plane.

Strainer for Drive Wells.—No. 753,846; W. H. Broome, Brooklyn, N. Y.

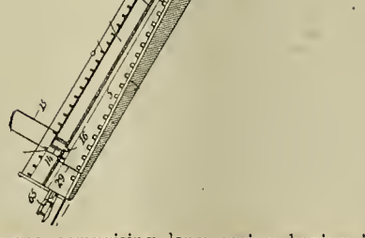
Strainer for drive wells, comprising perforated tube provided with enlarged end members having annular recesses in adjacent ends and around tube, tube being also provided with annular and longitudinal ribs, and in opposite sides thereof with longitudinal grooves or spaces, wire screen placed on tube and strips or plates secured in grooves or spaces and by which the screen is held in place.

Mine Shaft Door.—No. 754,268; J. Wineland, Athens, Ill.



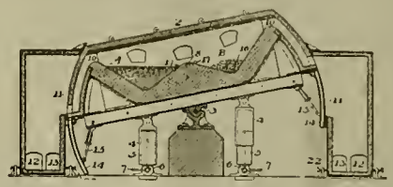
In door for closing elevator shafts, combination with structural framework, of swinging door section hinged to framework, crank arm fixed to each of door sections, pivoted levers having pin-and-slot connection with crank arms at one end and having pin-and-slot connection with vertically reciprocating bracket at opposite ends, and means actuated by raising or lowering of car in shaft to actuate levers and open or close door sections.

Roasting Furnace.—No. 754,199; S. D. Craig, G. E. Kelly and W. Turner, Laharpe, Kans.



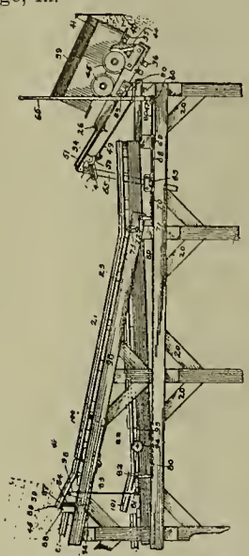
Furnace comprising long casing having inclined floor, track rails on floor, carriage mounted on rails, frame mounted to swing on carriage, two sets of scraper plates arranged on each end of swinging frame, plates of series at ends being at reverse angles, and plates at one end being at reversed angles to plates of other ends, means of holding plates at one end in lowered position while holding plates at other end in upper position, and means for reversing positions.

Method of Treating Ores, Mattes, etc.—No. 754,159; J. A. Potter, New York, N. Y.



Method of treating metal and metal-bearing materials, consisting in forming molten metallic bath upon one portion of furnace hearth, preheating separate charge of solid materials upon another portion of furnace hearth, pouring molten bath over solid material, preheating another charge of solid material upon that portion of hearth from which molten bath was poured, and then pouring bath back upon subsequent charge of solid material, and so continuing.

Automatic Blocking, Releasing and Dumping System for Tram Cars.—No. 753,917; C. J. Ringstrom, Chicago, Ill.



Combination of forwardly inclined and rearwardly inclined track, of rocking bar pivotally secured longitudinally under one of rails of forwardly inclined track and provided with upward extension at each of its ends, roller journaled on upper end of each of extensions, rail sections pivotally secured at one of their ends and located to align with rails of track and connected together, one of sections resting on rear extension of rocking bar, another rail section pivotally secured at its rear end and resting on front extension of rocking bar in alignment with one of track rails of forwardly inclined track, rail section pivoted at one of its ends and in alignment with one of rails of rearwardly inclined track, means to support connected rail sections in raised positions, and connection uniting means and rail section on rearwardly inclined track so that when section is depressed supporting means will be lowered.

New Use for Carborundum.

A new and interesting use has been discovered for carborundum, which has already found large employment as a substitute for emery, says the American Manufacturer. Capable of preparation only in a powerful electric furnace, where silica and carbon are fused together in presence of sawdust and common salt, carborundum is highly refractory; and it has been observed that a thin layer of the same substance applied to any other material of which furnaces are usually constructed protects it from the heat and renders it almost equally refractory. Finely powdered carborundum is made up into a paste with water glass, i. e., sodium silicate or some similar binding substance, and the paste is applied by means of a brush or otherwise to the bricks which are intended to be used for building a furnace, or those bricks are actually immersed in the viscid liquid for a certain time. If the furnace has already been built the paste can be painted on to the exposed surfaces, giving one or more coats, as may be desired. It is stated that a layer 2 mm. thick will protect the bricks from the attack of highest temperature which is ever produced by combustion methods in ordinary work. Examination of the bricks in such a furnace has shown that they had not suffered in the least.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ARKANSAS.

Marion County.

The property of Jones & Gilchrist, adjoining the Jack Pot mine at Yellville, has been added to the shipping list. This mine has been developed with a drill and a shaft has been sunk, proving the correctness of the drill report, says the Record. The shaft is down 50 feet and in ore similar to that of the Jack Pot.

ALASKA.

A. C. Clark, developing mines in Kayak section, says that at least thirty new well-drilling machines are being arranged for that field, besides machinery for beach gold mining at Yakataga. Supplies and machinery for Yakataga go in via Kayak. About 100 men have gone to Yakataga with dog teams and supplies for early beach gold mining this spring. The winter has been a mild one, the thermometer ranging from 28° to 40° above zero. Only twice has it reached zero, and then for a few hours only each time. About 3 feet of snow is on the lower valleys, which is no hindrance to work, though the light snow on the mountain sides is deep. Since November 1st development work has largely been at a standstill, except in the anthracite coal district. French & Campbell, the Alaska Petroleum & Coal Co. and the Alaska Development Co. have kept development work going. Oil development work could have continued during the winter had there been transportation facilities between Kayak island and the mainland. The first oil well struck there continues to flow regularly, and a strong flow of gas continues from the unfinished wells. Five barrels of crude petroleum are being shipped from the Catella oil well to the St. Louis Exposition as part of the Alaska exhibit. They also expect to have an exhibit of coal.

W. N. Matlock and W. M. Beagle, of Pendleton, Or., are arranging to put in a hydraulic mining plant for their mines, near Nome.

The Ketchikan Journal says construction work is progressing on the compressor building for the Alaska C. Co. at Coppermount. Machinists are completing installation of the compressor plant. The sawmill plant has been set in place and work finished upon the mill building. As soon as the work in progress of taking up the water power near the Mellen mine is finished all the works of the company will be operated by water power. An electric light system will furnish light for all the company's workings.

Shakan reports say three marble development companies have been organized in the East to work the marble deposits near there. A sawmill plant owned by one of these companies is on the ground, and a plant for marble cutting has also been received.

ARIZONA.

Cochise County.

G. Clark, of Bisbee, has an option on the World's Fair group, of L. C. Shattuck and W. Grenfell, and the Dubacher-Muheim group adjoining. In the World's Fair group are nine claims, and the Dubacher - Muheim group, three claims. They are 3 miles below Bisbee.

Graham County.

The Santa Rosa M. Co. has been taken over by J. E. Thompson, of Clifton.

Maricopa County.

(Special Correspondence).—S. Taylor, at Cave Creek, is working his claims.—— Free-milling ore is being hauled from the Phœnix mountains to the power arrastra on the Broadway ditch, south of Salt river. The ore is from the claims of J. V. Creatb. —— Development work will be started this week on the New York group of claims, near Morristown.

Morristown, March 13.

The Oro Concentrating Co. has turned over all its interests in the Welcome group of mines, near Wickenburg, to the Rincon M. Co., says Manager Phillips. He is arranging to build a stamp mill on the mine.

Mohave County.

The Altata M. Co. of Chicago, Ill., which has been organized and taken over the Altata mine, near Chloride, has put in a hoisting plant and all water has been removed from the drifts and the mine cleaned of debris to the bottom of the 150-foot shaft. The ore body at the bottom of the shaft has widened to 6 feet, showing mill values. In the drift north from the bottom are 5 feet of ore. In the south drift the same ore is being opened up. In cleaning out the crosscut on this level three veins of silver-bearing ore were shown. On the surface are said to be five veins showing outcrops. The water from the mine is impregnated with copper, and iron buckets left in the mine are soon covered with metallic copper. It is proposed to build tanks and recover the copper in the water. The company proposes to put up a concentrating plant to handle the dumps and the lower grades of ore opened up in the mine.

Machinery is being added to the equipment of the Minnesota-Connor mines, near Chloride, in the mill for crushing and handling the harder ores.

W. H. Cushing of Topeka, Kan., president of the Stockton Hill M. Co., operating at Stockton Hill, near Cerbat, says it is proposed to put in a magnetic separator plant to separate the zinc from the lead and gangue. The company is working a few men on the mine and sinking will be resumed. M. Hughes is superintendent.

At the San Cloud mine of C. T. Kennan, near Signal, near the Yavapai line, work is progressing. Eight miners are on development. The mill, concentrator and cyanide plant will be finished by April 10. The mill will be one of five 1000-pound stamps and five more will be added later. The engine and machinery have been placed.

Owing to inability to get oil, the C. O. D. mine, at Stockton Hill near Kingman, has reconverted its furnaces into coal burners. The work of unwatering is still going ahead.

The Premier Con. M. Co., of St. Louis, Mo., has bought the Rattan-Ruth mines, in the San Francisco mining district, near Acme, and is preparing to remodel and add to the plant on the river for the reduction of its ores. It is proposed to make the mill of 100 tons daily capacity. A cyanide plant will be put in to handle tailings from mill, while an electric plant will be built for power purposes. A railroad connecting mine and mill will be built. The Rattan is opened by shaft to depth of 200 feet and bodies of milling ore opened up. At the bottom there is milling ore.

Pinal County.

(Special Correspondence).—The Troy-Manhattan M. Co., at Troy, has completed the Alice tunnel. They are in 1300 feet. In driving the tunnel a lead of high-grade ore, 14 feet in width, was cut. The Troy-Manhattan Co. is considering building a spur from the Phœnix & Eastern railroad at Kelvin to portal of Alice tunnel, a distance of 6 miles.

The Copper Butte Co., east of Florence, has completed a wagon road from the Gila river to their property. A 40 H. P. boiler and hoist are being set up at the mine. Contracts for several hundred cords of wood have been let.

Florence, March 13.

Santa Cruz County.

The American I. Dev. Co. has taken over the Mowry mine and other lead veins in Tyndal district, near Nogales, and will start operations. J. N. Curtis is manager. He is putting in two pumps to unwater the mine.

Yavapai County.

Manager L. Blakely of the Ramrod mill, in Weaver district, near Octave, says he has milled 500 tons of ore from the Ramrod mine. It is proposed to cyanide the tailings, which contain $10 gold per ton. The ore milled carried an average value of $50 per ton.

Manager Hickey, operating the Malpais group of claims under bond, near the Zonia and Farwell groups, 11 miles from Kirkland, says he is arranging to put up a hoisting plant and other machinery. Development is at a depth of 240 feet.—— Superintendent H. H. Cloud of the Farwell group of mining claims near Kirkland says work is progressing. Work was resumed last month and they have completed 80 feet of underground work, showing ore. A hoisting plant will be put in.

W. W. Lewis of Prescott of the Penn G. M. Co., says as soon as the Poland tunnel has been completed, which will be in June, it is expected the company will resume operations at the Mud Hole mine in Walker district.

It is reported the capacity of the United Verde smelter, at Jerome, will be increased from 1250 tons per day to 1750 tons by addition of a 500-ton furnace. The payroll contains names of 1000 men and more are to be added. Near the smelter a brick building is going up to be used for saving the gold and silver values that pass off in the smoke and dust from the furnaces. It will be connected with the smokestack of the smelter. The company has built a smelter on the Equator mine, 6 miles south of Jerome, and will blow it in as soon as a supply of fuel is at hand. The plant was finished about a week ago and is expected to be in operation within a week. The tramway connecting the mines and plant is in operation.

F. A. Davis of Prescott, who has taken over the Easy Boss mine in Copper mountain section, will start operations on development this week. The Arizona G. & C. Co. has been incorporated and the mine renamed the Heart of Arizona. It is intended to sink the shaft to a depth of 500 feet before doing any drifting or crosscutting. The shaft is down 85 feet. The mine is 4 miles from Mayer, making it easy of access to railroad transportation.

Yuma County.

(Special Correspondence). — Cinnabar has been found east of Ehrenburg, near the old camp of Plomoso. Samples have been shown carrying a fair percentage of quicksilver. The vein matter also carries chrysocolla, and was worked years ago by a French company for copper, the cinnabar being considered as red oxide of copper. A limited amount of development has been done.

Quartzsite, March 13.

CALIFORNIA.

Amador County.

At the Defender mine, at Defender, the mill continues in operation. It is expected to resume sinking. The mine has been opened to depth of 350 feet.

Butte County.

Manager Chittenden of the Golden West M. Co. has additional mining machinery on the ground for the company's mines at Lumpkin, near Oroville.

Calaveras County.

Reports from the Del Monte mine, near Railroad Flat, east of Mokelumne Hill, show the main tunnel was driven 64 feet during month of February, at a cost of $17 per foot. The mill was run on clean-up ore from the upper levels.

The Veith placer mine, near Mokelumne Hill, has been bonded to J. L. Green for two years. Work will start this month.

A strike of ore is reported made last week in the 1050-foot level of the Royal Con. mine at Hodson. A ledge 40 feet in width was opened up.

The forty stamps at the Carson Creek mine, south of Angels, were started last week, rock from the dump being used. The work of opening the old shaft will be started next month. Fourteen men are employed.

El Dorado County.

It is reported that a body of free milling ore has been opened in the Karolyi (formerly the Lady Emma) mine, 1 mile east of Kelsey, and the 10-stamp mill will be put in operation.

The New Highland G. & C. M. Co. has been granted a permit by the California Debris Commission to carry on hydraulicking at the Mameluke Hill mine, adjoining Georgetown. Men are laying pipe and water will be turned on this week. ——The Ancient Channel M. Co. has been incorporated by J. K. Phillips, F. J. Juchter, W. M. Cubery, G. R. Read and E. Johnson, all of San Francisco.

Work at the Witmer & Fuller mine, near Placerville, has been suspended temporarily, pending repairs to the shaft, preparatory to resuming sinking. The concentrates are being shipped.——Operations have been resumed at the Whim mine, near Brownsville, under direction of G. Estey.

Inyo County.

H. J. Lent and O. H. Hill are opening up a deposit of merchantable slate in the foothills 3 miles from Laws, says the Bishop Register. The deposit covers full area of the mining claim, 600 by 1500 feet. It is accessible by wagon road, which will assist shipping. The owners will sink a shaft 50 feet to get below the weathered surface material.

Kern County.

The annual report of the Associated Oil Co., operating in Kern county fields, and also at Coalinga, Fresno county, shows that the total sales of oil for the year ended December 31, 1903, amounted to $2,347,799; transportation cost, $1,226,200; value of oil on hand January 1 was $120,775; production expense, including repairs to improvements, buildings, etc., $339,714; administration expense, $57,536; oil purchases, $94,175. The production of the company has been increased during the year by 7000 barrels per day.

Mariposa County.

During month of February a total of thirty mining locations were filed in Mariposa county.

A bond on the Mountain King, Calendar, Whiteman's, Spring Hill and Mary mines, near Mariposa, has been given to H. C. Austin for $40,000. He will develop and operate them.

Nevada County.

The company of local men opening the New Eureka quartz claim at Canada Hill, near Nevada City, have started a new tunnel to tap the shaft at depth of 115 feet and 30 feet below the present tunnel level. They have been troubled with more water than the pump could handle.

The decision in the case of O'Brien vs. the Grass Valley Con. M. Co. was rendered last week in the Superior Court at Nevada City by Judge Nilon in favor of the plaintiff and puts O'Brien in full possession of the Green Mountain mine.

E. L. Labadie of the American R. & D. Co. of Grass Valley has a bond on the Hartery, Winfield Scott, South Extension of Hartery, Minnesota, Crœsus and Crœsus Extension, near Grass Valley, besides the Edison-Ancho mines of Graniteville.

At the Green Mountain mine, near Grass Valley, a number of improvements and changes will be made, the principal one being temporary abandonment of the Centennial, which the company has bought. The Centennial will be developed through the Green Mountain shaft. The Centennial has been unwatered and the vein examined. Surveys showed the bottom of the Green Mountain shaft to be lower than the Centennial. It is intended to run a drift south of the Green Mountain shaft to intersect the Centennial vein. The distance to be driven will be 400 feet. The mill of the company being on the Green Mountain, it will save construction of another, which would be necessary if the Centennial was worked through its own shaft. Water is in the Green Mountain shaft, and this has interfered with work. Another pump will be put in.

Bonney & Hurst, opening the Elsie mine on Rock creek, near Arbogast ranch, on Selby Flat, near Grass Valley, report progress. They are drifting on the 100-foot level north and south, and stoping out ore from the 2-foot ledge. The Huntington mill is running steadily during the day shift.

W. Bawden et al. of Grass Valley have a lease on a lead which runs through the Weed property, on Alta hill.

The 23-stamp mill at the Blue Tent drift mine, near Grass Valley, is in full operation, says Superintendent C. Graham. The mill is driven by water power under 650-foot head. A mile of steel pipe conducts the water from the reservoir to the wheel. Side-dumping cars of one-ton capacity are used. They dump automatically into the upper ore bin which holds 200 tons, from where the gravel is drawn through gates over grizzlies. It then drops into a 200-ton bin from which it is automatically fed to the batteries, and passes over amalgamated plates. Gravel is being taken from the first raise in the bedrock tunnel at distance of 1100 feet from the mouth. The two main gangways and a crosscut are being driven.

Plumas County.

Three shifts are steadily at work in the Wild Boar mine, near Quincy, seventeen men being employed in running an incline to strike bedrock. A large volume of water has been struck, making progress slow. A 4-inch pump is handling the water.——H., C. & A. Hewett and F. Talley have started hydraulic operations in their mine on Hopkins creek.——Men are at work in the Bunker Hill mine. A raise of 50 feet ahead of the first raise has struck gravel, with the bedrock pitching into the hill.——Superintendent J. Drumgold has started up the hydraulic mine owned by Donohue & Metcalf, at the head of Nelson creek.——The Colonial M. Co., on Nelson creek, has begun operations in its hydraulic mine. W. Spencer of Gibsonville is superintendent.

San Bernardino County.

W. Osborn, manager of the Arum mines, at Vanderbilt, has started development of the Irish-American group of mines south of Java, west of Needles, on which he has a bond.

San Diego County.

The Ranchita mill, near Banner, started crushing ore from the mine last week. C. J. Couts is owner. A 2½-foot paystreak has been opened, avoraging $50 per ton.

At Escondido the Cleveland-Pittsburg M. Co. has bought eleven acres adjoining the mine on the south. The stamp mill of the company started up again last week. Three hundred tons of ore are on the dump.

The lithia mines at Pala will renew operations of mining and resume shipments to the East.

Santa Barbara County.

The Graciosa Oil Co. reports its first well on its land in the northern part of Santa Barbara county, near Santa Maria, continuously flowing. A 2000-barrel tank has been filled from it in five days without pumping, the gravity of the oil being 28°. The company has a contract with the Pacific Oil & Transportation Co. to take the petroleum at 85 cents a barrel. The principal owners of the Graciosa are H. J. Crocker, M. Casey, B. Liebes and L. Phillips of San Francisco. The importance of the result to the general oil industry is that it has demonstrated the wisdom of deep boring for oil, says the Chronicle. The Graciosa property is 12 miles south of Santa Maria and 6 miles from the line of the Southern Pacific Railroad. It consists of 7000 acres under lease. The company took up the Harris ranch, and the Careaga ranch, adjoining,

was leased by the Western Union Oil Co. The latter began sinking wells and now has seventeen finished and producing from 700 to 1000 barrels of oil a day of gravity from 20° to 22°. Petroleum of this gravity was obtained at a depth of 2000 feet. The managers of the Graciosa sank four wells, but, though they reached a flow of light oil at 2000 feet, they continued one well down to the 3000-foot point, where they struck petroleum of 28° gravity. The second well on the Graciosa is down 700 feet and is expected to reach 3000 feet before May 1, and machinery for a third well has been ordered.

Siskiyou County.

A dredger will be built in the Klamath river for working the Garvey Bar mine, above the mouth of Humbug creek, near Gottville, says Superintendent La Schell. Garvey Bar is between the Pacific, McConnell, Kanaka, Swiss Bar, Centennial, Fort Jones and other river claims below and the American Bar and Ash Creek above.

W. E. Baldwin with Angels men has taken over the Finley & Johnson mine in White's gulch on Salmon river, near Etna. The vein is small and high grade. White's gulch is between Eddy's gulch, where are the Gold Ball and other properties, and China gulch, containing the Advance and Music groups. Besides the Finley & Johnson, the Lanky Bob, Swain, Newseme, Cleaver and Blaisicnz mines are on White's gulch.

The Cherry Hill M. Co. intends putting up a quartz mill at its group on Cherry creek, near Fort Jones, directly in front of its tunnel, to be run by electric power from the Siskiyou Electric Power Co. The mine will also be lighted by electricity and the drills operated by the same power. The ledge is 4 feet wide.

Work has been suspended at the McKinley quartz mine on Humbug creek, near Hawkinsville until April 1st, on account of 3½ feet of snow preventing operations.——The owners of placer claims throughout the county are cleaning out the gravel and debris sluiced in during the heavy freshets from late rain storms, and expect to start taking out gold dust, as there is an abundance of water for ground sluicing, hydraulicking and box sluicing.

Work has been resumed on the Mount Vernon quartz claims at the divide between Greenhorn and Cherry creeks, near Fort Jones.——Work was started last week in the Spengler claim, at the mouth of Humbug creek, near Hawkinsville, with A. Smith as superintendent. There will be considerable ground sluicing carried on for some time in removing the surface ground.

Trinity County.

At Dedrick the Mason & Thayer mine will put on men and resume work.——The Globe mine will start up this week, says Superintendent H. Ramdohr.——It is reported the Chloride will resume operations this month.

Tuolumne County.

The mill at the Duffield mine, near Carters, is in operation.

The App mine at Quartz, which has been closed on account of the strike, resumed operations last week with a few men.——J. Barry and E. Sharp of Stent have bought the Brown Bird mine, 2 miles from Stent, alse the Josephine mine, in the same section.

C. Sawyer of San Jose, who has a bond on the Doyle ranch gravel mine, near Columbia, proposes putting a mill on the property to crush the cement gravel prior to washing it.

At the Jumper mine at Stent the 80-stamp mill is running on ore raised to the surface through the Jumper shaft from both the Jumper and Golden Rule ground. A circular saw, used in making wedges out of waste timber, has been set up in the sawmill. A power drill sharpener, operated by compressed air, is in operation. New auxiliary steam heads have been attached to the generator engine and exhaust pipes for saving steam have been set up in connection with the auxiliary plant.

The canvas plant formerly used at the Confidence mine has been bought by the Black Oak M. Co. and will be put in at the Black Oak mine, near Soulsbyville. This plant does not require sweeping, being washed off with a hose.——Sinking is in progress at the Over mine on Saw Mill Flat, 2 miles southeast of Columbia. The shaft is being put down from the tunnel level, 1100 feet from the surface, and is down 60 feet. Sufficient gold is being obtained to pay expenses of the development work, says the Magnet. Pownall & Conlin are owners.

COLORADO.

(Special Correspondenco).—The water supply for the coming summer is causing uneasiness on the part of seme of the mine and mill operators throughout the State. The snowfall has been below the average in most sections. A large number of mills depend on the streams for power as well as for use in the mill. State Engineer L. G. Carpenter reports on the Cache la Poudre the snowfall is about normal; on the Grand river it is about one-half the usual ameunt at this time of year. At the head of the Platte it is light and on the Arkansas and tributaries it is light, running from 40% to 60% of the amount ordinarily found at this season of the year. There is, however, a larger amount of ice in the streams, some of the streams being entirely frozen up. He says that while the snowfall has been light up to date, the ground was fairly wet in the mountains when the first fall came in September, se that the mountain watersheds are in a condition to preserve water. During the month of April is usually the heaviest precipitation.

Martial law in Telluride district, San Miguel county, has been declared at an end. No further serious trouble is anticipated. During the past week affairs have been unsettled and unsatisfactory in Cripple Creek district. The Federation has called out all the lessees. Some of the lessees have been shipping ore to the so-called "unfair" mills, and by shutting down the mines it will shut off the ore supply to the mills.

Denver, March 14.

Boulder County.

The Sylvanite Tunnel Co., owned by Omaha, Neb., men, will put in steam and electric drills to drive the tunnel into Magnolia mountain, at Magnolia. The tunnel starts at a point above the Marchioness tunnel, near the level of Boulder creek. It has been driven for 300 feet. When completed the tunnel will be in about 6000 feet.

The Sparkling Jewel M. Co. has closed down its mine, near Sugar Loaf, to put in a plant of machinery. The company has opened a body of ore at 200 feet, showing 2 feet wide, which Superintendent Culver says runs three ounces gold per ton.

Clear Creek County.

(Special Correspondence).—The tailings plant to handle the tailings from the Newton mill is about completed and will be in operation next week.

Idaho Springs, March 14:

Work will be resumed in April on the Doric tunnel near Georgetown. It has been driven 3009 feet.

Drifting has been resumed in the ninth and tenth levels, west of the Sun and Moon mine, at Idaho Springs. Development work was suspended last October. Last month they resumed drifting east in the two lower levels. A few men are at work in the drift from the Newhouse tunnel, which is being cleaned out and retimbered.——Manager F. D. Wiley of the Chamberlain-Dillingham ore sampler gives the shipments for February at 105 cars, or 2100 tons, against 1520 tons for same month last year.

The Lead lode on Seaton mountain, near Georgetown, has been sold to J. D. Williamson for Denver and Eastern men for $30,000. The ores show gold and silver values.

Chaffee County.

A vein of graphite, 15 feet wide, is reported opened up by the Ethel Hold M. Co., 1 mile north of Cameron, in Turret district. Tests made show the mineral will run 35%.

Custer County.

The following Custer county properties have been consolidated as the Smoky City group, says the Times: Pittsburg, Duquesne, Chartier, Potomac, Monongahela, Pennsylvania, Allegheny, South Pioneer, Invincible. The company is composed of D. D. Moninger, C. P. Becker and E. H. Chase of Pittsburg, Pa. In addition to the above they own the Potomac millsite. They propose to increase work on these claims.

The large volume of water in the shaft of the Toledo mine, near Silver Cliff, is being pumped out by the Bassick G. M. Co., and is being used for steam and other operating purposes at the Bassick mill. A short time ago the Bassick was threatened with shortage of water.

Fremont County.

The New England Con. Oil Co., drilling for oil on Garden park, near Canon City, are 1800 feet deep and have reached the Trenton limestone, says the Times. The company expects to find oil at from 2000 to 2500 feet.

The Copper King F. G. M. Co., F. M. Cooper of Colorado Springs president, reports work will be pushed on a drift at the 200-foet level in the Copper King mine at Dawson, 6 miles from Canon City.

Gilpin County.

(Special Correspondence).—E. W. Williams, manager of the Champion-Trio M. & M. Co., is drifting in the Trio tunnel to connect the same with the 800-foot level of the Champion. Connection is expected to be made by April 10. More men will then be put to work in the mines. The connection will give them good air. Shipments are being made to Idaho Springs and Black Hawk. The Trio tunnel starts in Virginia canyon, on Bellevue mountain, 3½ miles from Central City.

Central City, March 13.

Grand County.

(Special Correspondence).—J. H. Harris & Co. are operating on Grand river, 22 miles from Welcott. They have twenty claims, which they have been working and developing the past five years, and have opened up ore. Assays show copper values. The Moffat Railroad is surveyed through the Red Gorge canyon, in which are these properties. Ore from the Big Dick, on the east side of the canyon, runs 2½% to 7½% copper, and they have also found native copper. Other mines are being developed in this section, but little of importance will be done until the advent of the railroad.

McCoy, March 13.

Gunnison County.

At the May-Mazeppa and North Star mines, near White Pine, the Akron M. Co., owners and operaters, with the 3700-foot drainage and transportation tunnel, after having drained the ore bodies, attaining a vertical depth of 700 feet, shows the veins continuing down, says the Times. They are advancing the main tunnel ahead toward the Eureka, Nest-Egg and Erie mines. Galena concentrates from the ores, sold on controls, show $17 gold, 20 ounces silver and 47% lead, associated with 13% iron excess. At the Eureka, Nest-Egg and Erie mines, adjoining the Akron company, Manager D. C. Tobin of Leadville is extending shafts and levels pending erection of a mill on Galena creek. These properties are owned and operated by the North American P. & M. Association of Denver, which has put in machinery on the Silver Trowel shaft of the Erie group.

Hinsdale County.

R. M. Collins and W. M. Mendenhall, who have been working the Monte Queen and Nellie M. group near Lake City, have leased the stamp mill on the site of the Croeke smelter and will mill the ore which they have broken and stripped during the development of their mines. The ground covered by the Monte Queen and Nellie M. properties is 1½ mile south of Lake City. Collins & Mendenhall have a bond and lease on the Pan-American group in Burrows park, near the Isolde mine and adjoining the World's Fair group, owned by the Dupre M. Co., owners of the Isolde. —— The Hanna M. Co. has begun mining and milling operations. The property is at Capitol City.

La Plata County.

The Neglected mine at Durango, in the east drift, at a distance of 650 feet from the shaft, is said to be showing 4 feet of ore from which a twenty-sack sample gave ten ounces gold per ton. This drift is on the 175-foot level. A raise was made 200 feet east of the new shaft on this level. The management claims the concentrates will average seven ounces gold per ton.

Larimer County.

New York men, with T. R. Countryman of Cripple Creek as superintendent, have begun construction of a copper matte smelter at Pearl. The plant will have daily capacity of 600 tons.

Mineral County.

The ore output of Creede Camp for the month of February was 6000 tons, of which 1400 tons was concentrates from the Humphreys & Solomon mills. There is reported a general improvement in all the mines of the district, more men being at work than during any period of last four years. The open winter has not retarded prospecting and development of outside property. Sinking the three-compartment shaft of the Captive-Inca mine has gone to depth of 500 feet. The Amethyst vein is expected to be cut. The increase of water necessitated a pump, and work is progressing satisfactorily.——The Corsair mine at Sunnyside, near Creede, continues steady output of 600 tons per month. During past two months they have been sinking the shaft for another lift. They are 60 feet below second level, and will start drifting on the vein at 75 feet. They are working twenty-five men, and the number will be increased during coming season. Lessees on the Nelson, which is extension of the Corsair on north, have struck ore, and will begin shipping this week. This mine is owned by F. G. Peck of Colorado Springs, and is being operated by C. W. Stump et al. The Alpha mine, also owned by F. G. Peck, has been leased to S. A. Gardanier, P. Bauer and E. Zender. After extending a raise 50 feet they struck a body of ore, and have shipped sixty tons.

Work on the Nelsen tunnel is progressing at rate of 2 feet a day, and another producer will be added to Creede's shipping list next month in the property of the Little Kanawha, which joins the United mines on the north. The tunnel will reach that ground by April 1. Ore will be taken out through the Nelson tunnel. Arrangements are about completed for sinking the Antlers Park-Regent shaft to intersect the Nelsen tunnel by the time the tunnel reaches that point. Present depth of shaft is 700 feet, and additional 900 feet of sinking will reach the tunnel level.

The lessees on the Monte Carle mine, near Creede, are shipping high-grade silver ore. This mine is on Campbell mountain.——R. S. Light, manager of the Mollie S. mine, is building an aerial tram from the wagon road to the mine, which will be completed by April 1.

Park County.

(Special Correspondence).—The Almaden M. Co. is driving a 1500-foot crosscut tunnel. The veins they expect to open up have produced ore in the upper levels. They have 135 acres. The tunnel is in over 400 feet and two shifts are at work. They will put in a plant of machinery this spring. As soon as the ore body is opened up they will build a mill. The group is in Montgomery gulch above the Peabody placers, 4 miles from Como.

Como, March 13.

Pitkin County.

The Durant M. Co. has taken over the A. J. mine at Aspen and has begun operations, with J. Newman as superintendent. About 20 feet above the seventh level of the A. J., a drift will be started and will be driven through the ground of the A. J., the Spar Con. M. Co. and the Enterprise M. Co. This drift will cut the ore bodies of these properties 285 feet lower than the lowest workings of the Deep Shaft.

Rio Grande County.

It is reported the Golden Income M. Co at Embargo, near Del Norte, propose to put in a 25-ton mill this season. —— The Tornado M. Co., which has a shaft on Ternado hill, will increase development.

San Miguel County.

Work is progressing on the Invincible G. & S. M. Co. mines in Mount Wilson district, says J. A. Ross of Denver, president. The company owns 200 acres of patented ground on Mount Wilson, with a total development of 5000 feet, showing free milling ore. The company has placed a sawmill on the ground, 160 acres of which is covered by heavy timber, from which lumber has been sawed for building a concentrator this season.

Summit County.

The Fair-Stouffer lease on the Gold Dust mine, near Breckenridge, is taking out ore. After doing considerable dead work, retimbering, etc., and then driving ahead several hundred feet, the lessees started to stope on one of the small streaks of ore.——The Germania lessees continue to take out smelting grade ore from the upper tunnel. The ore is said to average 80 ounces in silver, with some gold and from 5% to 6% in lead.——Since completing the air connection by driving the raise of the lower tunnel into the winze from the upper tunnel, Moon, Weaver & Kerse, who are working the Carbonate, are in 18 inches of lead ore that runs in gold and silver. The property is on Mount Baldy, above timberline. ——The 150-foot level of the Old Union M. & M. Co. has been started. The sump below the proposed 150-foot level is completed. From the stope of the 100-foot level lead-silver-gold ore is being shipped.

The Jessie 40-stamp and concentration mill at Breckenridge is running on ore from the lower tunnel. Twenty stamps are dropping. As the water supply increases the balance will be used. The preperty is operated by T. R. Griffith & Co. under an eighteen months' lease. They retimbered and cleaned out old workings to get the property in shape to produce. Concentrating tables are used at the Jessie mill. At the Providence-Colorado group, on the eastern slope of Gibson hill, development is pregressing. The 13-foot vein will supply tennage as soon as the company builds a concentrating plant to handle the product, says Superintendent H. S. Whitehead.

Teller County.

Lessee Duncan et al. operating under lease the Teutonic claims on Ironclad hill, Cripple Creek, have finished putting in a steam plant and hoist. It is intention of lessees to continue sinking until they reach depth of 500 feet. The shaft is down 125 feet from surface. The property is adjacent to the W. P. H. claim.

Equipment of the Homestake cyanide mill on Ironclad hill, Cripple Creek, owned and operated by the Homestake M. & R. Co., will be increased by putting in a 100-ton crusher. With additional tank capacity, which will go in later, this crusher will increase the capacity of the mill to 1000 tons daily. The present capacity is 200 tons daily, but ground is being broken for additional machinery, which will increase it to 700 tons daily.

Three hundred and fifty union miners working in the Midget and Medoc mines, at Cripple Creek, and on various leased properties went on strike on the 12th

inst., having been called out by the Western Federation of Miners, because of shipments of ore to mills and smelters that has been declared "unfair" for failure to grant an eight-hour day. Col. E. Verdeckberg, in military command of the district, has resumed use of the "bull-pen."

IDAHO.

Boise County.

The Lincoln mine at Pearl has shut down owing to large amount of concentrates on hand, which the company cannot haul to railroad on account of poor condition of roads—its storage capacity being limited.

Blaine County.

The Union Standard G. Co. has been incorporated, with principal office at Huron, S. D., to operate near Hailey, by C. F. Heckler, H. L. Moyer, H. E. Crilly, F. Reeder, H. D. Heller, E. L. Sander of Philadelphia, Pa., P. Lawrence of Huron, S. D., and A. L. Sargent and M. H. Lawrence.

Shoshone County.

The three dredgers near Delta are expected to be in full operation the coming season. One is owned by the Mascot G. M. Co., another by the Delta G. M. Co., the third by the Northern G. M. Co. These companies own the lower part of Trail creek and Beaver creek from its junction with Trail to the north fork of the Cœur d'Alene river. The capacity of these dredgers is from 1200 to 1500 cubic yards per twenty-four hours. An estimate of the cost of handling a cubic yard of that ground is 10 cents. The dredgers are equipped with steam power, but later electric power may be substituted.

The Annadora M. Co. has been incorporated at Wallace by R. V. Largent, T. McGowan, L. J. Columbus, W. S. Sites and C. T. Fisher. The properties of the company are in the Beaver mining district.

Ore is reported opened up on the Chester mine, between Big Creek and Osburn, consisting of galena. The vein is 2 feet wide, half of which is said to be galena. The mine is owned by Webb brothers, C. H. Wentz and S. P. Fairweather. The drift from which this ore was taken is 1000 feet long. They will raise to connect with the bottom of a surface shaft.

KANSAS.

Cherokee County.

At Baxter Springs, J. T. McRue of Parkville, Mo., part owner in mines south of Baxter, is increasing work on the Gaines-Brewster tract. He is putting down a shaft where drill holes showed ore. His mine will be known as the Mary Torrance, and is west and joining the Mission mine.——The work of putting in the large crusher plant at the Sunny Side mine is progressing.——T. Goodwin of Ottawa has leased the Mary Buck farm and is putting down several drill holes.

MICHIGAN.

Honghton County.

The strike of the miners of the Copper Range Con. C. Co. mines at and near Painesdale was declared off on the 11th inst., and work is resuming. Changes being made at the Baltic mill are expected to increase its capacity to 2400 tons of rock daily, an average of 600 tons to a head.

At the Centennial mine, near Calumet, they have been sinking under way at No. 2 shaft.

Keweenaw County.

The annual report of the Allouez M. Co., operating at Allouez, shows receipts $115,360, expenditures $102,221. President Fay says the further development of the conglomerate in the first part of the year was encouraging, and a continuance of this work was desired, but so many obstacles were encountered in sinking through sand to the rock in No. 1 Kearsarge shaft, and these so increased the cost that it seemed best to confine their efforts for the present to work at that shaft. The difficulties were finally overcome and since securing control of the water flowing into the shaft the average monthly sinking has been such that it is expected the Kearsarge lode will be reached in the coming autumn. A second shaft will be sunk 1700 feet from No. 1, and this shaft will be started as soon as the snow is off the ground. Superintendent Chynoweth says that since his last report 330 feet of ground have been opened on the Allouez conglomerate on the eighteenth and nineteenth levels, but, although a large part of this ground was well mineralized and gave no indication of decreasing in value, it was decided to stop work at this point for the time and devote attention to the new shaft for reaching the Kearsarge lode, which underlies 640 acres of the Allouez property. The Kearsarge lode has been developed at considerable depth directly south of the Allouez, where it is yielding a large amount of copper, and operations to the north and east of the Allouez on this formation are of the same character. With No. 2 shaft down to the lode and sufficient ground opened up, 2000 tons of rock per day can be furnished to the mill.

MISSOURI.

Jasper County.

In Webb City and Carterville section W. H. Smith & Co., who have been prospecting the Zulu G lots on Center Creek M. Co. land with a drill, are reported to have made a strike of ore last week at 160 feet.——The Premier Lead & Zinc Co., on the Guinn land, north of Webb City, after sinking to depth of 157 feet suspended operations temporarily on account of heavy water. Manager Beckwith states he has set a 3-inch and 6-inch discharge pump in the pump station cut and sinking has resumed.——E. Church & Co., in sinking in the Dunlap shaft, on the Luscombe land, at 170 feet, broke into a lead and jack body in sheet ground. The ground is not so hard but that it can be worked with hand steel. This company has six lots adjoining the Blue Wing and the Osage, which are producers. They expect to have a mill built as soon as they get the ground in shape.

The Preble Zinc Co. of Joplin has been incorporated by G. W. Houk, J. Ulrich, J. D. Flory, M. J. Flory and J. H. Cape. ——The Ruby M. Co. on the High Ball lease at Duenweg has started the mill, with S. Pankin of Joplin as superintendent. Last week's turning was 62,000 pounds of blende and 37,000 of lead.——J. Dinkelhihler is opening two new mines on the Dinkelhihler lease of the Joplin district. The Ivanhoe M. Co. on said lease has overhauled its machinery.

MONTANA.

Fergus County.

The Barnes-King M. Co. at Kendall continues steady work and production. The tank capacity in the Barnes-King has been increased by the addition of an ore tank 32 feet in diameter and 6 feet deep, which has a holding capacity of 210 tons. It will increase the daily capacity of the mill 30 tons. Among other improvements at these mines the hoist house has been completed and the ore bin at the mill has been increased in capacity, holding 200 tons. In the Barnes-King mines the bottom of the incline shaft is 400 feet below the apex of the ore. From the 200-foot level the incline is down 120 feet and is in ore all the way. Ore for the mill is being taken from the open cut and the 100-foot level. Timber for the Barnes-King mines is being cut on Deer creek and other points in the Judith range. The mines have ninety-five men on the payroll.

Jefferson County.

The property of the Overland Con. G. M. Co., in the northern part of Jefferson county and near East Helena, consisting of the Overland claim, the Gold Bug quartz claim, millsite and water rights on McClellan creek, have been sold at sheriff's sale to Caird & Hawksworth of Helena.

The Basin Comstock M. Co., composed of G. W. Brandon, C. Sturtevant, W. A. Kidney and A. S. Ray, the last named being manager, continues operating its group of claims in the copper belt in Cataract district, near Basin. The Comstock Co. has been working continuously on the Boulder Comstock mine the past eight months. A shaft has been sunk on it 315 feet, where a ledge of concentrating copper ore has been opened up. The company intends to put in heavier machinery and sink the main shaft 300 feet farther, and on completion of that work a mill for the concentration of the ores will be built.

Madison County.

The Champion mine, adjoining the Watseka mine, near Rochester, has struck shipping ore on the 250-foot level, and as soon as the surface water recedes sinking to the 500-foot level will begin. Twenty-five men are at work in the mine, drifting and crosscutting, under the management of E. Hand.——Crosscutting continues at the Big Bonanza mine, near Rochester. Sinking will begin again and will be taken to the 400-foot level. This mine is also under the management of E. Hand.

Teton County.

The Belly River Oil & Improvement Co. has been incorporated, with the main office in Shelby, by C. M. Webster, S. H. Wood of Great Falls, W. Dawes of Shelby, H. Beaupre, J. A. Kennedy, P. Younck and J. H. Boucher.

NEVADA.

Humboldt County.

High-grade ore is reported opened up in the James Fraser mines, in Down Valley district on the border of Humboldt and Washoe counties, north of Reno.

Douglas County.

A deposit of topaz is reported found near Lake Tahoe.

Lincoln County.

(Special Correspondence).—The Searchlight M. & M. Co. is down 250 feet in the working shaft, and expects to reach water level this month.——A bond for $40,000 has been taken on the Black Hawk group, consisting of three claims, by J. N. Williams of Boulder, Colo., with J. M. Yates as manager. Work has started.

The second level has been reached on the Pompeii mine, with encouraging results.——Work on the Cyrus Noble mine is temporarily closed. They expect to put up a mill this summer.

The New Era M. Co. will have its 10-stamp mill completed this month.——A crosscut has been made from one of the Empire tunnels at Newberry mountain, and the ledge was found 21 feet wide. The tunnel is in 110 feet, at depth of 100 feet from the surface, and in high-grade ore.

Searchlight, March 12.

The Southern Nevada M. Co. is preparing to put in a 100-ton cyanide plant at Searchlight to treat its stamp mill tailings.

Additional machinery is on the ground for the Quartette M. Co. at Searchlight, including an electric plant. A power house will be built west of the mill. A pumping plant is also to be set up. A triplex station pump will be placed on the 700-foot level and a Cornish pump will be used for sinking. Both pumps will be operated by electric motors. Ten tons of cement will be used for construction of the mortar blocks for the ten additional stamps which will be added to the mill. To increase the water supply a series of 14-foot settling tanks will be set up above the mill.——The Cyrus Noble mine has resumed operations after a brief shutdown. A drift and upraise are being run on the 300-foot level.

At Camp Duncan, near Searchlight, the Dupont tunnel is in 220 feet and is showing values. The tunnel is being run not only to tap the main east and west lead, but also the intersection of the north and south leads—three in number. During the last four years Dupont has made several shipments of ore from them.——Work is going ahead on the Peek-a-Boo tunnel, and on the O. K. a shaft is being sunk.——The Empire Co. has begun operations on the Woods mine, doing preliminary work preparatory to sinking. E. K. Woods is superintendent.

Storey County.

A plant is being built at the Morgan mill on the Carson river, near Virginia City, for working slimes, says Manager Rand. The Comstock M. & M. Co. has sold Rand 10,000 tons of slimes, which are said to carry values of $5 to $6. He will use four tanks 26 feet in diameter and 10 feet deep.

NEW MEXICO.

Grant County.

Last week forty men began grading for the foundation of the concentrator for the Burro Mountain C. Co., near Silver City. T. Carter is manager. The mill will be beyond the Sampson mine and midway between that property and the St. Louis, both of which mines are under control of the company. Daily capacity of the concentrator will be 150 tons. It is intended to have the mill completed next month. A new shaft will be sunk on the Sampson, near the end line of the St. Louis.

The Burro Mountain smelter (Johnson's smelter), near Silver City, was blown in this week. Coke is being hauled from Silver City to the smelter. The electric light plant is in operation. About 100 men will be worked on the Virginia mine and smelter. L. Osmer and E. J. Prest have put men at work on their group of claims at Gold Gulch. They are down 75 feet on the Myrtle and will crosscut at depth of 100 feet. A pumping plant will be put in to handle the water, which is giving difficulty.

R. L. Berkey of El Paso, Texas, has a lease and bond on the Robert E. Lee mine, south of Lordsburg, and Superintendent C. M. Berkey is putting in a pump to unwater the mine.

Otero County.

S. O. Smith is taking out ore from the Little Anna mine at Jarilla.——J. Taylor has put men to work on his lead property in Jarilla.——E. A. Hersperger has men at work on the Garnett mine at Jarilla. Shipments are being made. The steam hoisting machinery for the Three Bears mine at Jarilla is being set up.——Culver & Downs are down 200 feet on their mine at Jarilla. Besides indications of ore there are also indications of water, which is as desirable as a gold strike.

Socorro County.

The Dividend M. & M. Co. is building a smelter at Estey City, with an electric copper plant, in which the ores from the company's properties will be tested, as well as to do custom work. O. A. Henninger is superintendent. The company is laying a pipe line to a spring in the Oscuro mountains. This will supply water until they have sunk a deep well at the mill. Development on the claims is said to be showing fissure veins carrying copper. Teams are hauling the ore to the mill. The company is building roads from claims to mill.

The Martin mill at Rosedale is working steadily. The Golden Bell Co. has men at work and considerable prospecting and development work is reported being done in the camp.

OREGON.

Baker County.

In Virtue district, near Baker City, the Emma mine has been working all winter and putting out bullion, says Manager W. L. Vinson. He has made arrangements to enlarge the working plant of the mine and to continue the tunnel, which is in 135 feet. The work is being done by compressed air drills, which will be driven by electricity. Contract has been let for an electric power line from the Rock Creek Co. of Baker City. Vinson also proposes increasing his mill capacity. The mine will be lighted by electricity. Poles for the transmission line to the Emma mine will be started this week.

In Cable Cove district, near Sumpter, the Valley Queen mine has made progress during the winter, says manager T. C. Gray. He expects to increase the plant and double the output. A mill is also proposed.

Arrangements for extending the transmission line of the Rock Creek electric power plant to the mines around Bourne have been completed. From Bourne the line will be extended to all the principal mines in Cracker Creek district. The fuel problem has been a matter of serious consideration on the part of the mine owners, says the Telegram. Fuel is not only scarce and high priced, but the expense of transporting wood to the mills and hoisting works is almost prohibitive in instances. With electric power available the location of a mill or hoist will not have to be made with reference to fuel supply.

Full operations are under way at the Columbia mine, near Sumpter, on the 700-foot level. The management of the Columbia is also developing under contract the Taber Fraction. Operations on that mine are carried on through tunnel No. 1 of the Columbia.

Grant County.

Manager C. L. Cox is preparing to start operations on the Buffalo mine, near Granite. It is intended to extend the crosscut on lower level to the Buffalo vein which is expected to catch in the next 50 feet. Cox is working his Olive Butte group, near Alamo.

Douglas County.

E. Jenks, owner of the Arrastra and Baltimore groups of mines near Bohemia, says there has been considerable work going on in the district this winter, notably on the Vesuvius group, the Crystal Con., Bohemia group and North Fairview group. The Crystal Con. Co. has been working all winter and has its 5-stamp mill ready to run. The Oregon Securities Co. operations have been shut down since January, but it expects to resume development work this month. The company's Musick mine is blocked with ore, which can not be put in the dump on account of the snow. It has a 30-stamp mill ready to run and room for twenty stamps more, which will be added in the spring.——The North Fairview Co., which has its office in Eugene, has also been working. The Bohemia Co. has continued to drive. It has from 1200 to 1500 feet of tunnel on its group. Superintendent Jenks says, besides the extra twenty stamps to be added to the Oregon Securities mill, preparations are being made for a mill on the Vesuvius and Oregon-Colorado mines during the coming summer.——Trains on the railroad from Cottage Grove to the mines are making one trip a day regularly (except Sunday). The last bridge has been completed and the road will be built farther on into the mines.——Besides the companies mentioned, there are a number of individual claims which have been worked by their owners.

Corvallis men have organized the Twin Rocks G. M. & M. Co. to operate in Bohemia district. The directors are L. and W. B. Hartley, Wallace Hartley, S. R. May and G. B. Spitler. The property of the company consists of nine claims with free-gold prospects.

Jackson County.

M. P. Ward of Portland, part owner of the Millionaire mine, near Gold Hill, says he is increasing the number of men at work. It is the intention of Ward and associates to carry on work and build a plant this season. The property is free-milling and a stamp mill will be put up.

SOUTH DAKOTA.

Lawrence County.

The Trent M. Co. is working men on its group near Carbonate camp, having

started a new tunnel. The Trent grouud is near the Iron Hill mine.

The Deadwood Standard G. M. Co., operating in Ragged Top section, near Lead, will build a wiro rope tramway for delivery of oro at its mill. Additional ore bodies have been opened up. Tho company's cyanide mill is ready fur operation.

Tho cyanide plant at the Buxton and Big Bonanza mines, near Terry, is in operation, handling eighty tons of ore per day. The plant is operated by electricity. The aerial ropo tramway is run by electricity, delivering ore from tho Buxton mine. It is 1200 feot long and crosses Novada gulch. Ore from the Big Bonanza is convoyod to top of mill in cars. The Buxton and Big Bunanza minos are owned by J. Lundborg, J. V. Dorr and A. D. Wilson.

Development is progressing by the Globe G. M. Co., on its group in Nevada gulch, near tho Homestake mincs. They are drifting west from the bottom of the shaft (500-foot level). Surface improvements include hoist with capacity for 1200 feet, air compressor, machine drills, pumps, sawmill, etc. Power is furnished hy gasoline ongines, of which the company has five.

It is expected the additional stamps being installed at the Amicus mill of the Homestake M. Co. at Lead will be in operation by June 1. A portion of tbe macbinery is in place, and work of enlarging the cyanide plant is well under way.—— Tbe additional machinery for the Hidden Treasure G. M. Co. on upper Deadwood gulch, near Deadwood. is in position, and sinking will be resumed in tbe shaft. Tbe plant consists of a gasoline engine, designed to operate a dynamo, by which lights will be furnished about the works and electricity generated for running an olectric drill. The shaft has been started from a drift level at 150 feet below surface, whore a chamber has been cut 35 feet in height. Gasoline machinery will be used for sinking this shaft for several months until a steam hoist is put in. The steam hoist plant will go on top of the hill, directly over the present shaft, from which a raise will be made, says W. Lawlor, superintendent.

UTAH.

Carbon County.

The American Rubber & Asphaltum Co. of Chicago, Ill., bas put in plant of machinery at the Pariette gilsonite mines, 100 milos northeast of Price, and on edge of the Uintah reservation, besides timbering the main shaft of the Pariette down 300 feet.

Juab County.

Preparations are being made for starting the 40-ton cyanide mill in Clifton mining district, says Manager Chipman. For a year past efforts have been directed towards development of the mine. During last run of mill, which was closed down, due to scarcity of water, $10,000 was cleaned ı p, extraction running 90%, with average value of heads $20 per ton. The water problem, Cbipman states, has been solved. The Midas mine is 25 miles west of Fish Springs, and near Canyon Station.

The Gemini mine at Tintic, near Eureka, is producing an average of twenty carloads of ore per week, the heaviest output attained since the fire, which caused a suspension of operations.

The pay of machine men and muckers at the Gemini mine, near Eureka, has been increased 25 cents per day, making the former $3 per day and the latter $2.25, says Superintendent McChrystal. About 100 men are on the payroll of the Gemini.

Salt Lake County.

C. L. Dignowity of Boston, Mass., delivered a lecture to the students of the Mining Club of Harvard at Cambridge, Mass., on March 3d. His subject covered "The Great Bingham Mining Camp of Utah," in which he showed how its ores existed, how they were mined and reduced to metallic form, and what development had taken place there within a few years, changing its output from a silver-lead to that of copper and gold, showing the camp to be annually yielding 800,000 tons of ore, a total yearly profit equal to 10% upon $50,000,000 valuation.

Work has been resumed at the Galena mine at Bingham, and the shaft, which is 235 feet deep, will be driven down to the 500-foot level, from which station prospecting will be started.

The Ohio C. Co.'s mill at Bingham has resumed operations on its second-class product. The first-class ore is shipped to the valley smelters.

Tooele County.

The output of concentrates continues from the Ophir Hill mines and mill of W. A. Clark of Butte, Mont.

It is reported the management of the Buckhorn mines at Ophir proposes building a tramway at the mine for transportation of ore.

WASHINGTON.

Ferry County.

Reports from the Moteor, on south half of the Colville reservation, says mining wurk is progressing in that camp. The tunnol being run into east side of Stray Dog canyon is going ahead. It is proposed to crosscut ledgos, the farthest away of which is 1 mile from portal of tunnel. Tho Several is being worked at 250 feet in depth and is shuwing ore. The White Swan has comploted a tunnel which crosscuts the east and west ledge. ——The Whito Rose has increased its equipment.——The Meteor, the Dead Shot and the Raspberry, besides a number of other properties, are proparing to resume operations.

Franklin County.

The Pasco Fine Gold Co. is putting up a 5 H. P. ongine, with other machinery, including several hundred feot of 6-inch hose, for extracting gold from the black sands, at Pasco. Experiments are said to bave been successful.

FOREIGN.

AFRICA.

Congo Free State.

Engineer Adams, for the Tanganyika Concessions, operating near Kambove, reports developments on the Ruwe Gold Hill mine in Katanga are satisfactory. Each of the three shafts being sunk along course of reef for length of 800 feet have entered the gold-bearing standstone, and it is found to be regular. Shaft No. 1 is 47 feet, No. 3, 41 feet and No. 5, 42 feet in depth, giving backs on dip of 100 feet. Free gold and gold-bearing sulphides are shown. Adams further reports he is prospecting surface dirt near outcrop and has sunk fourteen holes to hardpan (about 2 feet) for a distance of 445 feet, and 3500 pounds of dirt from these holes panned 3 ounces 17 dwts. 17 grains of coarse gold, besides fine gold and sulphides. Some of the pieces weigh 2 to 6 dwts. At the Kansanshi mine of the company in Northwestern Rhodesia, the report estimates that in reefs D and E above the 80-foot level there are in sight 53,000 tons of ore of average value of 17% copper, 3 dwts. gold and 7 dwts. silver. Of tbe six smaller veins exposed in main crosscut being extended across the mine eastward from shaft E, one vein is 3 feet wide and of sulphide ore assaying 25% copper and 2 dwts. gold.

AUSTRALIA.

New South Wales.

The cost of production at the Central mine, Broken Hill, during the year ended June 30, 1903, is shown by the annual report to be £4 2s 7½d per ton of concentrates obtained, as against £3 14s 8d per ton during the preceding year. The extra expense arose from the "creep" at the mine and the infiltration of water from an adjoining property.

BRITISH COLUMBIA.

Boundary District.

Estimates show 1300 men employed in the mines and smelters of Boundary district, including those directly employed in the ore carrying from the mines to the smelters, says the News-Advertiser. As a number of properties are not now working that are expected to be operated this spring, it is expected the number will be increased.

Mines.	Men.	Wages.
Granby Mines	400	$40,000
Athelstan	25	2,500
Mother Lode	100	10,000
Emma	34	3,500
Oro Denoro	30	3,000
Providence	35	3,500
Elkhorn	14	1,400
Senator	14	1,400
Miscellaneous	50	5,000
Granby Smelter	300	30,000
Mother Lode Smelter	150	15,000
Train crews	150	25,000
Totals	1,302	$140,300

All miners in the Boundary district receive $3.50 per day of eight hours under ground or ten hours above ground, while muckers receive $3 for corresponding time. The railway train crews work longer hours and receive extra for overtime.

The British Columbia C. Co. is adding to its plant and machinery at both its Mother Lode mine, near Greenwood, and its smelter at Greenwood. A second crusher is on the ground. In connection with the installation of this crusher, improvements are being made at tbe mine which will result in more expeditious handling of large quantities of ore. At the smelter the buildings for housing the converter plant are finished. One of these is built of steel, on mansonry piers and covered with corrugated iron. The main building is 45 feet by 90 feet and 38 feet height, and an extension is 30 feet in width and 60 feet in length. The machinery is slow in arriving. The blowing engine is arranged for running by either steam or electricity. The brick sub-station for stepping down the electric current to be received at 22,000 volts is ready for use as soon as tho transformers are received. A brick smokestack 122 feet in beight has been built. J. E. McAllister is superintendent of tbe smelter, with G. Williams construction engineer.

The Chicago-Phœnix M. Co. has been organized in Chicago, Ill., to operate the Nellie Cotton group of claims at Phœnix. Tho Nellie Cotton gruup consists of the Nellie Cotton and Mystic mineral claims, south of tho Knob Hill mine. Most of tho work has been doue on the Nellie Cotton, where there is a showing of pyrrhotite. A machinory plant will be put in and H. J. Cole of Spokane, Wash., will be manager.

The Bruce, near Midway, near Phœnix, has been bonded by F. Keffer, manager, and J. E. McAllister, smelter superintendent, of tbe British Columbia C. Co. at Greenwood, for $50,000, for eighteen months. Considorable development work is done on the property and it has a tunnel several hundred feet in length. It is near the Canadian Pacific Railway, and it is proposed to connect the mine with the railway by a tramway.

The Athelstan Co. is arranging to reorganize and consolidate the Athelstan-Jackpot group in Wellington camp with its holdings. Work and shipments will be resumed April 1.——On the Don Pedro claim, one of the Lake group, being operated by the Chicago-British Columbia M. Co., the contractors for 100 feet of sinking have depth of 60 feet, the shaft being well timbered and sinking being on high-grade ore.

The British Columbia C. Co. has issued a circular to stockholders announcing the abandonment of its plans to consolidate with the Snowshoe mine near Greenwood. It also says improved conditions in the property render failure of the consolidation plan of no great consequence. The blast furnaces are in full operation, with ample ore supplies. Converting and electrical plants are approacbing completion.

Cassiar District.

The coming season is expected to increase operations in Atlin section. The British-American M. Co., with headquarters at Philadelphia, Pa., will have two dredgers in operation. The company last year put in a dredger and intends to start it on Gold Run about April 1. It will also build another dredger on its ground at Tar Flats, 2 miles above Discovery, on north side of Pine creek.——J. M. Ruffner is negotiating an amalgamation of the Pine Creek Power Co. and Stevendyke & Deek's group of leases on south side of Pine creek, above Discovery.——Seattle, Wasb., people have taken over the Con. Spruce Creek placers and has merged it with the Spruce Creek Power Co. They will complete the plant. The Denny-Blaine L. Co., N. H. Latimer, G. B. Gaddis et al. of Monmouth and Avon, Ill., are interested.——A consolidation of interests on McKee creek is also planned, the Atlin M. Co., the Con. M. Co. and the Hawkins-Christopher leases being in the deal. If the merger goes through it may also embrace the Birch Creek Hydraulic Co.

East Kootenay District.

It is expected the St. Eugene mine, near Fort Steele, will be put in operation again next month.

The Nip and Tuck placers on Wild Horse creek, near Fort Steele, owned by D. Griffith, have been leased to a Chinese company. Considerable preparatory work is being done. Pipe lines are being laid and flumes built. This company will operate two giants during the coming season.——A Chinese company will work on the hillside above the Nip and Tuck. They are also making preparations to start piping.——Several Chinese outfits will work the channel of Wild Horse creek, some have wing dams and another outfit will flume the creek near the mouth of Brewery creek, as this ground has never been worked and is too narrow to wing dam, says the Prospector.

Rossland District.

Le Roi Two oil concentrator was closed down last week awaiting arrival of a delayed car of oil, which was held up by a snow blockade in tbe East. The plant is expected to be in full operation again next week.

Vancouver Island.

During month of February the Tyee mine at Mount Sicker shipped 500 tons to the Ladysmith smelter. The average cost of mining and transporting the ore is $2.25 per ton.——During Febraury the Marble Bay mines, on Texada island, sent 3414 tons to the Crofton smelter. Of this 1124 tons were first class ore and 2290 tons were of second class. The first-class ore was from the north stope of the 460-foot level.——The Copper Queen, on Texada island, has joined the list of shippers. It is one of the Van Anda M. Co. claims. G. L. Mackenzie, manager, is increasing development on the group.

Slocan.

The following are total ore shipments from Sandon fur January and February:

SILVER-LEAD.

Mine.	Total Tons.
Ruth	232
Blue Bird	20
Slocan Star	262
Ivanhoe	121
Reco	301
Last Chance	101
Payne	204
Sunset	145
Mountain Con	27
Sovereign	41
Idaho	80
Monitor	20
Cinderella, Medford	120
Total	1,664

ZINC.

Ivanhoe	99
Payne	357
Total	456

The silver-lead and zinc mines around Sandon have sent out so far this year 1500 tons of the former ore and 500 tons of zinc. The shipments of zinc ore have been confined to the Payne and the Ivanhoe. This is chiefly due to the fact that the lead bounty provided by the Dominion Government is now obtainable. The Slocan Star, Reco, Payne and Ruth are the chief producers of silver-load ore. The Star has sbipped 250 tons of high-grade ore, the Reco 300 tons, tbe Payne 230 tons and the Ruth 162 tons. The zinc from the Payne mine has beeu sent to Iola, Kan. It assays 55% to 58% zinc, twelve ounces silver and 5% iron. The ore is free from lime and manganese and is the product of the magnetic separator. Magnets of a heavier type than the ones now in use are being put in in order to bring the ore up to a 60% grade, with 1% iron and from twelve to fifteen ounces silver. The Slocan Star has zinc, but is not sending it out. The Payne mine is reported to have a contract with a company of Halderstadt, Germany, for 2500 tons of zinc. The ore will be shipped in bulk and will comprise most of the year's output of tbe Payne. More men have been added to the number at work at the Ivanhoe mine, there being sixty-five on the payroll.

There will be three reduction works built in the Kooteneys, two will be for zinc and one for lead, says F. Ferneau, of Newcastle-on-Tyne, England. A zinc enriching plant, a zinc reduction mill, and a lead smelter for the reduction of wet ores are proposed. The zinc plants will he started as soon as the snow is off the ground. The zinc enriching plant is to be built by the Monitor & Ajax Co., at the head of Slocan lake, near Slocan City. The ordinary zinc concentrates, which can be turned out of most Slocan mines, will be enriched by maguetic process to a percentage which will stand exportation or treatment at British Columbia reduction works. The location of the latter plant has not yet been decided on. Ferneau estimates that the mines of the Slocan will turn out zinc concentrates averaging 40%. In the enriching mill, the percentage will be increased to 55 and upwards.

West Kootenay District.

The Spokane Falls Placer Co. has been organized to work ground on Lardeau creek, near Trout lake, by A. E. Shepherd, J. P. Mix and J. B. Campbell of Minneapolis, Minn. The company has a five-year lease of ½ mile of the creek and also a water right for hydraulic purposes. It is intended to dam the Lardeau at mouth of the canyon, ¾ of a mile from Trout lake, and from there build a flume which will deliver the tailings directly into Trout lake.

CANADA.

Imports of mining machinery into Canada during 1903 were large, the total value being $1,281,185, says the Vancouver News-Advertiser. Most of the machinery imported was supplied by manufacturers in the United States, the value of tbe imports from this source being $1,206,405, while from Great Britain machinery to tbe value of $61,425 was imported. Great Britain supplied Canada last year with nearly double tbe quantity of wire rope furnished by the United States.

Yukon Territory

L. L. Lane and C. D. Lane, of San Francisco, Cal., and J. H. Conrad of Montana, are reported to have bought the Arctic Chief copper mine, at White Horse, for $80,000. Conrad says tbe property will be worked with more men this summer. Conrad also hought a number of claims on Bullion creek in tbe Alsek district. He will send in men and supplies to work them this year.

MEXICO.

Chihuahua.

N. O. Bagge of Los Angeles, Cal., owner of the Minas de Almaloya, between Jimenez and Parral, and Manager D. W. Shanks report operations going ahead with 130 men in the development of prospects near the Cigarrero mine. On the

San Enrique mine three tunnnls are under way. The upper one will gain depth of 166 feet, the second 280 feet, and the third, which will be, 800 feet long, will give depth of 430 feet. On the Cerro Colorado three shafts are being sunk. The last one started is down 50 feet; auother is down 200 feet, with 100 feet of drifting on the lowest level, and the third has reached 225 feet. They propose putting in additional machinery. It is thought the machinery will be electrical, and a central power plant is proposed. The Mexican owners of the Cigarrero mine are shipping to the American S. & R. Co. 125 tons of ore daily, that nets $40 per ton, Mexican. This is their second grade ore. Last week five cars were shipped that gave 50% lead, and, besides the lead and silver, carries gold. An 8-inch streak in the mine is said to run 3000 ounces silver per ton. The owners have their double-track gravity tram from the two workings completed. Contract for 500 meters of tunnel work, drifts, etc., from the present lower tunnel has been let. The company will build a railroad from the mine to Baca station, on the Parral branch of the Mexican Central, a distance of 5 miles. They are figuring on cost of an electric plant to make it an electric road.

The Barranca del Cobre mines are turning out 300 tons a month of 40% copper concentrates, with gold and silver values, that are shipped out by way of Minaca. Since last September the machinery has been overhauled. Much development work has been done, and every head is in ore, says the Chihuahua Enterprise. The capacity of the plant is fifty tons per day.

Durango.

(Special Correspondence). — The California M. Co. has resumed work on its mines near San Dimas. The last ore shipment was made to Durango a year ago and the mill has been closed since.—— E. E. Hicks of San Dimas has men at work exploring his claim at Chilar. The ore is free milling.

San Dimas, March 11.

Mexico.

An Arizona company has been organized to take over and consolidate the Chihuahua, Primavera, La Chiquita, El Globo and Omega mines, near El Oro. The work, it is said, will be concentrated on the Chihuahua.

El Oro M. & R. Co., at El Oro, reports for month ending Jan. 31, the mill ran twenty-eight days, crushed 9368 tons, producing from 100-stamp mill $111,884 and cyanide plant $7563; working expenses and development amounted to $64,951. Profit from railway for month was $6161. There has been expended on permanent improvements $75,863, including $74,529 on new mill. The manager says the railway profit has been reduced by repairs to engine and expenditure on permanent improvements.

Michoacan.

In central Michoacan a group of copper mines owned by A. J. Peyton & Co. of New York and Mexico City has been steadily developed for the past three years. The group consists of the Santa Emilia, Dona Luisa and La Natividad, six hours' ride from Coapa, on the Morelia branch of the National Railroad. It is at an elevation of 6700 feet and the 473 acres of land are well wooded, having an abundant supply of lumber for timbering and firewood. The water supply is large. At the Santa Emilia mine the shaft is sunk to a depth of 543 feet. Sinking will be continued till 600 feet is reached, when drifting and crosscutting work will be started. While sinking, two veins of red copper oxide were cut in the shaft. On the surface the equipment of the mine included a 100 H. P. boiler and hoist with capacity of 2000 feet. The company proposes to make improvements and additions to the equipment, including a 60 H. P. boiler, an air compressor to give better ventilation, and an electric plant. A second shaft has been sunk near the first and a vein of native copper cut. From this vein several carloads of ore were shipped, but work had to be suspended, due to a heavy inflow of water. At the Dona Luisa mine the Enrique tunnel has been run 396 feet and three veins have been cut, one 3 inches wide, one 6 inches and tbe third 6½ inches wide. The north drift tunnel is run for 160 feet and is kept supplied with air by pumping. Seventy feet ahove the Enrique tunnel is tbe Heath tunnel, which has been driven 550 feet. It is 700 yards south of the Enrique tunnel. At the end of the Enrique tunnel a winze has heen run 150 feet. The Enrique tunnel follows the vein along its entire length and the ore shows 4% copper. Work has been temporarily stopped in this tunnel until compressed air machinery can he put in. In the north drift two veins have been opened, which show copper values, with seven ounces of silver and half an ounee of gold per ton. A third vein shows 5% copper and small values in gold and silver. They propose sinking a vertical shaft, which will be started as soon as machinery is set up. The shaft will be sunk to water level. At 1000 feet higher than the Santa Emil a shaft is the company's La Natividad. A vein of red oxide (cuprite) has been opened, showing 2 feet thick between walls, and is said to have a pay streak of 6 inches of 40% copper.

Sinaloa.

(Special Correspondence). — Timbering is in progress in the Estaca and Descubridora mines at Guadalupe de los Reyes. The mines are owned by a Franco-Spanish company and are the principal producers of Sinaloa. Recently some of the pillars in the mines were worked up, leaving the backs unsupported. Some of the heavier timbers are being cut from the hard woods of the mountains in the lower country and are hauled 25 miles to the mines by oxen. The ores have changed from mostly gold values to predominance of silver.

A company has been organized to work thc Mariposa mine, 2 leagues west of Guadalupe de los Reyes. A mill will be built below the mine on the Arroya de Guadalupe. —— T. Ripperdam, owning several smelting properties near the Sinaloa-Durango line, has bought a site to build a 50-ton smelter at Casala.——The Refugio mine, near the Elota river, is being crosscut at 200 feet. A sample across the face gave returns of twelve ounces silver and $4.13 gold per ton. The vein runs between granite and lime.

Guadalupe de los Reyes, March 10.

Sonora.

The Alsacia mine, 30 miles from Cananea, will be equipped with machinery for development purposes, says C. F. Wren of Bisbee, Ariz., manager. Ore has been taken out of the shaft which is down 80 feet, showing values in silver and copper.

Vera Cruz.

This year the refinery of the Mexican Petroleum Co. at Ebano, near Tampico, will be worked to its full capacity of 800 barrels daily. Until lately the work of the company has been experimental. The product of its sixteen wells that are in operation has been stored in tanks, where it is left to settle. After drawing off the lubricating oil, there remains a residue of asphalt. The greater part of this asphalt is consumed at present in the cities of Vera Cruz and Mexico. The company has completed a railroad 6 miles long, between the wells and the refinery, for transporting men and tools to the wells and returning with oil to the refinery.

Zacatecas.

The San Luis del Oro Co.'s plant, consisting of twenty stamps, 1000 pounds per stamp, etc., and a 50-ton cyanide plant, are in operation. The San Luis del Oro mine is 2 kilometers south of Zacatecas.

NEW ZEALAND.

The total gold returns from dredgers represented about 22% of the New Zealand output for last year.

NORWAY.

On the west coast of Norway M. Christopherson, B. Tibbey, R. Smoot, H. C. Lund, H. Dinwoodey, P. T. Farnsworth et al. of Salt Lake City, Utah, have options on nickel and copper-bearing ledges, and first payment has been made. Manager Christopherson says he has started work of opening up the ledges, which are showing values of 2% to 6% nickel. In one of the ledges an average of 9.5% copper has been obtained. The nickel-bearing vein sbows from 9 to 20 feet of ore, which has been opened up for 130 feet on the strike. For the reduction of nickel ores an electric process is in use in Norway, although the furnaces at Swansea, Wales, are open to a reduction of a concentrated product, the cost of transportation being but $1.12½ per ton, says Christopherson. The same outlet is afforded the copper-bearing ores. W. A. Christopherson is superintendent.

Obituary.

P. D. CARPER, owner of the Good Hope mine at Searchlight, Lincoln county, Nev., died at Los Angeles, Cal., on the 1st inst.

J. C. BUTLER of Denver, Colo., interested in Colorado mines, died at St. Louis, Mo., on the 4th inst. Deceased was born in Pennsylvania forty-six years ago, and graduated from Alleghany College at Meadville.

C. M. BONNEMORT, a mining man of Oakland, Cal., died on the 14th inst. at the age of seventy-one years. Deceased was a native of Massachusetts. He was associated with Mackay, Flood, Fair and others during the early days of the Comstock in Nevada.

Personal.

J. S. CAINE of Bodie, Cal., is in San Francisco, Cal., on mining business.

E. C. ENGELHARDT has returned to Denver, Colo., from Cave Creek, Ariz.

B. F. BROOKS of Weed, Cal., interested in oil properties, is in San Francisco, Cal.

J. BROCKMAN of Los Angeles, Cal., interested in Arizona mines, is in San Francisco, Cal.

C. M. FUELLER of Denver, Colo., has returned there from a trip to Cripple Creek district.

F. L. CLARK of Spokane, Wash., interested in mines in the Northwest, is in San Francisco, Cal.

J. M. BARNEY of Dutch Flat, Placer county, Cal., is in San Francisco, Cal., on mining business.

J. NEWMAN is superintendent of the mines of the Durant M. Co., at Aspen, Pitkin Co., Colo.

MANAGER T. JACOBSON of the Columbus Con. M. Co. of Bingham, Utah, is in Houghton, Mich.

W. H. KINNON of Denver, Colo., is superintending construction of a smelter at Basin, Montana.

R. A. KERR returned to Salt Lake City, Utah, last week, from Toronto, Canada, on mining business.

E. L. LABADIE of the American R. & Dev. Co. of Grass Valley, Cal., has gone East on mining business.

W. OLIVER is superintendent of the Frontera group of the Dwight F. Co., near Mascota, Jalisco, Mexico.

J. J. BURKE, mechanical engineer, of Salt Lake City, Utah, returned last week from a trip to Boise, Idaho.

C. J. PHILLIPS is manager of the Calera mine, near Minaca, Chihuahua, Mex., vice J. W. Phillips resigned.

W. BALLANTYNE of Central City, Colo., is manager of the Mingo group of mines in Lake district, Gilpin county.

G. W. STARR, superintendent of the Empire mine at Grass Valley, Cal., is in San Francisco, Cal., on business.

A. SMITH is superintendent of the Spengler mine on Humbug creek, near Hawkinsville, Siskiyou Co., Cal.

F. A. HAZZARD of Whittier, Cal., is at Santa Eulalia, Chihuahua, Mex., examining mines in which he is interested.

L. S. JUDD of Oak Park, Ill., is in San Francisco, Cal., from Quartzsite, Ariz., where he has been examining mines.

G. W. DORSEY is at Boise City, Idabo, from California, via Salt Lake City, Utah. From there he will go to Lincoln, Neb.

A. H. ELFTMAN, Ph. D., of Minneapolis, Minn., has returned from Park City, Utah, via the Black Hills, South Dakota.

C. K. COLVIN of Denver, Colo., has returned there from Breckenridge, Colo., where he was examining mining property.

L. T. BAKER has returned to Britton, S. D., from a trip to the Gold Bug mine, near Sumpter, Or., in which he is interested.

W. L. WATTS, E. M., has returned to the City of Mexico from an extended trip among the mining districts of Durango, Mexico.

F. F. THOMAS, manager of the Gwin M. Dev. Co., at Gwinmine, Calaveras county, Cal., is in San Francisco, Cal., on business.

R. D. JACKSON, manager of the Santa Eulalia M. Co., at Santa Eulalia, Chihuahua, Mex., is in San Francisco, Cal., on business.

W. C. BOGUE, local manager of the Mine & Smelter Supply Co., Salt Lake City, Utah, has returned there from Denver, Colo.

VAN R. WHITALL, manager of the Hydrocarbon Manufacturing Co., Denver, Colo., has returned there from a trip East.

J. W. PHILLIPS has resigned as manager of the Calera mine, near Minaca, Chihuahua, Mex., and has gone to Denver, Colo.

M. HUGHES is superintendent of the mines of the Stockton Hill M. Co. at Stockton Hill, near Cerbat, Mohave county, Ariz.

E. BAMBERGER and J. A. KIRBY returned to Salt Lake City, Utah, last week from examination of the Gold Ridge mine, near Durkee, Or.

W. W. LEWIS of Prescott, Ariz., of the Penn G. M. Co., returned there last week from a business trip to New York and Philadelphia.

M. L. REQUA, mine owner and president of the Pacific Wire & Steel Co. of San Francisco, Cal., has gone to New York on business.

W. W. LEWIS of Prescott, Ariz., returned there last week from a trip to New York and Philadelphia, Pa., in interest of the Penn G. M. Co.

C. C. MATHEWS, superintendent of the Oregon Securities Co. of Bohemia, Or., returned there last week from New York on company business.

W. F. SNYDER, manager of the Western Exploration Co., returned to Salt Lake City, Utah, last week, after an absence of several weeks.

F. L. ROUDEBUSH has returned to Denver, Colo., from Sinaloa, Mexico, where he has been looking after mining interests for London men.

E. F. ARMSTRONG, managing director of the San Jorge-Minillas M. Co., at Minillas, Chihuahua, Mex., has gone to London, Eng., on business.

W. H. CUSHING, president of the Stockton Hill M. Co., has returned to Topeka, Kan., from the company's mines at Stockton Hill, Mohave Co., Ariz.

P. P. BUSH, general Western manager of the Vulcan Crucible Steel Co., has returned to Denver, Colo., from a trip to the Pacific coast and Northwest.

H. C. BEELER, consulting engineer of the Crœsus M. Co., has returned to Cheyenne, Wyo., from the company's mines near Hailey, Blaine Co., Idaho.

J. M. MEIGHAN, formerly superintendent Mount Jefferson Mines Consolidated, Tuolumne county, Cal., is now located at 175 Crocker building, San Francisco, Cal.

T. R. COUNTRYMAN of Cripple Creek, Colo., has gone to Pearl, Larimer county, Colo., to superintend construction of a copper matte smelter for New York men.

J. F. WATSON, of Portland, Or., has been chosen to fill the vacancy on the board of directors of the American Mining Congress, caused by death of J. T. Grayson.

C. L. BUCKINGHAM, who has had charge of the erection of the new mill on the property of the Bonnie Girl M. Co. at La Plata, Colo., has returned to Denver, Colo.

HORACE F. BROWN, E. M., has gone to Butte, Mont., from San Francisco, Cal., and will also visit the iron furnaces of western Pennsylvania before returning to California.

FRANK KLEPETKO, now of New York, is credited with being offered a high place in the general management of the Anaconda and Amalgamated interests, Butte, Mont.

MANAGER G. SNYDER of the Western Exploration Co., of Salt Lake City, Utah, operating the Balaklala mines at Kennett, Shasta county, Cal., is in San Francisco, Cal., from Kennett.

R. A. F. PENROSE Jr., interested in Arizona and California mines and president of the Commonwealth M. & M. Co., at Pearce, Arizona, is in San Francisco, Cal., from Philadelphia, Pa.

G. W. HOWE, who has had charge of the Levens Ledge mine, southern Oregon, as assayer and chemist, has accepted a similar position with the Home M. Co., near Bakersfield, Kern county, Cal.

F. G. BAUM, formerly assistant professor of electrical engineering at Stanford University, Palo Alto, Cal., has been appointed electrical engineer and general superintendent of the California Gas and Electric Corporation, at San Francisco, Cal., which recently absorbed the Standard Electric Co.

Trade Treatises.

Catalogue No. 60 of the National Electric Co., Milwaukee, Wis., furnishes finely prepared illustrated description of alternating current machinery for lighting, power and railway service.

THE Van Meter continuous system of concentration and separation of minerals hy means of aluminated hydrocarbon concentrating oil, is the subject of a catalogue issued by J. W. Van Meter, inventor, and W. P. Fuller & Co., San Francisco, Cal., manufacturers. Patent specifications are given and cuts show laboratory apparatus for experimental purposes, also details of working plants.

Commercial Paragraphs.

A. E. Blackwood, 42 Broadway, is the New York representative of the Sullivan Machinery Co. of Chicago, Ill.

The Redfield Drill Co., 1606 Blake St., Denver, Colo., have recently shipped one of their band power rock drills to Portland, Or., one to Woodside, Utah, and one to Rockvale, Colo.

Deitz Electric Drill & Machinery Co., 1614 Blake St., Denver, Colo., have orders from the Montgomery G. M. Co., Alma, Colo., and D. R. Patterson, Jamestown, Colo., each for one of their electric drills.

The American Locomotive Co., has bought the Locomotive & Machine Co. of Montreal for $1,500,000, 33⅓% to be paid in cash and $500,000 in 4% bonds. The financing of the purchase will embrace the issue of $1,500,000 of 4% bonds by the American Locomotive Co.

Consolidation of the Bullock Electrical Manufacturing Co. of Cincinnati with the Allis-Chalmers Co. of Chicago is announced. The entire business of the Bullock Co. is taken over by the Allis-Chalmers Co. and the trade of both will be continued as that of a single concern.

Fairbanks, Morse & Co., Denver, Colo., have recently sold three Elspass mills, one for Baker City, Or., one for Golconda, Nev., and one for Chloride, Ariz. They also report the sale of a 15-stamp mill, including engine, boiler, etc., to the Hudson Mining Co., Idaho Springs, Colo.

Latest Market Reports.

San Francisco, March 18, 1904.

METALS.

Silver.—Per oz., Troy: London, 26⅛d (standard ounce, 925 fine); New York, bar silver, 56⅝c, refined (1000 fine); San Francisco, 56¼c; Mexican dollars, 45⅜@46⅛c San Francisco, 44½c New York.

Copper. — New York: Standard, $12.50; Lake, 1 to 3 casks, $12.50; Electrolytic, 1 to 3 casks, $12.62½; Casting, 1 to 3 casks, $12.37½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 15s spot per ton.

The New York Commercial says: The local copper market is stronger, there being a better inquiry both from domestic consumers and exporters. The small volume of business shows that the consuming trade still lacks confidence in the future of the market. The statistical position of copper in Europe favors a stronger market than is at present in evidence. The stocks of copper abroad are light and consumption during the past two months has been going on at a very good rate. Consumers evidently desire to make purchases, but they were met with firmer prices whenever they tried to secure supplies in large quantities.

Lead.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £12 ₱ long ton.

Spelter.—New York, $5.10; St. Louis, $5.00; London, £22 5s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

Tin.—New York, pig, $27.75@28.10; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 31c; less, 32c; bar tin, ₱ lb., 32½@35c. London, £126 2s 6d spot.

Platinum. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

Quicksilver. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ₱ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

Babbitt Metal.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

Solder. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

Zinc.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

Nickel.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

Aluminum.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

Nails.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

Lime.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

Cement.—Imported, $2.15@2.40 ₱ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ₱ bbl. in sacks, 4 sacks to bbl.

STRUCTURAL MATERIALS.

Iron.—Pittsburg, Bessomer pig, $13.60 @13.85; gray forge, $12.60; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

Steel.—Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 00@14 75
Northern 2	13 25@13 75
Northern 3	13 25@13 75
Southern 1	14 35@14 50
Southern 2	13 85@14 35
Southern 3	13 25@13 50
Forge	12 60@13 15
Charcoal	15 00@15 50
Billets, Bessemer	24 00@24 00
Bars, iron	1 40@ 1 45
Bars, steel	1 40@ 1 45
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 50@13 50
No. 1 cast, net ton	11 50@12 50
Iron rails	17 00@17 50
Car wheels	14 00@15 00
Cast borings	4 00@ 4 50
Turnings	8 00@ 8 50

GENERAL SUPPLIES.

Antimony. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

Powder.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

Caps.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

Fuse.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

Candles.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

Chemicals. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1⅞@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

Bone Ash.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

Coal. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

Oils.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

White Lead.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

Red Lead.—500 lbs. and over at one purchase, ₱ lb., 6½c; less than 500 lbs., 7c.

Litharge.—Pure, in 25-lb. bags, 8@9c ₱ lb.

Borax.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

Manganese.—Pure, ₱ lb., 60c.

Sodium.—Metal, ₱ lb., $1.00.

Bismuth.—Subnitrate, ₱ lb., $2.00.

Mercury.—Bichloride, ₱ lb., 77c.

Molybdenum.—$2.00 ₱ lb.

Chromium.—90% and over, ₱ lb., $1.00.

Phosphorus.—American, ₱ lb., 75c.

Silver.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

Aluminum.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

Uranium.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

Dewey, Strong & Co.'s Scientific Press Patent Agency, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING MARCH 8, 19 4.

754,112.—Oil Burner—G. W. Arper, Oakland, Cal.
754,276.—Syringe—E. Bartsch, S. F.
754,010.—Bread Cutter—O. Bernard, S. F.
754,043.—Bicycle—W. H. Bradley, Portland, Or.
754,051.—Air Rifle—T. W. Craven, Fairfield, Cal.
754,057.—Telephone—English & Ten Broeck, S. F.
754,297.—Meat Press—G. Freysleben, San Diego, Cal.
754,212.—Table and Bed—L. C. Graessle, San Jose, Cal.
754,312.—Saw Handle—P. M. Irish, Booneville, Cal.
753,980.—Pump—F. W. and C. A. Krogh, S. F.
754,325.—Wire Solder Rolling Machine—A. Lotz, S. F.
754,327.—Brake—J. B. Mabana, Tacoma, Wash.
753,992.—Facet Cutter—F. A. Marcher, Los Angeles, Cal.
753,993.—Dusting Frame—J. R. Mauran, Los Angeles, Cal.
754,334.—Conveyor — W. L McCabe, Seattle, Wash.
754,335.—Conveyor — W. L. McCabe, Seattle, Wash.
753,900.—Boiler—H. A. Miller, Selby, Cal.
754,337.—Blast Furnace—J. W. Pack, Berkeley, Cal.
754,007.—Necktie Holder—G. G. Parsons, Madera, Cal.
754,012.—Wrench—J. M. Reams, Seattle, Wash.
754,250.—Plate Lifter—G. S. Solomon, Bisbee, Ariz.
754,172.—Lawn Sprinkler—E. Sutherland, Los Angeles, Cal.
754,174.—Harrow Jack—N. W. Thompson, Erskineville, Or.
753,946.—Game—S. E. Wharton, Everett, Wash.
754,402.—Fault Locator—D. E. Wiseman, Spokane, Wash.
754,109.—Insulating Structure—O. F. Zahn, Los Angeles, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

Wire Solder Rolling Machine.—No. 754,325. March 8, 1904. A. Lotz, San Francisco, Cal., assigned to Pacific Metal Works of San Francisco, Cal., a corporation of California. This invention relates to improvements in machines for rolling and trimming wire solder. Crude solder as it comes from the molds in a long continuous strip has a rough unfinished surface; and it is necessary subsequently to run this strip through a sizing and trimming machine to give it a smooth uniform appearance. The object of the invention is to provide a machine simple in construction and operation capable of ready adjustment to roll solder in strips of any desired shape, and adapted to trim strip uniformly and deliver the strip ready for coiling separate from the trimmings.

Blast Furnace.—No. 754,337. March 8, 1904. J. W. Pack, Berkeley, Cal. This invention relates to improvements in furnaces, such as smelting or blast furnaces or the like. It consists in a novel construction of the furnace with exterior and interior water jackets, and said interior jacket is of such shape as to form an inner chamber through which communication may be had to make connection for burners where oil is to be used.

Syringe.—No. 754,276. March 8, 1904. Edwin Bartsch, San Francisco, Cal. The object of this invention is to provide a syringe of simple construction and of small cost as compared with those commonly in use, which will have a maximum capacity and be of a minimum size, which will not leak when filled, and which will be easy of manipulation and effective in operation.

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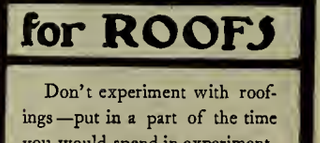

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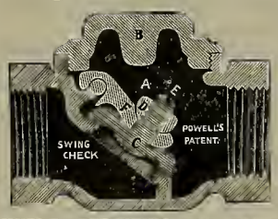

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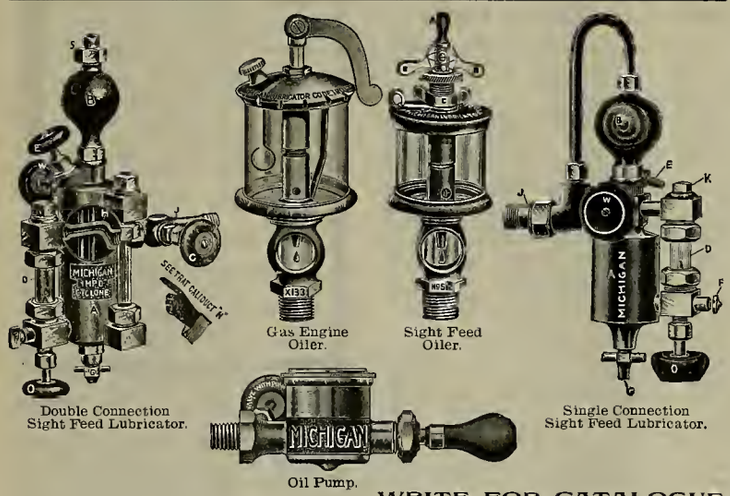

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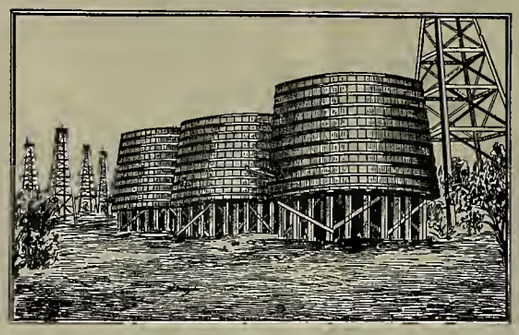

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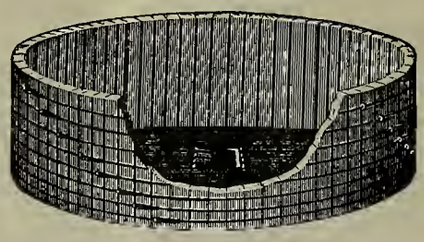

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MINING AND SCIENTIFIC PRESS

Whole No. 2279.—VOLUME LXXXVIII. Number 13. SAN FRANCISCO, CAL., SATURDAY, MARCH 26, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Interesting Mine Model.

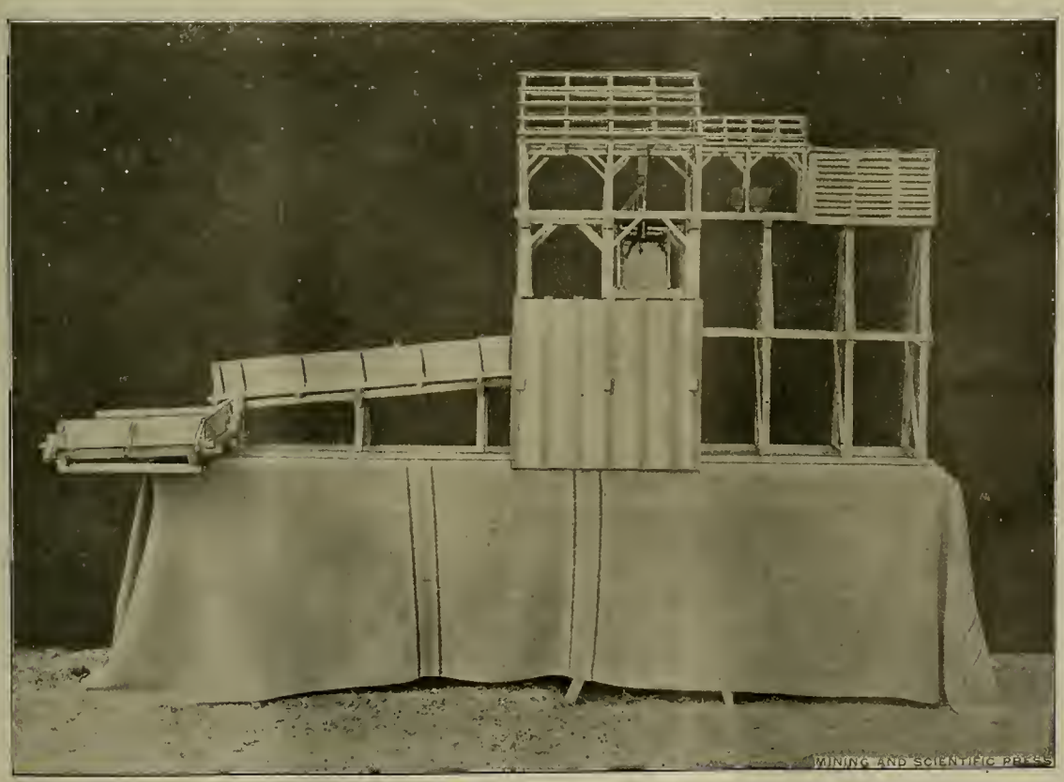
Among the great drift mines of California, the Hidden Treasure-Mountain Gate, at Sunnysouth, on the Forest Hill Divide, in Placer county, is one of the most noted. The workings comprise upward of 10 miles of drift and stope, on a series of channels, the exact relations of all of which still remain partly in doubt, but in a general way are understood and are being operated in a systematic and scientific manner. The main working tunnel exteuds from Sunnysouth for 6 miles under the volcanic capping of andesite tuff and breecia. The gravel is breasted from the working faces and transported in trains of cars by electric locomotives to the surface, where the material is dumped into sluices and washed by water flowing from the mine workings, 300 cubic feet per minute being required. The dump has a daily capacity of 500 tons, though at present but 400 tons are being washed every twenty-four hours. The gravel is first dumped iuto the head box paved with wooden blocks. Below this is a 12-foot box paved with steel Hungarian riffles. In this short length of box 85% of all the gold obtained is caught, and this is cleaned up daily. This fact alone indicates the free-washing character of the gravel. Below the Hungarian riffles is 1700 feet of flume set on a grade of 14 inches to 12 feet. These boxes are cleaned up at long periods, two or three of the upper sections every two or three months. Little gold is obtained in the lower run of the flume, which is paved throughout with hard, siliceous cobbles taken from the mine workings.

Harold T. Power, general manager of these mines, has had made a model, on a scale of one-twelfth, showing the dumping bins, with automatic dumping arrangement, the apron for diverting the gravel to either of the two upper boxes at the head, and a limited section of the long flume, with an "undercurrent," where the boulders are cut and only the fine material passing the grizzly goes onto the table below. This handsome model of practical mining shows every detail of work in drift, dump house and flume. In the drifts not only the posts and caps of each set, but lagging and even the wedges, are shown. It has been presented by Mr. Power to the California State Mining Bureau, but before being placed on exhibition in the Mining Bureau in San Francisco, it will be taken to the Exposition at St. Louis, Mo. The accompanying engraving gives both a side and end view of the model, a study of which will make its operation clear to those who have no opportunity to see either the mine or the model.

Model of Gravel Washing Plant at Hidden Treasure Mine, Placer County, Cal.

Artificial Barriers in Torrential Streams.

The United States engineers of the California Debris Commission in charge of the construction of the debris dams on the Yuba river in California, have changed and enlarged their plans in the reconstruction of the barriers which were torn out by the flood of the early winter. Several plans have been submitted, but the conditions existing on the Yuba river are unusual and have made substantial dam construction expensive and thus far somewhat uncertain as to the ultimate result. The site of the dam on the Yuba river, although in the valley lands, is subjected to the wide variation of volume and current of water characteristic of mountain streams, and the difficulty of completing within the short space of the few months of the dry season when the river is comparatively low, has thus far rendered attempts at dam construction futile. It is now the intention to construct a series of dams, the first of which will be attempted above Marysville, where the stream is 1000 feet wide. In the former constructions sheet piling were employed. In the new dams ordinary round piles will be driven in four rows, being driven to a depth of 20 feet, forming a solid wall. On top of these will be placed massive concrete blocks, reinforced with sections of wire cables, to reduce the tendency of the blocks breaking up. This line of blocks has a width of 10 feet and a thickness of 18 inches, extending entirely along the crest of the dam from shore to shore. At either end of the dam is to be built a solid wall of masonry, composed of large blocks set in cement. Sheet piling will be driven both above and below the main dam to make it water tight and to reduce as far as possible the tendency to wash out—which is the greatest danger, particularly below the dam — in time of high water. In addition to these items of construction, a trench above and adjoining the pile bulkhead will be filled with heavy rocks, the upper tiers of which are to be cemented. The entire construction will approach solid masonry, reinforced with heavy piling in the interior section, and it is the opinion of engineers that these plans are likely to prove successful, as it is now known that a less substantial and costly structure cannot withstand the force of the great volume of water which comes down the Yuba in the winter season. It is stated that at the site of the proposed dam the river bed has raised during recent years not less than 13 feet, although comparatively little mining has been done in the territory tributary to the river. This is considered encouraging, and it is thought a dam built along the lines suggested will be able to withstand any freshet that may occur. Great dams have been constructed on other streams where there is great variation in the volume of water in the stream at various seasons, but these works have required years of toil and vast sums of money to render them enduring, and while it is possible to construct similar dams on the Yuba the expense is not justified.



Side View of Model of Gravel Washing Plant at Hidden Treasure Mine, Placer County, Cal.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

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United States, Mexico and Canada.....$3 00
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SAN FRANCISCO, MARCH 26, 1904.

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AGAIN it has become necessary for the Governor of Colorado to call upon the State militia to preserve order in that State, this time in Las Animas county, of which Trinidad is the capital city. There are said to be 1500 unemployed men in that section armed and terrorizing the peaceable citizens of the State, and resisting the local authorities. These are the men who for several months past have been on strike, and now having failed to gain their demands have instituted a "reign of terror" in the coal regions of southern Colorado. No union or body of laboring men can ever hope to gain their desires by a show of lawlessness and the intimidatiou of those who do not agree with tbeir ideas or are not in sympathy with their methods. Not only does this sort of thing fail to accomplish the desired results, but it also loses the working men the respect and moral support of the public who otherwise feel an interest in their welfare.

ANOTHER attempt is being made to change the Federal mining law as applied to Alaska, a bill having been introduced in the Senate providing tbat withiu ninety days after the location, and before notice is filed, a shaft shall be sunk at least 10 feet deep, or au excavatiou made 10 feet long exposing the lode. At least twenty days' work is required annually on each claim, and a penalty is provided for making false affidavits of location or as to work performed. It does not seem expedient for the Government to make mining laws for one section differing from those of another section. The several States and Territories, and even mining districts, have the authority to add to the Federal laws, but can make no laws in conflict with the Federal laws. The Government establishes the minimum requiremeut and the State and Territorial Legislatures and miniug districts may make non-conflictiug amendmeuts thereto, increasing the amouut of annual assessment work, or requiring certain acts or work within a limited time after locatiou.

Location By Agent.

Much dissatisfaction is being expressed in some districts—notably those in some of the newly discovered gold fields of Alaska—over the location of a large number of claims by agent, in some instances the agent having power of attorney. One instance complained of is that in Ptarmigan Creek district, where it is said several prospectors, well equipped, went in in April, 1903, and spent the entire season prospecting. Late in the season a stranger came into the district aud staked claims to the number of 60 on that creek, taking others elsewhere. In all this industrious person, as agent, located claims for people in Dawson to the number, it is said, of 205. Whether or not the beneficiaries are Americans is not stated. Dawson, however, is in British territory and Ptarmigan creek is in American territory. In locating claims on the public domain the agent is acting within the provisions of the law. The object of the mining statutes is to advance the development of the undeveloped mineral resources of the public domain, and making certain provisions to this end, failing to comply with which the locator forfeits his claim to the ground located. It seems immaterial who takes up the locations, or how many claims are taken by one iudividual, as the law requires these claims to be developed to the extent of $100 worth of work or improvements annually. If the law is uot complied with the penalty is forfeiture and the location reverts to the public domain, and the ground may then be located by the first comer. In the instance above cited it is stated that the prospectors first on the ground lost all opportunity to secure claims for themselves, as the "agent" covered everything iu sight. If this be true, the prospectors acted in a most unusual way. Ordinarily prospectors in a new region promptly locate more ground than they can work, at the first sign of value discovered, either actual or prospective, and, being first on the ground, have the best chance. Later they keep what appears the most desirable, and have claims either to sell or give away to those who come later. That the mining law requires any change iu respect to location by agent is not apparent, but a strict enforcement of existing laws would inure to the benefit of the Government and be of great service iu the development of the mineral industry. The real trouble arises when peaceable men undertake to claim locations upon which tbe assessment work required by law has not been performed. The former locator, although having failed to comply with the law, often by threat and intimidation witb a display of force keeps men who are peaceably inclined from acting within their rights as provided by the mining law. Every new mining camp has the remedy for this sort of thing at hand. Organization of the law-abiding element will always accomplish tbe desired end and gain the "greatest good for the greatest number."

Uniform Code of Bell Signals.

State Commissioner of Mines E. L. White of Colorado has issued a State mine-bell code, under the authority vested in him by the law. The code is essentially the same in all important respects to that which has been in use in California for several years, and which these several years of trial have demonstrated to be a satisfactory code of signals. This newly adopted code has remedied a great defect in the codes in use in some parts of Colorado, where the code suggested by the Western Federation of Miners has beeu largely adopted—that of indicating wheu men were to be hoisted, for which there was uo premonitory signal. In some instances three bells were given to indicate that men were on the cage or skip, but no further bell to denote that they were ready to be hoisted. After three bells, the engineer would begin to hoist. The better signal in the new code is "three-one." The person desiring to go from one level to another can now first ring the level to which he wishes to go, followed by three bells; then, taking his place on the skip, give the final signal to be hoisted or lowered, as the case may be. There has been no uniform, legalized bell-signal code in use iu Colorado heretofore, and Commissioner White has performed a praiseworthy act in taking steps to put one in force that will not only bave the merit of uniformity in Colorado, but which will also agree with that in some other States. If the mine inspectors or other authorities in other States would do likewise, within a short time the code of bell signals would be uniform throughout tbe Western United States.

A New Steel Enterprise.

It is announced in a local paper at San Diego, Cal., that a corporation has been organized in that city for the purposes of mining, manufacturing, etc., the principal feature of which will be the making of iron and steel from the ore of the Tepustette mines in Lower California. The ore is there in large amount, and capable judges have pronounced this ore to be a superior quality of hematite and magnetite. In 1891 a somewhat similar proposition was launched in San Diego—a company to make iron direct from ore by the J. C. Eames process, and the work went so far as tbe completion of one reverberatory furnace and the partial construction of two others at Roseville on San Diego bay, but the project was abandoned, it was stated, because of insufficient financial aid. The intention was to employ crude petroleum as fuel. The ore was to have been crushed in breakers and rolls and ground fine in Chile mills, mixed with coke dust that had previously been treated with clay water, and after drying spread on the hearth of the reverberatory. The application of the petroleum—steam blast, it was believed—would supply the necessary heat, and the result would be the making of a high-grade carbon iron direct from the ore without the intervention of the blast furnace. The idea was based on the practice of the Carbon Iron Company of Bethlehem, Pa., where the process had been successfully applied, employing natural gas for fuel. The Carbon Iron Cumpany produced a fine grade of iron which found a ready sale. As the use of natural gas for fuel is not wholly unlike the result of the petroleum steam blast, the proposition seems feasible, and if sufficient capital is provided for the experiment at San Diego success may result. In the Carbon Iron Company's furnaces the ore became a bright red soon after the flame was turned into the furnace. The soft, agglutinated, semi-molten surface of the fused iron ore was rolled up by workmen with their rabbles, like snowballs. These were withdrawn from the furnace and squeezed into blooms, and in this form were sold to tbe trade.

THE lead miners of the Kootenay district of British Columbia have appealed to the government to extend the "lead bounty act" to a limited quantity of ore to be exported and smelted abroad—provided the extension shall not prejudice the payment of the bounty on ores smelted in Canada; and provided that the maximum freight and treatment rate shall not exceed $10 per ton, and the marketing charge shall not exceed $20 per 2000 pounds, and the limit on zinc shall not decrease from 10%, and the penalty on excess sball not exceed 50 cents per unit. A great portion of the lead-silver ore in the region about Nelson is low grade, as far as known, and this ore cannot be mined and smelted at profit unless a subsidy be granted in some form. Either they must receive a bounty or have a very low transportation and treatment charge. The smelters demand 40,000 tons annually of ore which will run 45% lead, or the charge will be $17 per ton for treatment. It is doubtful, from the statements made by the local press, whether the mines of East Kootenay can supply this requirement.

NO business is more legitimate than honestly conducted mining. Money invested in mining enterprises results in a distribution of the money to a score of other industries dependent upou the mine. The iron miner and smelter, and the manufacturer of every class of mining, milling and reduction machinery, is directly benefited. The farmer, the merchant and others engaged in a great variety of enterprises have the money expended in mine equipment, development and operation, and this whether the mine venture be profitable or not. Should the mine prove to be a producer of gold, silver, copper or any other metal or valuable mineral, its output goes to swell the grand total of its particular product in use in the world. Should the venture prove profitable, then the benefits flowing from the operation are of even greater importance.

CONCENTRATES.

THE white mineral specimen from Columbia river, Oregon, is rhyolite tuff (volcanic ash), and may possibly be made useful as a polishing agent.

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THE placer miner usually considers 20 miner's inches of water—30 cubic feet per minute—a sluice head in a 12-inch box having a grade of 8 inches in 12 feet.

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THE term "sand carbonates" originated in Leadville, Colo., and refers to a disintegrated granular carbonate of lead and has no reference to copper ore of any description.

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MINERAL paint is made of either hematite ores, or from roasted iron sulphides. In some variety of natural iron oxide the color is brighter than in others, but none of them make a brilliant red. Cinnabar makes a bright vermilion red, but is much more expensive than iron oxide paints.

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THE mineral specimen from Placerville, Cal., is roscoelite, a variety of vanadium mica. This mineral was at one time supposed to be invariably gold-bearing, but the occurrence of gold with this mica is probably merely accidental, as gold sometimes occurs in garnet, in hornblende and in other minerals.

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CARBORUNDUM, the strange mineral made in the electric furnaces at Niagara Falls, New York, is extremely hard—nearly as hard as diamond—but is too fragile for use as a substitute for carbonado (the black diamond) in diamond drills. As an abrasive, carborundum is superior, but it has not as yet been applied to rock boring.

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SOME of the mining districts of Colorado are at a high altitude. Alma, in Park county, is at an altitude of 10,240 feet; Breckenridge, in Summit county, at 9524 feet; Caribou at 9905 feet, Creede at 9000, Cripple Creek at 9396; Georgetown, 8587; Kokomo. 10,654; Leadville, Lake county, 10,185; and Sunshine, Boulder county, at 12,945 feet above the sea.

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IN a cyanide plant for Colorado it was proposed to dispense with the montejus as a means for filling and operating filter presses by pumping the slimes to a tank situated on the hill back of and 180 feet higher than the mill, thus securing about 80 pounds direct pressure. The object of the tank was to secure a direct and nearly uniform pressure in the operation of the presses.

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A CUBIC FOOT of solid quartz rock weighs about 165 pounds. A cubic foot of dry tailings from this quartz will weigh about 100 pounds. The usual estimate of quartz ore in place is 13 cubic feet equals one ton. Where only 10 cubic feet are required to make a ton, the ore must be heavy in sulphides or their oxidized products, such as lead or copper carbonate, etc.

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THE rock specimens from Midas, Nye county, Nev., are quartz, with mica. That looking like gold is stained with iron oxide, the bright golden scales are mica. That resembling arsenical pyrite is also mica, similar to that above mentioned, but unstained by iron. The reddish-brown piece is quartz stained by iron oxide. If gold be present in these rocks it should be readily detected by panning.

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THE best screen for treating fine gold in ores is that screen which will retain the ore in the battery or other crushing device until the material is sufficiently fine to free the gold from the gangue. The subsequent recovery of the gold is another problem which may prove to be either easy or difficult of accomplishment. Granular ores pass most readily through wire cloth screens. Flaky, flint-like ore passes more readily through slotted screens.

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SEA WATER holds in solution the salts of various metals which are derived from the dissolution of rocks on the land. A gallon of sea water contains about 2500 grains of saline matter, of which 1890 grains consist of sodium chloride (common salt). In 1000 parts of sea water there are about 29 parts of sodium chloride, 0.5 part potassium chloride, 2 of magnesium chloride, 2.5 of magnesium sulphate (epsom salt), 1.5 of calcium sulphate (gypsum), and it is said also to contain gold. The amount is variously stated at from 2 to 3 grains per ton of water, or 8 to 12 cents per ton.

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THE construction of buildings in regions of heavy snowfall should be designed with the fact in view that for each square foot of horizontal surface freshly fallen snow varies from five to twelve pounds. In some mountain regions, buildings erected in summer have been crushed by the snows of the following winter, an insufficient factor having been allowed for the great weight of snow. It is no uncommon thing in regions of heavy snowfall to find the eaves of mills and other mine buildings broken off by the weight of the saturated snow lying on the lower portions of the roofs.

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THE attempt to effect perfect concentration from stamp batteries without hydraulic concentration can only be partially successful, for the reason that it is a physical impossibility to separate particles of the same specific gravity and greatly varying size from a gangue mineral of uniform specific gravity, though varying much from that of the mineral which it is desired to concentrate, with the same grade or vibration of table, belt, or other mechanism, and with a stated quantity of water. There are many mills where this is to-day the practice, and where it has been the practice for years, and the managers are satisfied; but if sizing were resorted to, a higher saving would undoubtedly result with no consequent increase in expense.

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MISPICKEL containing gold can be successfully treated by a combination of metallurgical processes. The ore is first crushed and then roasted in a reverberatory furnace to free it from arsenic, the fumes from which are collected in a chamber and condensed in the form of white arsenic (arsenious acid). The roasted ore is then treated by the bromo-cyanide process to extract the gold. Arsenical ores should be roasted with carbon in some form—preferably pulverized coke. This reduces the arsenic to metallic state which, as fast as formed, volatilizes and passes off to the condenser in the form of fumes. If the carbon be not added, only a portion of the arsenic will pass off, leaving the ore in but little improved condition for subsequent treatment.

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CHANNELS composed of andesitic boulders, cobbles and gravel are sometimes gold-bearing, but when such is the case it will probably be found that the channel also contains quartz and other hard crystalline rocks, which are gold bearing. Although andesite in many regions encloses gold-bearing veins, there are no rocks of this kind containing gold veins on the west side of the crest of the Sierra Nevada mountains, in California, as far as known, and all of the ancient channels thus far discovered to be auriferous have cut through older crystalline rocks. In a few instances later channels containing chiefly volcanic rocks, have cut through older gold-bearing channels which have derived their gold from the older rocks, and below such points of intersection the lava channels are also gold-bearing.

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IN extracting gold and silver from copper matte, one process is that of roasting the matte to convert the silver to sulphate, in which condition it is leached out by means of water, the silver being precipitated on metallic copper, the gold still remaining in the matte. Another method is to concentrate the matte by further fusion in a reverberatory to black copper, granulate it, grind, roast, and leach with salt solution by the Augustin process and precipitating silver in the usual manner. The residue containing the copper and the gold is then concentrated in a reverberatory furnace until a small amount of copper is extracted as a copper bottom, carrying nearly all the gold. The method of treating these enriched "copper bottoms" as practiced at Argo, Colo., has never been made public.

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NO ORE, even if it show no metal—gold, silver, copper, lead or other material of undoubted value—should be discarded and thrown over the dump merely because its appearance is unpromising. Ores of high specific gravity are not always valuable, nor are light porous ores always worthless. In the Lava Beds district of San Bernardino county, Cal., is an ore so porous and light from oxidation of the original sulphides as to resemble pumice, yet this ore contains forty to sixty ounces silver per ton in the form of dust-like chloride. Some of the iron ore of the croppings of the Congress mine in Arizona was so porous that a man could easily lift a block of it as large as a barrel. Some ores of great weight due to the presence of a large amount of heavy spar (baryta) are commercially worthless, such as some of the silver ores of Calico district, Cal. Many iron ores are practically without value, owing to limited occurrence in the vein or deposit, or to situation. Most ores and metals of high specific gravity (8 to 10 or over) are valuable. Among these are copper, 8.8; the tellurides of gold and silver, 8 to 10; platinum, 14; platin-iridium, 19; and gold, 15.6 to 19.30.

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BY MATTE or matting is meant the process of running the metal out of the rock—not in pure state, but combined with sulphur and other minerals, and in a concentrated condition. Thus a low-grade copper-iron sulphide ore on first treatment can be made to yield a matte consisting of 40% copper, the remainder being principally sulphur and iron. Copper matte generally also contains gold and silver, dependent upon the ore from which the matte is derived. Copper is not an essential constituent of "matte," though sulphur is—for there are also iron matte, zinc matte, etc., with no trace of copper. "Speiss" is not "matte," but is a compound of arsenic or antimony, with iron, cobalt, nickel, lead, bismuth, copper, etc. It has a metallic luster, and is nearly always crystallized, is of high specific gravity, and when it is the product of treating base antimonial, arsenical or cobaltiferous silver or gold ores, is high in the precious metals, though having a greater affinity for gold than for silver. Speiss, at one time the bane of the smelter, is now sometimes intentionally created to collect precious metal values, and also of copper from ores treated in a reverberatory matting furnace.

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A PLACER LOCATION or placer patent cannot confer any extralateral right, as to any lode or vein, the apex of which lies within the lines of the placer claim. In order to secure such right to follow the downward course of the vein beyond the lines of the placer location it is necessary to locate the vein separately, the same as on the unoccupied public lands. In such case the extralateral right is defined by the lode claim boundaries, whether these coincide with the placer location boundaries or not. Should the discovery of a vein or lode not be made within the placer until after patent has issued, the placer claimant can hold only such portion of the vein as lies within the lines of the placer extended downward vertically. In the case of Aurora Lode vs. Bulger Hill Placer (23 L. D. 95) the court said: "The discovery and location of a placer mining claim establishes in the owner the right to the possession of the superficial area within its boundaries for all purposes connected with and incident to the use and operation of the same as a placer mining claim. Such location, however, does not operate to give title or right of possession to veins, or lodes, within its limits, or preclude the right of discovery and location thereof by others."

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THE carnotite deposits of Montrose county, Colorado, occur in two districts near the Utah State line. One series of deposits is along a sandstone bluff 700 feet above the creek. The carnotite, a canary yellow mineral, is found in bunches in white sandstone, or along the contact of the sandstone with underlying shale. These deposits occur within a few feet of the surface. The ore bodies are generally flat-lying streaks and sheets a few inches thick, which pass both above and below into the common white sandstone, and which also gradually disappear when followed into the hillside. It is said that the deposits show every evidence of being of very recent formation. On Roc creek carnotite occurs in the plane of a fault fissure intersecting horizontally bedded sandstone. The displacement has been about 50 feet, the fissure dipping north at 70°. In this fissure the carnotite occurs as small irregular branches in a loose mass of crushed sandstone, and also as an impregnation in the solid portion of the sandstone strata. Copper carbonates also occur in the same rock strata at a distance of a few hundred feet from the carnotite. The mineral occurs in a number of places in western Colorado and eastern Utah, but as far as known not any place in large quantity.

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MILL SCREENS are manufactured by many different firms and there is a lack of uniformity in them. Generally speaking a No. 5 screen is equivalent to 20 meshes to the inch; No. 6, to 25 meshes; No. 7, to 30 meshes; No. 8, 35 meshes; No. 9, 40 meshes; No. 11, 55 meshes, and No. 12, 60 meshes. In South Africa on the Rand it has become the custom to designate a screen by the square of the number of meshes per lineal inch, thus a 20-mesh screen is called a 400, a 30-mesh is a 900, etc. If this idea were generally adopted it would result in greater uniformity and the character of the screen referred to would be much more readily understood, and if in addition to the number of apertures per square inch the number of wire of which the screen were made be given, or if a punched or slotted screen, then the size of the aperture as indicated by wire gauge, this would be still more valuable, in making clear the character of screen employed in any particular mill work. A screen may contain 400 meshes per square inch, but be constructed of wire so heavy or so fine as to reduce the superficial area of the apertures, or increase it to such an extent as to make comparison with other screens of the same number of mesh worthless. Some ores require a heavier screen than others to be durable. It is always desirable to have a screen as thin as possible and at the same time secure a substantial and enduring screen. A given screen which in one mill will last two weeks, in another may last a month. The higher the discharge the longer is the screen likely to last. A low discharge and heavy feeding will quickly wear out a screen, though in the latter case the loss is chiefly due to breakage.

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MILL PLATES which have been treated with nitric acid until "eaten through" are in undesirable condition, but thorough dressing and rubbing with quicksilver should put them in fair condition again, unless they have become hardened by excessive use of cyanide of potassium, when they should be annealed. If badly corroded, they should be replaced by new plates. If the plates discolor, it is probably due to the character of the ore or the battery water used, or both. When the bronze-colored film forms on plates no amalgam is caught or formed on such discolored surfaces. Sodium amalgam is a valuable aid in getting plates in condition. Keep adding it occasionally and dress frequently—that is, brighten the plate by frequently hanging up and rubbing with a brush, but do not remove the amalgam already formed. No surface is equal to a layer of gold amalgam to catch more gold. Allow it to remain and endeavor to gradually reduce the discolored area. It will require time and patience, hard work and the loss of some gold to arrive at this desirable condition, but it pays to do it. Do not use nitric acid on the plates. It unites with the "quick" forming nitrate of mercury, which has a tendency to disintegrate the copper. In some instances the introduction to the ore feeder, or the bin of a small quantity of quicklime which will be crushed with the ore, is found beneficial—this when the ore or battery water contains ferrous sulphates or free sulphuric acid, which the lime has a tendency to neutralize, and thus protect the plates from attack of the acid. The above are the remedies usually employed with greater or less success in treating discolored amalgam plates.

Wet Concentration of Ores by the Sherman System.

Written for the MINING AND SCIENTIFIC PRESS by
FREDERICK WOOSTER SHERMAN.

To any one who has given much thought to the wet concentration of ores, it has surely become apparent that the chief loss is always through the medium of the fine or slime particles of mineral. The loss from this source is much higher than is geuerally supposed, as it will average from 20% to 40% of the entire value of the ore. Nor does the writer think it possible to raise the saving much above 75% without some system of classifying the fine ore and freeing the same from an excessive amount of water before it is delivered to the concentrating tables for treatment.

Different schemes have been resorted to at various places to correct the loss of the finer particles of mineral that were being carried away in the water. At the Anaconda Works in Montana this class of material was conveyed to large tanks or reservoirs, where the same was simply allowed to settle, and then worked through the smelter to the best advantage possible. At the Silver King mine, Park City, Utah, the slimes are forced through filter presses, then shipped to the smelter, and thus the values are recovered; again, in California you will find below the conceutrating tables long canvas plants that to some extent correct this loss.

There are many concentrating propositions over the country where none of the above-mentioned methods would successfully apply—properties that are not near enough to a smelter to permit of settling and then smelting this fine product; properties that do not have an ore of sufficient value to permit of filter-pressing the slimes and then shipping to a smelter; properties where canvas plant concentrates would be of too low grade to be of any great value. It is hoped that the following article, giving a description of the above-mentioned system and the results that can be obtained by same, will prove of interest to all parties, and especially so to parties operating concentrating plants over the mining world that have not in some satisfactory manner been able to correct the above-mentioned losses.

The first system of these classifying tanks was installed at the Daly-West concentrating plant one year ago last August; a second system at the Daly-Judge plant early last spring; a third system is now being installed at the new Honerine concentrator at Stockton, Utah, and a fourth system in a tailings plant that is now being erected to rework the tailings from the present concentrating plant of the Daly-West.

Without some explanation it might be remarked that the fact of the Daly-West building a plant to rework the tailings from the present mill does not speak very well for the system there iu use. As an explanatiou, some figures from the past year's report will be submitted to show what the present system did accomplish and what is planned to be accomplished by the new plant.

The average grade of the ore milled at the Daly-West during the year ending Dec. 31, 1903, was 6.97% Pb. (galena) and 16.22 ounces Ag. The average tailings were 0.319 of 1% Pb. and 4.046 ounces Ag. Thus the mill made a saving of 95.42% Pb. and 75.10% Ag.

The new tailings plant is being erected with the idea of bringing the silver saving up to a point where the recovery will be from 85% to 90%. It is expected that the new mill will rework the tailings at a cost of from 10 to 15 cents and will be successful in making a net profit of from 30 to 50 cents a ton. Nearly the entire concentrate product will be derived from the recovery of the silver in combination with iron sulphides. This plant will be in commission soon after the middle of March, aud it is confideutly expected that its actual work will verify the above figures.

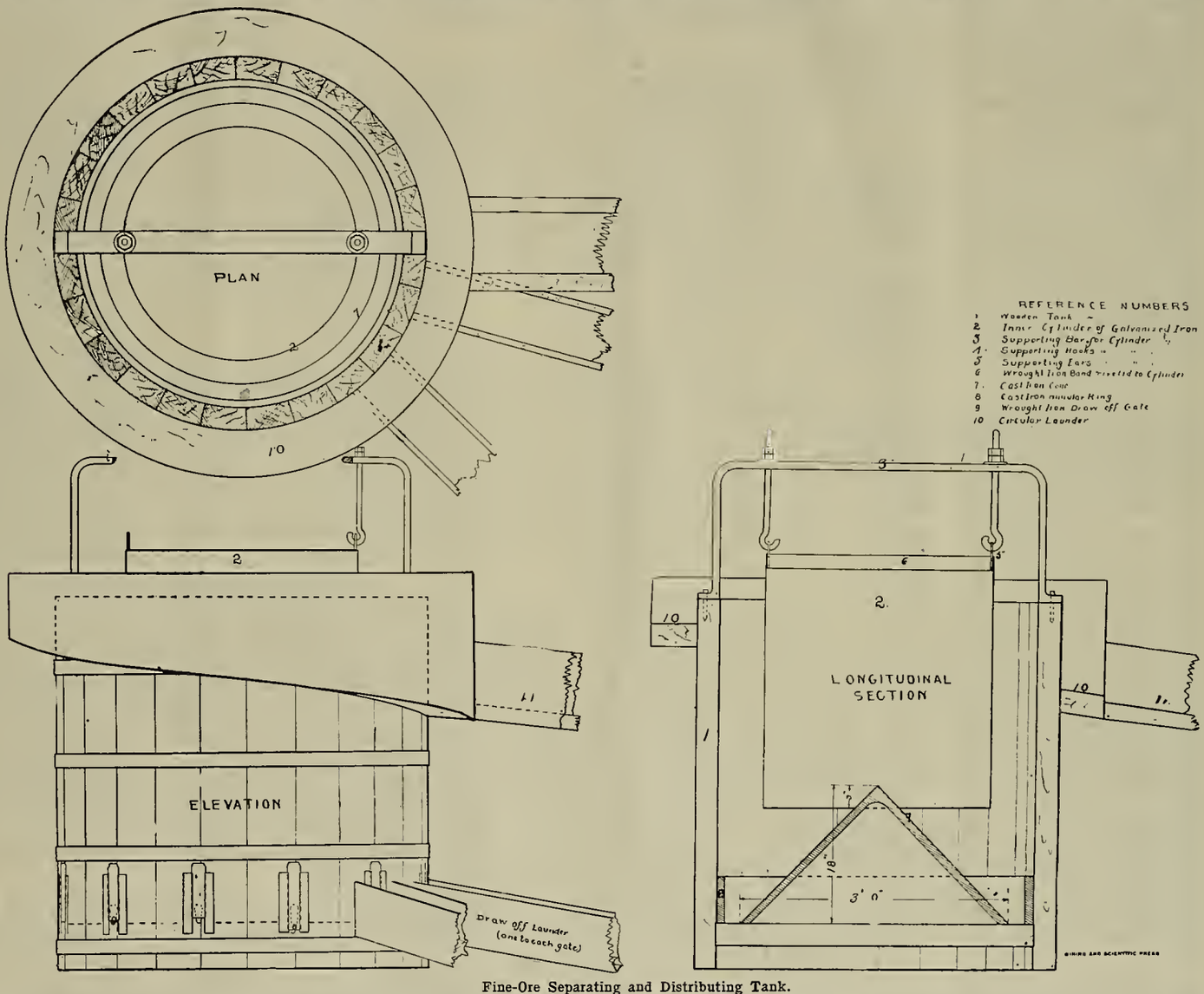
In order that the followiug explauation of the system may be more readily uuderstood, drawings have been prepared of the fine ore separating and distributing tank and the system of fine ore settling and classifying tauks. In each instance there is shown a "top plan," a "side view" and a "longitudinal sectiou," with the different parts designated by numbers, to which reference will often be made.

The first application of the system, as applied to the regular jig concentrator, is the installing of one of the fine ore separating and distributiug tanks just below the last revolving trommel or jig sizing screen. This tank is 4 feet in diameter and 4 feet deep and has suspended within it a galvauized iron cylinder which takes up just one-half the surface area of the tank. It is elevated 6 inches higher than the top of the tank and extends downward to within 15 inches of the tank's bottom. This cylinder is designated (2) in the drawing. Resting on the bottom of the tank and extending to a point 3 inches above the bottom of the cylinder is a cast iron coue. This is shown in the "longitudinal sectiou" and designated (7). Encircling the top of the tank and attached to it is a launder (10). The outside of this launder is made of galvanized iron and extends 3 inches higher than the staves of the tank, while the bottom of the launder at its highest point is 3 inches lower than the top of the tank; thence the bottom has a fall each way around the tank of 6 inches until it comes to and joins a delivery spout or launder.

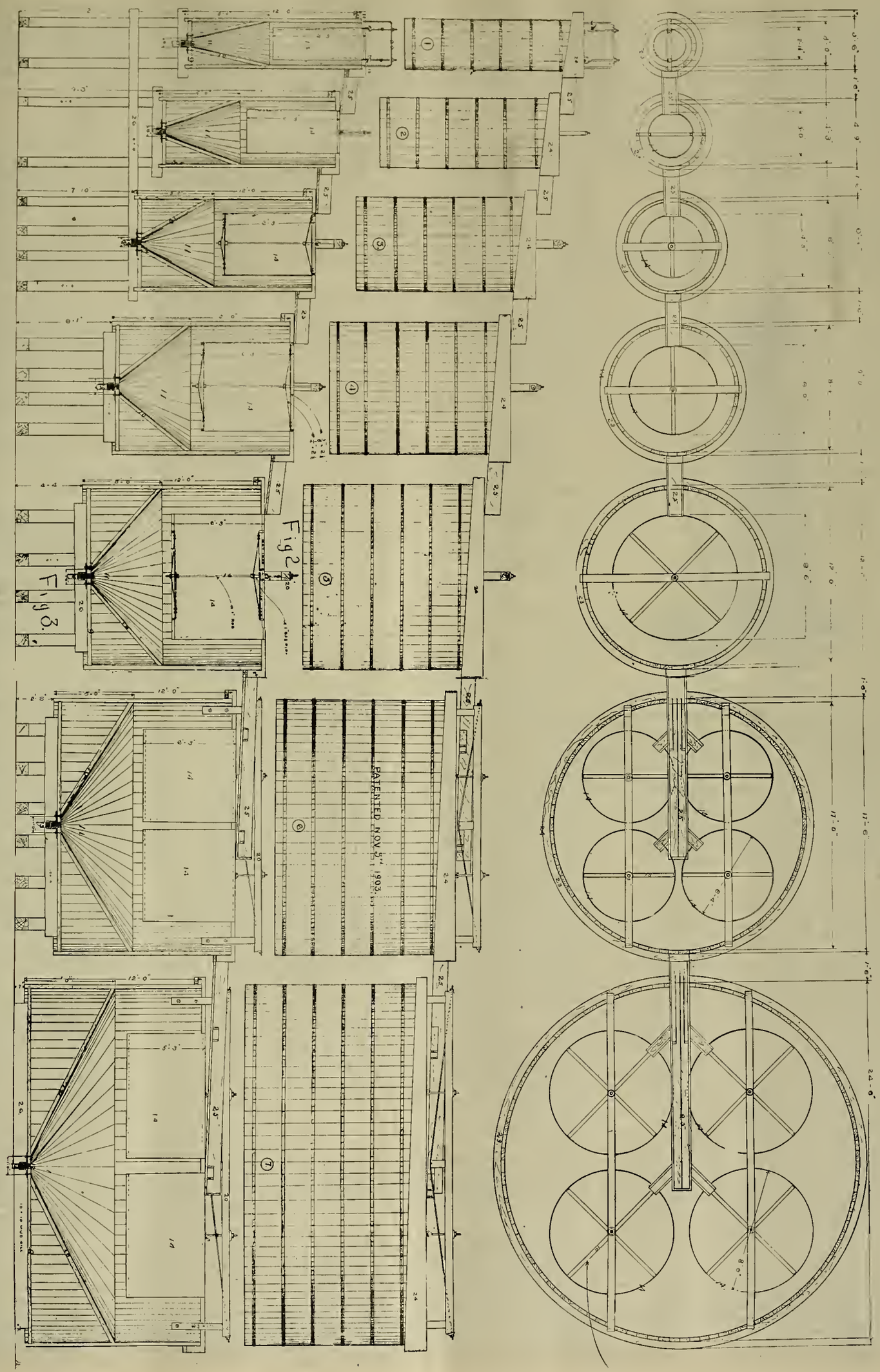
This tank is for the purpose of separating the fine ore and slimes from the coarser products, the latter going to the fine jigs for treatment and the fine ore and slimes being conveyed by launder to the system of settling and classifying tanks.

This tank receives the undersized product from the last revolving trommel. The product, accompanied by the water that has carried it through the system of revolving screens, drops into the cylinder (2); thence it passes downward to a point in the tank just below the bottom of the cylinder, where a separation takes place; the coarser particles, dropping onto the cone, are conveyed to the sides of the tank, thence through openings (9) to outer launders, which in turn convey them to the jigs for treatment. The finer particles of ore, still remaining in suspension in the water, are carried up in the circular space between the outside of the cylinder and the inside of the tank, overflow the top of the tank, drop into the launder (10), thence into the delivery spout (11), whence they are conveyed to the system of settling and classifying tanks. Only two of the openings (9)—the two directly opposite each other—are used in letting out this coarser material. The size of these openings is regulated by adjustable gates, so only a limited amount of water passes out with the jig product.

The next application of the system comes with the installation of a second oue of the fine ore separating and distributing tanks at a point far enough below the mills used to regrind the middlings from the jigs, to permit of the reground product being carried through a launder by gravity and dropped into the cylinder of the tank. It is also placed high enough above the concentrating tables so that the coarser product from this tank can be conveyed by launders



Fine-Ore Separating and Distributing Tank.



Sherman Fine-Ore Settling and Classifying Tanks.

to the tables for treatment. This tank not only receives the reground material from the mills, but also receives the tailings from the last fine jigs, as these tailings carry certain slime values which make a further treatment necessary.

This tank performs virtually the same kind of work as the first one, the fine ore and slime being separated from the coarser ore, the latter product being distributed to as many concentrating tables as are required for the successful working of the same. Each table receives its feed from one of the openings (9), though six tables have been found ample to handle this coarse feed from one unit of a concentrator treating 400 tons per twenty-four hours. The fine ore and slimes are carried by launder, or, when necessary, by the assistance of a centrifugal pump, to the system of fine ore settling and classifying tanks.

At this point in the operation all the fine ore and slimes have been diverted to the system of tanks, with the exception of a small amount which passes out through the gates (9) with the coarser material to the concentrating tables. In order to catch this fine ore and slimes, the concentrating tables (Wilfley pattern) are set with a raise of 1 inch toward the discharge end. As soon as this product falls on the table, the water carrying the slimes and fine ore leaves the coarser feed, passes over the riffles directly across the table, is caught up and by means of a centrifugal pump joins the other fine ore and slimes going to the system of tanks.

Before entering upon a description of the tank system, it would no doubt be well to give a description of the treatment of the coarser table ore. From the six Wilfley tables treating the coarser material there is made a finished concentrate, a middling, a tailings rejection, and a fine ore and slime product —mention of this last class having already been made. It is especially of the treatment of the middlings that further mention should be made. These middlings are carried by their respective launders to a common centrifugal pump and thence elevated to a third fine ore separating and distributing tank, which distributes the same to a second series of four Wilfley tables for further treatment. The water at this point carries little or no slime values and is allowed to go direct to the tail race. These tables make a finished concentrate, a middling and a tailing rejection. The middling product is again returned to the same four Wilfley tables in like manner as are the middlings from the first series. With a large middling coming in between the finished concentrate and the tailing rejection, it is found comparatively easy to make a high-grade concentrate and a poor tailings rejection.

THE SYSTEM OF FINE ORE SETTLING AND CLASSIFYING TANKS AND THEIR METHOD OF OPERATION.—This system of tanks takes the material which is fine enough to remain in suspension under a strong current of water and makes seven or more distinct classifications of the same; it frees each class from an excessive amount of water and delivers it to its respective concentrating table with only that amount of water necessary to give the pulp the right consistency for the successful working of the same. A system of seven tanks seems to be about the right number for the successful treatment of ordinary concentrating ores, though instances have been found where a system of eight tanks was needed. The accompanying drawing shows a system of seven tanks.

All the tanks in this system are 12 feet deep; the first or smallest tank in the series is 3 feet in diameter, and each succeeding tank doubles the preceding one in gallon capacity until the last tank is reached, which is 24 feet in diameter. Suspended in each of the first five tanks is a galvanized iron cylinder 6 feet 3 inches deep, each cylinder having a diameter sufficient to fill one-half the surface area of its respective tank. Each cylinder is suspended in the center of and 3 inches higher than its tank and extends downward into the tank 6 feet. In the last two tanks there are four cylinders in place of one, though the combined surface area of the four is one-half the surface area of the tank. The only reason for having four cylinders in place of one is the difference in favor of the cost of construction. In each tank there is an inverted cone-shaped false bottom, with its lowest point encircling the pipe outlet (13), thence raising up 5 feet and resting against the staves of the tank. (This forms the settling pocket (11), which is a receptacle virtually freed from all current.)

At the top of each tank there is a circular launder (23), shown in the top plan. The outside of the tank forms the inside of the launder, and a sheet of galvanized iron (24), shown in plan, makes the outside of the same. The bottom of the launder is formed by bolting segments of wood to the staves of the tank. At its highest point the bottom of the launder is 3 inches lower than the top of the tank, thence it has a fall each way of 9 inches until it terminates in a common delivery spout (25). The tanks are so arranged as to elevation that delivery spout of one tank is high enough to deliver its flow of material into the cylinder (14) of the succeeding tank, the last tank in the series being 10 feet 7 inches lower than the first.

With the above description, it is hoped that the following explanation of the working of the tanks will be readily understood.

As heretofore stated, the tanks deal only with that material which is fine enough to remain in suspension under a strong current of water. The current bearing this material drops into the cylinder of the first tank. The fact that the cylinder is 3 inches higher than the top of its tank causes the product to pass downwardly through the cylinder; then it raises up in the circular space between the outside of the cylinder and the inside of the tank, overflows the top of the tank into the circular launder and passes through the delivery spout (25) into the cylinder of the next succeeding tank. As the tanks double in gallon capacity and the same amount of water passes through all the tanks—the amount of water going out with the table feed of each tank really making no perceptible difference—the velocity of the up-cast current is reduced one-half each time, and each time this up-cast current finds a series of particles too heavy for it to raise; hence these particles settle into the receptacle (11) and pass through the pipe outlet (13) to their respective concentrating tables for working. The outlet is so valved that the classified material may be delivered to the table with only the right amount of water for the successful working of the same.

Thus it is quite obvious, as the operation progresses from the smaller to the larger tanks, that the current must become slower, that its lifting power is reduced one-half in each succeeding tank, and that a thorough classification must result and a separately classified product be secured from each tank in the series.

The following is a screen test showing a classification made by a series of six tanks at the Daly-West:

PRODUCT FROM NO. 1 TANK.

Stopped on a 30-mesh screen	4%
" " 60 mesh "	14%
" " 100-mesh "	54%
" " 150-mesh "	20%
" " 200-mesh "	4%
Passed a 200-mesh "	4%

PRODUCT FROM NO. 2 TANK.

Stopped on a 60-mesh screen	1.25%
" " 100-mesh "	40.25%
" " 150-mesh "	42.00%
" " 200-mesh "	12.50%
Passed a 200-mesh "	4.00%

PRODUCT FROM NO. 3 TANK.

Stopped on a 100-mesh screen	12.80%
" " 150-mesh "	47.50%
" " 200-mesh "	23.50%
Passed a 200-mesh "	16.20%

PRODUCT FROM NO. 4 TANK.

Stopped on 150-mesh screen	16.25%
" " 200-mesh "	31.25%
Passed a 200-mesh "	52.50%

PRODUCT FROM NO. 5 TANK.

Stopped on a 200-mesh screen	22.50%
Passed a 200-mesh "	77.50%

PRODUCT FROM NO. 6 TANK.

Stopped on a 200-mesh screen	1.25%
Passed a 200-mesh "	98.75%

On comparing the classified material from a series of seven tanks at the Daly-Judge mill, the material sprinkled on plate glass, the relative size of particles may be distinguished by the eye. While the entire product is fine enough to remain in suspension in a strong current of water, yet the system of tanks is able to make seven distinct classes, readily discernible to the naked eye.

Accompanying the classified feed going to each table, there is a certain amount of slime water—for though the outlet (13) is valved, yet it is quite necessary that sufficient water accompany the pulp to give the same the right consistency. From each of the first five fine tables there is made a finished concentrate, a middling, a tailing rejection and a recovery of the slime water. The middling product and the slime water—the two taken from opposite ends of the table—drop into a common launder, conducting them to a centrifugal pump, by means of which they are returned to the cylinder of the first tank of the series to be resettled and reclassified. While the middlings from all the tables are returned together, yet the series of tanks has no trouble in reclassifying this middling product the second time, for when any middling particle reaches the current, which has not the power to lift it, it again settles and is again conveyed to the table for working. The slime water from the last two tables is not returned with the middlings from these tables, but is caught up by itself and passed over two Wilfley slimers, set tandem. By thus diverting this slime water, virtually nine classified products are made. A Wilfley slimer operating on this material at the Daly-Judge mill showed the following results:

Head sample assayed	5.5% Pb.
Tailings "	1.9% Pb.
Concentrates "	35.5% Pb.

This on material every particle of which is the undersize of a 250-mesh screen. One slimer is able to make a ton of the above concentrates every twenty-four hours from a class of material too fine to even settle on the linoleum cover of the standard Wilfley table.

At the tailings plant of the Daly-West two of these slimers will be set tandem, the second machine treating the tailings from the first. It is believed, but still remains to be proven, that three slimers, the third machine treating the tailings from the second, will pay well on the investment. Where two of these slimers are used, the entire tailings of the first machine do not pass over the second, but only that portion of the tailings that leaves the slimer before the introduction of wash water; thus each slimer treats a different class of material, the first machine making a concentrate from the coarser particles, and each succeeding machine handling a finer grade of material. When using slimers in series, each succeeding machine is set flatter, run slower and with less stroke, thus increasing each machine's capability for concentrating an increasingly finer grade of slimes.

Before bringing this article to a close, there are a few important points that the writer especially desires to emphasize:

That a system of tanks, once installed, can be kept in continued service for years without any repairs.

That the manner of delivering the classified feed from the tanks to the tables is such that, when the valve is once properly set, but little attention need be given to the same.

That the tables will receive their feed for hours without the feed valve being changed.

That by classifying the fine material and delivering the same to the concentrating tables, with only the right amount of water, as high a saving can be effected from the fine material as from any of the coarser mill products.

That a large middling product can be constantly returned from each fine table, thus making a high-grade concentrate and a poor tailing rejection.

That the system separates the slimes from all coarser products, and delivers them to the Wilfley slimers with no excess of water, thus making it possible to produce a clean concentrate and effect a good saving.

That a jig concentrator, handling 400 tons a day, can do so on less than 100 gallons of water per minute.

That the system makes it possible to effect a high saving by concentration.

For the Miners.

A publication that will be of practical interest to the mining world is a bulletin (No. 225) of about 400 pages which the United States Geological Survey expects to have ready for distribution before May 1. It is entitled "Contributions to Economic Geology, 1903," and is the second publication of its kind by the Survey. It has been prepared under the supervision of C. W. Hayes and S. F. Emmons, and the contributors include about thirty of the Survey's best known geologists. The bulletin will contain more than fifty short articles, which indicate the work of these men during 1903 in various widely scattered fields of economic inquiry.

A hint of the bulletin's contents will give an idea of its scope. Gold and silver are represented by the following articles: J. M. Boutwell describes the Park City, Utah, ores; A. H. Brooks the placer gold of Alaska; F. H. Moffit the placers of Seward peninsula; L. M. Prindle the Fairbanks placer district of Alaska; A. C. Spencer writes on gold near Juneau, Alaska; C. W. Wright on the Porcupine district, Alaska; G. O. Smith on gold in Maine and Vermont; J. E. Spurr on the Tonopah and Silver Peak districts of Nevada, and H. F. Bain on Wichita, Okla., gold.

A. J. Collier's article on Alaska tin is the only contribution concerning that interesting metal.

Copper is represented by W. H. Weed's paper on New Jersey copper, J. S. Watson's article on Vermont copper, and J. S. Diller's discussion of the geology and resources of the Redding quadrangle, California.

Lead and zinc deposits in Illinois are described by H. F. Bain and zinc in east Tennessee by A. Keith.

Iron is represented by two contributions from C. K. Leith, one on Utah iron ores and one on the iron ores of the Lake Superior district, and by an article from J. M. Bontwell on the iron ores of the Uinta mountains of Utah.

Numerous papers on coal are included in the bulletin. M. R. Campbell writes on Arizona and West Virginia coals. G. H. Ashley contributes a paper on Cumberland Gap coals. C. A. Fisher writes on coal of the Big Horn basin of northwestern Wyoming, J. E. Spurr on Nevada coal, E. F. Burchard on lignite in Dakota county, Nebraska, and J. S. Burrows on Pennsylvania coal. R. W. Stone discusses the Elder Ridge coal fields of Pennsylvania.

Four papers on oil and gas fields are included in the bulletin, namely: Alaska oil by G. C. Martin; the oil fields of Boulder, Colo., by N. M. Fenneman; the Hymer gas pool of Clinton county, Pa., by M. L. Fuller; and oil and gas in Green county, Pa., by R. W. Stone.

Stone is represented by E. C. Eckel's paper on slate in Utah and California, G. W. Stose's article on limestone in Pennsylvania and West Virginia, and T. N. Dales's contribution on the slates of Arkansas.

The clays of western Pennsylvania are discussed by L. H. Woolsey.

Cement in Virginia is discussed by C. Catlett, cement in Pennsylvania by E. C. Eckel, and cement in Alaska by E. A. Smith.

Sulphur receives the attention of three contributors: G. I. Adams describes the Rabbit Hole sulphur mine in Nevada, J. E. Spurr writes about sulphur and alum in Nevada, and G. B. Richardson has an article on sulphur, salt and petroleum in Texas.

Miscellaneous features of the bulletin are J. M. Boutwell's article on gypsum in Utah, E. C. Eckel's

paper on salt in Utah and California, H. F. Bain's description of the fluorspar of southern Illinois, J. E. Kemp's discussion of the graphite deposits of New York, and G. W. Stose's article on the barite of Pennsylvania.

The bulletin will be published for gratuitous distribution.

Canvas Tables.*

Written by H. P. Stow.

The canvas table I shall discuss is different from any other I have ever seen, is manipulated quite differently, and is the result of about twelve years' experimenting, and I hope to demonstrate to you the advantages of the table as used by me.

The ore (quartz) is crushed by stamps and run over Frue vanners — two 4-foot machines to each five stamps—before running onto the canvas tables. No. 7 slot-punched screens are used and the lighter stamps average 2½ tons, the heavier ones 3 tons, per day of twenty-four hours. There is about 2% sulphurets in the ore—iron pyrites exclusively.

The pulp is run from the vanners to the table in launders, a box of any convenient size being used, say 8x8 inches, which widens out before reaching the table to permit a number of small launders to branch off from it, these in turn branching so as to give one launder to every two canvas strips.

At the head of these smaller launders, and also of the one widened out, are placed movable fingers which shift the pulp, thereby equalizing the amount of pulp flowing through the last launders into the distributing box at the head of the canvas.

The canvas table is made up of a series of strips 22 inches wide by 80 feet long, and I find three such strips a satisfactory number for each five stamps, the stamps crushing from 2½ to 3 tons of ore per twenty-four hours. The table is built with great care, the joists—2x8 inches, set 18 inches apart—being laid on a solid foundation, and made perfectly level crosswise, but so as to give a grade of 1 inch in 12 inches lengthwise of the table.

The floor of the table itself is made of 1¼x22-inch by 20-foot boards, of the best No. 2 material, surfaced on one side. Loose knots must be cut out and a solid piece mortised in.

It is better to have the flooring as green as possible to minimize swelling, and the boards should be laid with a small space between them, say ⅛ inch, to allow for swelling. The head of the table is made flat and level for the distributing and clear water boxes. At the head of the table and on this flat platform, running its full width, and having no partitions in it, is the distributing box, made of 1¼-inch material, 8 inches deep, 8 inches on the bottom and 12 inches wide on the top. It has no cover, but placed on top of it, resting on 2-inch cleats, is the clear water box, likewise running the full width of the table, made of 1-inch stuff, 8x8 inches.

In the front of the distributing box 1¼-inch holes are bored about 1½ inch above the level of the table, and in the center of each strip or sluice. A wooden button, about 4 inches long and 2½ inches wide, is screwed onto the side of the box in such a position that it will close and open the hole as desired to regulate the pulp to flow onto the sluice. The best arrangement for the launders described above is to bring them over the top of the distributing box, and so arranged that they spill into it opposite the division between two sluices. If the launders spilled opposite the hole in the distributing box, it would cause too much pulp to flow onto that sluice. A 1-inch hole is bored in the clear water box directly above the hole in the distributing box, and a little sliding gate of thin board is used to shut off the water, the gate being placed inside the box. A piece of leather or rubber is tacked loosely over the hole to break the force of the water, and if properly put on it gives a fan-tail stream, distributing the clear water evenly over the sluice. It requires about 2 inches of clear water for each table. A tailing sluice is built under the lower end of the table and should be at least 1 foot below the level of the table at its highest end, to insure a free discharge of the tailings. At a distance of 6 inches from the end of the table, and 4 inches below the level of it, is placed the concentrator box in two sections and carrying them out as an "ell" in the center to the outside of the building. A platform is built about 6 feet deep and running the full width of the table, and just even with the top of the concentrator box, coming up flush with it, and is necessary for room for the workmen and to hold a secondary box into which the concentrates are shoveled when cleaning up. Ten-O duck 22 inches wide is the canvas used. Do not misunderstand me and confound 10-O duck with 10-ounce duck. Ten-O is very heavy and coarse, and the old hydraulic miners will understand what I mean, as they used to make hose of it. The canvas is cut square and tacked at the head of the sluice tight up to the distributing box, 8 or 10-ounce tacks being used. It is tacked across its width and down the sides about 15 inches, which is all that is necessary.

The roll of canvas is then rolled down the sluice and carried onto the platform, but is not yet cut off. A clamp, similar to one-half of the clamps used for tightening belts when lacing, is then bolted onto the canvas near the end of the sluice, making sure to get the clamp square with the canvas, and a small block and tackle fastened to the clamp and a cleat on the platform, directly opposite the sluice, the tackle tightened, stretching the canvas enough to make it lay smoothly. Before fastening the lower end of the canvas it is well to walk up the sluices and raise the canvas by its edges two or three times along its length, which insures its being smooth and taking its proper place on the sluice.

The sluice being 22 inches wide and the canvas the same, it is easily adjusted and made straight. The canvas being in its proper place, it is now tacked down at the bottom for about 15 inches on each side and is turned over the end of the board and tacked there, rather than on the top of the board, the tack heads being objectionable if on the face of the canvas.

The canvas now being tacked down at the bottom, it can be cut off, being sure to cut it square, and leaving just enough to lap over the edge of the board where it is tacked on after being cut off. The clamp is then removed from the roll of canvas, the latter carried up to the head of the next sluice and the operation repeated. The rolls contain from 64 to 66 yards, so one roll covers three sluices, with some left over—which, however, is not wasted. After all the sluices are covered with canvas, strips of wood are nailed down between them, one strip covering the edges of two canvas strips, making a complete division and confining the pulp within its proper limits. These strips are sawed from pieces 2x2 inches, the cut being taken diagonally, making a triangular strip, which is then planed on all three sides and nailed down on its widest side. Six-penny nails are sufficient and should be put in alternately about 1 foot apart. This fastens the canvas down firmly and explains why it is only necessary to tack the canvas at the head and tail of the sluice. These strips, of course, run the full length of the sluice and should project at the foot about 1 inch. An apron made of 12 inches of the canvas is tacked onto a thin strip of wood 22 inches long and 1¼ inch wide and beveled on one edge. The strip is then nailed onto the end of the sluice, the beveled edge up and the canvas side next the end of the board, the flap being then turned over the strip and allowed to hang down onto the tail sluice. The apron is nailed onto the sluice just flush with the canvas, so as not to make a riffle.

The building covering the table should be a well-built structure and should be built on a separate foundation from that of the table, so that, should it settle, it will not cause the table to get "out of true," and the table, being on its own foundation, can be leveled up at will. It costs practically no more to build the building with trusses and without center posts, which are very much in the way.

The pulp coming from the vanners runs through the launders, where it is split up as evenly as possible, as above described, one final launder feeding two sluices.

The ideal flow of the pulp is a wave motion, which rolls the grains of sand over and over and brings the sulphurets in contact with the surface of the canvas. Only experience and assays of the tailings and concentrates will tell how long to allow the pulp to flow over the canvas before cleaning it up.

The longer the pulp runs over it the better, provided there is no loss in the tailings. I use two tables like the one I have described, there being twenty-four sluices in one and twenty-five in the other, and when the pulp from eighty stamps ran over them (an average of 5200 tons per month) the upper canvas was swept three times in twenty-four hours and the lower twice. All the pulp ran over the upper canvas, and then over the lower one. The pulp is turned off the sluice by closing the button over the hole in the distributing box, and the sliding gate in the clear water box opened and sufficient clear water run on to wash the sand off. If too little clear water is used it takes too long to wash off the sand, and if too much it causes the sulphurets to become dislodged, thereby causing a loss.

The attendant uses a kind of paddle made by fastening a stick for a handle onto a thin piece of board 24 inches long and 2 inches wide, and after turning the pulp off and the clear water on he follows the last of the sand down and by gently putting the paddle down on the canvas throws the clear water to one side or the other, thereby increasing the current and dislodging any sand that adheres too firmly. After the sand is all washed off the apron is raised up and the end placed in the concentrator box, the edges of the apron being turned up, making sides which direct the concentrates into the box and prevents their spilling over and being lost. The apron being set, the attendant takes his broom and, going to the head of the sluice, turns on more clear water and sweeps it down, making even strokes of sufficient weight to clean off the canvas, and yet not to sweep absolutely clean, for reasons to be explained later on. Having swept down one sluice, the apron is lifted out of the concentrator box and then the clear water is turned off and the pulp turned on. The pulp being turned off the next sluice and the clear water turned on, the operation is repeated until all the sluices are swept. The operation took about three hours for each table by men experienced in the work.

Outside of the building and below the concentrator box is set a series of settling boxes, made of 1x12x16-inch, and arranged side by side, the opening from one box to the other being at alternate ends. The surface of the water stands above the opening from one box into the other, in order that the particles of floating sulphurets will have to dip down and get wet in passing from one box to another, which causes them to settle. Naturally, these settling boxes are set perfectly level. The end of the concentrator box is cut down on top some, so the water will overflow from it into the settling boxes. Holes are bored into the ends of the concentrator and settling boxes at varying heights to facilitate drawing off the water when cleaning them up.

(To be continued.)

*Trans Cal. Min. Ass'n.

A New Power Hammer.

Herewith is illustrated what its maker calls the "Little Demon" power hammer, which is designed to furnish at a low price a labor-saving device that will prove economical to mine owners and shop men who have use for a machiue that, by the simple pressure of the lever shown in the picture, can strike 250 blows per minute, a blow heavier than that from a blacksmith's sledgehammer. For many forms of special work, it is claimed by its manufacturers to be of unusual value.

"Little Demon" Power Hammer.

It stands 6½ feet high, is made almost entirely of steel, and weighs 800 pounds. The hammer bead is made of fine cast steel. The manuer of attaching it to the heavy spring does away with the leather strap, making it most convenient. One set of dies, made of forged steel, are furnished with each hammer. It is made and supplied by the J. C. Howlett Machine Works, 256 Fremont street, San Francisco, Cal.

Alaska Assessment Work.

To the Editor:—In your issue of January 2nd, page 2, you say that "a petition from Alaska to several senators asks that the requirement of annual assessment work be removed" (giving the substance), and make some very just comment thereon. The fact may be that such a request was made to some senators. I have lived in Alaska for ten years and have been actively engaged in mining during most of that time as manager, superintendent or in the development of claims, and have never heard a real miner mention favoring such a move, nor have I heard at all of the instance you mention. I presume that request came from the Yukon district or from some district in the far north. The point I wish to make is that the news published relating to Alaska is too vague and indefinite. Such a petition coming from York or any other vicinity in that part ought not to be confounded with a district 1500 miles to the southeast of it, or vice versa. Different parts of Alaska are as unlike as are Idaho and the Sacramento valley, and much farther apart. The fact is that Alaska ought to be divided into three separate territories, but by a careful discrimination such a great journal as the Mining and Scientific Press can do much to benefit this vast and varied scope of country.

H. W. Mellen.

Coppermount, Alaska, Feb. 29.

Diamond workers are divided into cutters, splitters and polishers. There are about 9000 people engaged in this industry in Amsterdam. The number of factories is 64, with 7400 mills. For ten hours' daily work in diamond factories the weekly wages are:

Splitters	$14 07 to $20 10
Cutters	10 05 to 14 07
Verstellers	10 05 to 14 07
Polishers	10 05 to 14 07

A Proposed Filter Press Slimes Plant.*

Written by FRANCIS L. BOSQUI.

The following paper embodies a report which I made on the filter press treatment of slimes at the Liberty Bell mine, Telluride, Colo. At the time this report was submitted the management deemed it wiser to defer the installation of so costly a plant as the one required, in the hope that the many investigators in the field might soon evolve a cheaper and more perfect method of slimes treatment, and one better suited to the conditions at Telluride.

The Liberty Bell ore consists essentially of quartz aud clay, with iron pyrite disseminated through the quartz in very fine particles. There is considerable iron and manganese stain in some of the ore, the latter especially in the clays, which are sometimes quite black. Occasionally particles of galena, zincblende, gray copper and few other minerals are seen, but they are comparatively rare, and not in sufficient quantity to affect considerations of treatment. Free gold is occasionally seen in the quartz, and one or two instances of wire silver have been observed.

The milling plant consists of an 80-stamp amalgamating mill, which crushes through 20-mesh screens; twenty Wilfley concentrating tables, taking out, in iron sulphides, about 2% of the total ore crushed; and a cyanide plant consisting of two tiers of 33-foot vats, five in each tier, fed by revolving pipe distributers. The slimes overflow from the upper settling tanks through gates with adjustable outlets, and thence to a large canvas plant, which effects only a small saving. This slimes product, of which about 100 tons escape per day (or 38% of the total ore crushed), consists of about 3% dry solids. Of this, approximately 93% will pass a 200-mesh screen. The slimes range in value between $3.90 and $4.87 per ton, the values being about equally distributed between gold and silver. The actual averages for ore and slimes during the years 1900-01, 1901-02, 1902-03—using the market values of silver for the respective years—were as follows:

Year.	Value of Ore Milled, Per Ton.	Value of Slimes, Per Ton.	Value of Sands, Per Ton.
1900–1901	$8.00	$3.90	$2 91
1901–1902	8.13	4.05	2 78
1902–1903	9.55	4.87	3.24

The decantation method of slimes treatment, as practiced in South Africa, was abandoned after a fair trial, for the following reasons: The impossibility of settling the slimes to a suitable consistency within a reasonable time, even with the aid of lime; the enormous plant made necessary by the retarded settling and the slow dissolution of the silver; and the high consumption of cyanide from the successive dilutions of the strong solution required for the silver. The only alternative was the adoption of the filter press method. This, however, for so large a capacity, involved a heavy outlay for presses, it having been found necessary to use a primary battery to remove the bulk of water from the slimes.

In the experiments that followed, and in the estimates made on cost of treatment and installation, the data and practice of certain filter press plants now operating in Australia were used as a working basis, modified as the conditions at Telluride required.

To those who have followed the development of filter pressing in Australia, it is evident that this branch of cyaniding has reached a state of high efficiency there. But the over-sanguine metallurgist who is apt to be unduly captivated by the attractions of the new process, and lured by the plausibilities of exploiting concerns who control "improvements" and patents, should be reminded that in Australia filter pressing was evolved from strikingly unique local conditions—or, rather, from a happy conjunction of favorable conditions. I think this may be admitted without depreciating the achievements of those who are responsible for the success of the process. In the Australian ores there is little or no silver to contend with; the slimes are of that permeable sort which admit of rapid operations in the press; the gold exists in a state favorable to quick and satisfactory extraction, or is rendered so by roasting; and, most important of all, the material is high grade, and can bear a high cost of treatment by a process which happens to be the cheapest and only possible one for those fields. But it is doubtful if filter presses will ever solve the problem of the cheap treatment of low-grade slimes. It is generally allowed that the large filter press, as at present constructed, is au unsatisfactory machine. Its first cost is heavy, especially if transported any distance (a press holding a 7-ton charge weighs approximately 20 tons); it is a clumsy machine to handle, and an expensive one to operate. Yet, imperfect as it is, there is nothing just now to replace it. Managers perplexed with low-grade slime problems can do little more than experimeut in the hope of finding something better, or at least wait until somebody else does. It seems not altogether improbable that with so mauy investigators at work on the problem we may soon hear of a slimes process which will possess the great desiderata—high efficiency, comparative cheapness of installation, and low cost of operation.

The slimes at present overflowing from the cyanide tanks at the Liberty Bell mill are principally of clay, and, as already stated, extremely fine. With a system of pointed boxes and large 40-foot settler vats, the experiments indicated that the slimes could not be settled in forty-eight hours to a sludge containing less than 80% water. An experimental filter press plant was installed and operated in the following mauner: A settler vat 5.5 feet deep and 8 feet in diameter was filled by a stream cut out of the total mill flow, equivalent to 2.5 gallons per minute. Into this stream milk of lime was fed in the proportion of 20 pounds of lime to 1 tou of slimes. The vat required about twelve hours to fill, and then overflowed clear water for another twelve hours. At the twenty-fourth hour the slimes commenced to overflow, and the stream was shut off. The vat charge was then allowed to stand for twenty-four hours, the resultant pulp consisting of 15% solids. This pulp was then agitated and fed into a small monteju, whence it was forced by compressed air into a 24-inch center-feed, recess-plate press of nineteeu plates. It took about five montejus to make a charge in the press. The filling was, therefore, intermittent, and the time required for the various emptyings of the montejus was five, fifteen, thirty, fifty and eighty minutes, respectively, or a total of about three hours. The pressure was started at about 20 pounds and reached 80 pounds at the third monteju charge, continuing at 80 pounds to the end. The resultant cake on each side of the plate was only $\frac{3}{8}$ inch thick. The water in the cake was then displaced by cyanide solutiou (.3%), which took from one to one and five-tenths hours. The displacemeut was slow and imperfect, and the effluent liquor, until it reached standard strength, constituted a weak solution which was subsequently used for displacement in the second pressing. The effluent solution was tested constantly by titration as the solutiou was forced in, and this, together with the results of sampling the discharged cake, determined the displacement. The discharged cake contained from 30% to 40% moisture. It was fed into a muller with strong solution and flowed thence to an extractor vat 5 feet in diameter and 6 feet deep, where about 1 pound of lime per ton of slimes was added to maintain the alkalinity. This pulp, containing 20% of dry solids, was agitated with air at intervals of five-tenths hour for seventy-two hours, beginning when the pulp first flowed into the vat, and ending when the last was drawn off. It was then forced through the press again at about the same rate and pressure as before. The strong solution remaining in the cake was displaced by the weak solution above referred to, and about 1.2 pound of cyanide per ton of dry slime was left in the cake when discharged. About 0.5 pound of cyanide was lost in consumption during contact, making the total lost and consumed 1.7 pound. All solutions were run through zinc boxes and the zinc was finally reduced as a check. In this small plant a total of 7.7 tons (dry) was treated of an average value of $3.84 (silver estimated at $0.40 per ounce). The extraction by bullion yield was 74.5%. As these tests were made under rather adverse conditions, it would be reasonable to expect a somewhat higher extraction in practice, and in the followiug calculations 75% will be assumed as the probable working extraction from the slimes.

The mode of operating a large plant was to be as follows: The slimes product, after addition of lime, to be divided between twenty pointed boxes, 5 feet deep, 5 feet wide and 20 feet loug, with constant underflow and overflow. Experiments indicated that this would eliminate about 50% of the water. Possibly a second series of boxes might be added to settle the pulp further. The final underflow was to be led to settler vats 40 feet in diameter and 20 feet deep, of which there were to be three in number, so that each vatful of slimes would have three days between the beginuing of filling and the end of emptying. In these vats, by settling, decantation, and possibly by the aid of filtering, it was thought that the moisture in the final pulp might be reduced to 75%. All of the clear water was to be pumped back and reused in the mill. These settler vats were to be provided with agitating apparatus to prevent settling and irregular supply to the presses during the process of press filling. From the bottoms of these vats several 8-inch discharge pipes were to lead to the pumps, the latter to be a specially designed modification of the Gould triplex plunger pattern, with ball valves, aud provided with a water flushing device to prevent erosion of the plungers. The pulp was to be pumped through a 4-inch pipe to a pressure tank on a hill behind the mill, the tank to be 10 feet in diameter and 20 feet high, the distance pumped to be about 400 feet aud the elevation about 180 feet, insuring 80 pounds pressure in the presses. The presses were to be fed directly from this tauk. In practice it was proposed to pump directly into the press and pipe column, and the tank on the hill was to serve merely to maintain a constant pressure—to reinforce the pump during the beginning of press filling, and later to act as a safety valve in case the pressure should exceed the limit. Some adjustment of this kind would be necessary, because the pumps were to be driven by belt and motor at constant speed, while the press would take a variable amount per minute, according to the stage of filling. These pressure tauks were to be provided with agitators if found necessary.

(TO BE CONTINUED.)

*Trans. Am. Inst. Min. Engs.

Fuel Oil in Roasting for Chlorination.*

Written by E. C. VOORHIES.

In discussing this subject we will first briefly describe the furnace we converted to oil burning, which was the old-style, straight-line reverberatory furnace, size 14 feet wide by 75 feet long, with working doors each side for shifting and stirring the batches or charges. These doors are 6x24 inches in size and are set at regular iutervals along each side of the furnace, with a fire box, grate bars and bridge wall at one end; at the other the dust chamber, damper and smokestack. In preparing this furnace for oil burning we took out the grate bars and bridge wall, and leveled up the fire box with brick and clay to the level of the hearth; we then cut a hole in the fire box end wall, in the center of the width of the furnace, about 12 inches above the hearth, and inserted a sheet iron box or flue, 6x10 inches in size, made of No. 18 iron. This was luted with fire clay to hold it firmly in place. This flue is to supply air to the burner. The burner (we use the American crude oil burner) is set directly above this air space and projects into the furnace so far that the flame, in goiug from the end of the burner, does not impinge upon any of the brick work.

Near the end of the furnace a small 4 H. P. steam boiler was erected for supplying steam to the oil pump, and to the burner for heating and atomizing the oil.

The ordinary oil pump is used for pumping the oil and is set in the usual manner. The oil and steam pipes leading from the pump and the boiler to the burner are covered with asbestos to maintain the heat in each as much as possible. The burner is connected to these pipes with brass uuiou couplings, which are preferable to other kinds, as they have ground joints and do not leak; they are also interchangeable when you wish to change burners, which becomes ofteu necessary owing to the iutense heat to which the burner is subjected, and only being used a part of the time the oil carbonizes to some extent in the burner, and it has to be cleaned out occasionally, for which reasou we always have an extra burner on hand.

We find we get the best results by keeping the steam pressure from 90 to 100 pounds and the oil pressure at 50 pounds.

By proper regulation of the steam and oil a flame can be thrown into the furnace 30 to 33 feet long without any blow-pipe action. The appearance of the burner when it is properly regulated, looking at it from the peepholes or doors on the sides of the furnace, is that of a brown fog coming out of the burner, and the gases do not take fire until they reach a distance of 4 or 5 feet from the burner, when they ignite into an easy rolling flame, which rolls along the furnace in all directious without noise or disturbance, and makes an ideal flame for this purpose—the typical reverberatory flame. The flame can be regulated easily by the admission of air through the side doors, so that any particular part of the furnace may be kept at a higher temperature than another part, by allowing the cold air to enter the side doors when it is desired to reduce the temperature.

When a charge of sulphurets is sufficiently desulphurized to have the heat increased the charge can be heated hot enough to draw from the furnace in about forty minutes, while with the use of wood to get the same heat would take from two and one-half to three and one-half hours. In that way we gain a sufficient amount of time during the twenty-four hours to increase the capacity of the roasting furnace, at least one-third. The furnace here described was capable of roasting four tons per day with wood for fuel. With oil we can roast six tons and do the work better and control the heat to a much better advantage than is possible when burniug wood.

Our experience has been in the treatment of sulphurets, when using oil for fuel, that the tailings average a little lower in value on the same class and kind of sulphurets than when we used wood for fuel.

Sulphurets from different mines require a somewhat different treatment, owing to the amount of sulphur, arsenic or lime contained iu the ore, but we do not hesitate in the least, from tweuty-six years experience, to say that the use of fuel oil in roasting sulphurets for chlorination purposes is a decided advantage over the use of wood for fuel, as the charges are more uniformly roasted and never overheated, as is often the case with wood fire, and the heat is under absolute control of the workman, for when a charge is finished you want to dispense with the heat, and all that it is necessary to do is to stop the oil pump, blow out the remainiug oil in the burner with live steam, then shut off steam and your oven is theu ready for the next charge; while with wood the finishing hearth is often too hot with the remains of a hot fire for the next charge, making it necessary to open the fireplace door so as to allow it to cool down a little before moving in the next charge; time is gaiued here also.

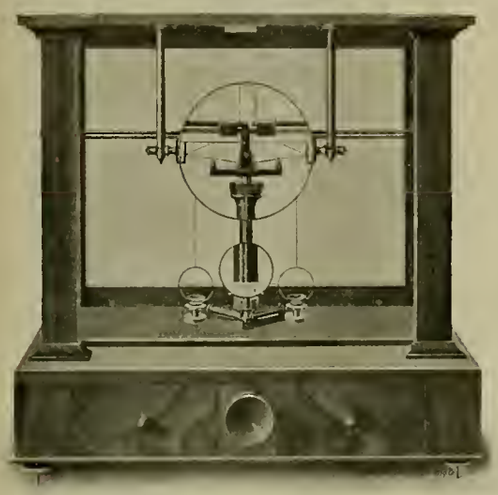
The following is a detailed statement of the amouut of oil and coal used for the treatment of 2647¼ tons of sulphurets: 1290 barrels Bakersfield crude oil, 14° to 16° gravity, was used, which cost, delivered, $1917.63;

*Trans. Cal. Min. Ass'n.

$\frac{11}{100}$ barrel was used per ton of sulphurets treated; the cost of oil per ton of sulphurets was 72 cents; 66.76 tons of coal were used to maintain steam in the boiler used for pumping, heating and atomizing the oil, cost delivered, $867.84, or 35 cents per ton of ore treated, making total cost of fuel for roasting 2647¼ tons of sulphurets, $2785.47, or $1.05 per ton.

A Denver, Colo., Firm.

F. W. Thompson, Denver, Colo., manufacturer of balances, started in business in February, 1896, under the name of Smith & Thompson. At the time they occupied a small place at 2219 Stout St., containing but 600 square feet of floor space, and manufactured but one style of balance. About three years ago Mr. Smith retired from the business, since which time Mr. Thompson has been carrying on the enterprise alone. Several months ago he moved into his present quarters, in the new building at 1717 Arapahoe St., Denver, Colo., where he has over 3500 square feet of floor space, or nearly six times as much as when he started in business eight years ago. He is now manufacturing sixteen different styles of balances, one of which is herewith illustrated. This balance is furnished with either round or cylindrical glass. The cut herewith shows style No. 7 short-beam button balance; sensibility, $\frac{2}{10}$ milligram; length of beam, 4 inches; agate edges and bearings. The beam is made light, to add to its quickness, and is braced for stiffness; it is gilded and has pin graduations. The beam is divided in fifty divisions on each side of center, to enable the operator to place the rider on the center and also to weigh the full milligram with a one milligram rider. It is provided with a double-rider attachment, fall-away pan rests, star adjustment, straight-top beam, skeleton hangers, reading glass for ivory index, plate glass base, levels and leveling screws and polished mahogany case with counterpoised door. Herewith is also illustrated the machine department of the establishment.



Short-Beam Button Balance.

How Bullion is Received, Treated and Paid for at the U. S. Mints.*

Written by Frank Leach, Superintendent U. S. Mint.

We have at San Francisco one of the most important mints in the world, considering its equipment and the volume of coinage annually executed. Until recently it occupied the largest and best building, devoted exclusively to coinage, in the world, but within the past year or so the mint at Philadelphia has moved into a much larger and superior structure; in truth the new mint building at Philadelphia is one of the finest of public buildings now owned by the Government.

We not unfrequently hear the San Francisco institution alluded to as the "branch mint," a term which is not wholly pleasing to the old mint officials, for the reason that the establishment ceased to be a "brauch" years ago, and is now as independent and important as any of the mints of the United States.

Under the old system of the mint service, the Philadelphia mint was the parent institution, and all of the mints of the country were known and established as branches of that mint, and all accounting and reports of the brauch mints were made to the superintendeut of the Philadelphia mint. But in the year 1873 the mint service was reorganized by the establishment of what is known as the Bureau of the Mint, under the Secretary of the Treasury at Washington, at the head of which is an official styled Director of the Mint. The branch mints were made separate and independent mints, and all officials were put on an equality with those of the mint at Philadelphia.

All accounting and reports of operations were from that time made to the Director of the Mint, who, as his title indicates, has immediate charge and direction of the operation of all the mints.

During the course of a year the officers of the San Francisco mint receive several thousand deposits, and probably not more than one iu five hundred of the patrons know, or have much of an idea, of the rules and methods by which the Government officials are controlled in settling with them. The methods and processes of testing and determining the value of gold dust or bullion brought or sent in by depositors to the United States mints, and the systems of assaying, refining, coining, etc., are not at all mysterious or secret in any way. The work is done in the ordinary well-recognized manner, and in such a way as to secure accuracy and promptness in making returns.

After the person bringing bullion to the mint has his metal weighed by the receiving clerk he receives from the register clerk a receipt, which is an acknowledgment that the Government has received from him so many troy ounces, gross weight, and further sets forth that the net value, when ascertained, is to be paid to the depositor on his order. These receipts being negotiable, it is very important that they be not lost, for no depositor can be paid by the cashier without his presenting to that official a receipt from the register of deposits.

In case of a loss of receipt, the depositor is required to give a bond to the superintendent in an amount equal to double the value of the deposit, and also publish an advertisement in a daily paper three times, giving notice of the loss of the document before a duplicate can be issued.

(To be continued.)

Machine Shop of F. W. Thompson, Denver, Colo.

* Trans. Cal. Min. Ass'n.

Uniform Bell Signals.

A code of mine bell signals has been issued by State Mine Commissioner White of Colorado, and the large mines of Cripple Creek have been visited and the new signal code posted. The code is as follows:

Bureau of Mines, State of Colorado.

In accordance with the provisions of Sec. 7 of an Act "to regulate the construction, equipment and operation of metalliferous mines, mills and metallurgical plants," I have hereby established the following uniform code of signals to be employed in all mines using hoisting machinery, same to be securely posted in a clear and legible form in the engine room, at the collar of the shaft and at each level station:

SIGNALS.

One bell, hoist.
One bell, stop, if in motion.
Two bells, lower.
Three bells, men on; run slow. Engineers will carefully observe this signal.
Seven bells, accident; hoist or lower by verbal orders, only.
Three-two-one bell, ready to shoot.
Engineers shall, after signal 3-2-1, raise the bucket or cage 2 feet and lower again, and shall remain at his post until final signal is given and command executed.

LEVEL SIGNALS.

1–1 bells	1st level
1–2 bells	2nd level
1–3 bells	3rd level
1–4 bells	4th level
1–5 bells	5th level
2–1 bells	6th level
2–2 bells	7th level
2–3 bells	8th level
2–4 bells	9th level
2–5 bells	10th level
4–1 bells	11th level
4–2 bells	12th level
4–3 bells	13th level
4–4 bells	14th level
4–5 bells	15th level
5–1 bells	16th level
5–2 bells	17th level
5–3 bells	18th level
5–4 bells	19th level
5–5 bells	20th level

RULES GOVERNING SIGNALS.

Rule 1—In giving ordinary signals make strokes on bell at regular intervals. In signals similar to "Ready-to-Shoot" (3–2–1 bells), each bar (– – –) must take the same time as each stroke of bell.

Rule 2—When men are to be hoisted or lowered, give the signal for "Men on, run slow" (3 bells). Men must then get on bucket or cage, then give signal to hoist, or lower (1 or 2 bells).

Rule 3—After signal "Ready to shoot" (3–2–1 bells), engineer must give signal that he is ready to hoist by raising and lowering bucket 2 feet. Miners must then give the signal "Men on" (3 bells), then "Spit fuse," get on bucket or cage and give signal to hoist.

Rule 4—All timbers, tools, etc., "longer than the depth of bucket" or placed within a cage, must be securely lashed before being hoisted or lowered.

Rule 5—Signal of three (3) bells means "Men on; run slow," and nothing in conflict therewith will be allowed. Signals to meet local demands, and not in conflict with the above, may be added by individual operators, but the same must be posted in clear and legible form in connection with the above code.

(Signed.) E. L. White,
Commissioner of Mines.

NOTICE.

Please observe the following, as they are imperative in order to comply with the law:

Don't get on bucket without first seeing that safety chain is properly hooked.

Don't get on cage or bucket without first signalling the engineer. Give three bells, then get on cage or bucket and ring one bell to hoist or two bells to lower.

Don't ride on loaded cage or bucket.

Don't ride on cage or bucket containing tools, timbers or explosives.

Don't load steel or timbers without first landing car or bucket.

Don't attempt to get on or off cage or bucket while in motion.

Don't leave guard rail thrown back.

Don't get in a hurry in signalling engineer; space your bells.

Don't work in ground you consider dangerous. Call your foreman's attention to the condition of the ground.

Don't be careless, thereby endangering the lives of your fellow workmen.

Don't drill in an old hole or "gun."

Don't fail to thoroughly examine ground for missed shots before starting to drill, whether any misses are reported or not.

Don't attempt to pick out a missed shot.

Don't store explosives in excess of one day's supply under ground, but in magazine provided for that purpose.

Don't thaw powder except in powder thawer, which must be provided for that purpose.

Don't use steel or a metal rod of any description for tamping.

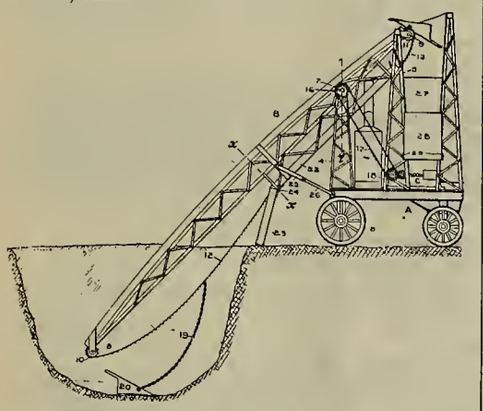
(Signed.) E. L. White,
Commissioner of Mines.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 15, 1904.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

EXCAVATING MACHINE.—No. 754,480; J. D. Moran, St. Panl, Minn.

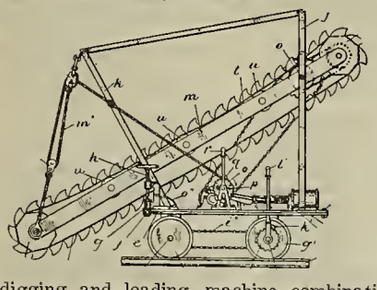


In excavating machine, combination with snitable framework, a downwardly inclined runway having fulcrum support in framework, endless chains carried by runway, scoops connected with chains, guideway supported below upper end of runway, hinged apron at lower end of guideway, discharge chute supported in framework adjacent to inner end of runway, and means for actuating chains.

DRILL OR PUMP ROD GRAPPLE.—No. 754,579; J. Luke, Eskridge, Kaus.

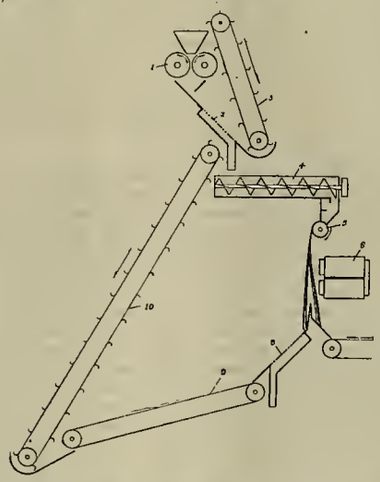
A grappling device consisting of spaced resilient arms terminating in inwardly extending claws and provided with longitndinal slots, and bar movably disposed in slots and provided with notches for engagement with walls of slots to maintain bar in distended position, bar having spaced barbed arms depending therefrom between bar and claws.

DIGGING AND LOADING MACHINE.—No. 754,592; D. McDonald, Bruce Mines, Canada.



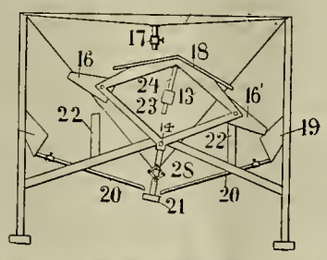
In digging and loading machine combination of movable trnck or platform, swing table mounted thereon, worm shaft for swing table, rack connected to movable truck or platform meshing with worm shaft, pinion shaft, intermeshing bevel pinions mounted on pinion shaft, worm shafts, main frame supported by swing table, carrier frame journaled at one end to main frame, adjustable gear for raising and lowering other end of carrier frame, drums mounted in carrier frame, carrier belt passing around drnms, buckets connected to carrier belt, sprocket wheel for driving carrier belt, motor and means for transmitting motion from motor to sprockct wheel.

PROCESS OF SEPARATING ORES FROM MAGNETIC GANGUE.—No. 754,756; T. A. Edison, Llewellyn Park, N. J.



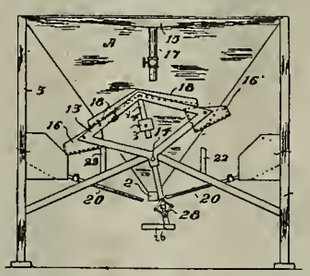
Process treating magnetic ores carrying small proportion of non-magnetic material to be recovered, which consists in grinding ore to sufficient fineness to free non-magnetic particles, in adding thereto predetermined aud larger bulk of coarser non-magnetic material, in subjecting mixture to action of magnetic separator whereby non-magnetic material to be recovered together with added coarser material will be rejected as tailings, and finally in separating added coarser material from original non-magnetic material.

AUTOMATIC ORE AND SLIME SEPARATOR.—No. 754,911; C. Allen, El Paso, Tex.



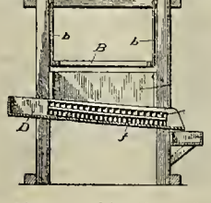
In device of character described, combination with intermittently oscillating tank or hopper hiuged at one end and counterbalanced connections with opposite end tank or hopper having inclined bottom and discharge passage in bottom, of valve in passage connected with counterbalanced connections and operable in unison with oscillations of tank.

AUTOMATIC ORE AND PULP SAMPLER.—No. 754,912; C. Allen, El Paso, Tex.



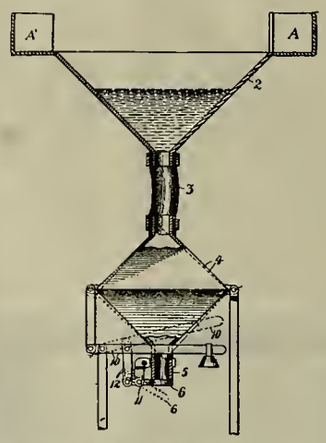
In ore and pulp sampler, tilting tank or hopper having sand ontlet in bottom and separate water outlet, valve in first-named outlet controlled automatically by tiltings of hopper, spout movable across path of sand outlet and operable intermittently by action of discharged water from tank.

GOLD SEPARATOR.—No. 754,657; A. C. La Bud and H. J. Barton, Oakbar, Cal.



In gold separator, combination of slnice box, and plurality of sets of inverted L form riffles therein, lower set of riffles lying on bottom of sluice box and slightly spaced from each other, and upper set directly overlying lower set and having riffles more widely spaced from each other than those of lower set.

AUTOMATIC SILT AND SAND SEPARATOR.—No. 754,732; C. Allen, El Paso, Tex.



In settling apparatus, combination with a conduit section having side opening forming lateral discharge, second conduit section having side opening presented toward discharge of first section, sections being separated from each other, and fluid container forming transverse continnons connection between discharge of one conduit section and inlet of second section, of subjacent tilting tank having communication with container, and having valve controlled sand discharge automatically governable in nnisou with oscillations of tank.

The Globe District of Arizona.

F. L. Ransome of the United States Geological Survey is the author of an illnstrated paper of 168 pages on the geology of the Globe copper district, Arizona. The investigation of this district was begun early in the summer of 1901, when a month was devoted to preliminary reconnaissance and areal mapping of the geology. Work was subsequently resumed in October of the same year and continned to February, 1902. The report is now available as Professional Paper No. 12, and may be obtained, free of charge, on application to the Director of the United States Geological Survey, Washington, D. C.

The area within the Globe quadrangle contains abont 250 square miles. It is sitnated in the southeast-central part of Arizona, between the Gila and Salt rivers, and includes portions of Gila and Pinal counties. It is in the heart of the mountain region of Arizona. The town of Globe, which lies near the eastern edge of the qnadrangle, has a population of about 1500.

The Globe claim, now part of the Old Dominion mine, was the first claim located in the district. That was in 1874. Silver ores were at first the attraction in this region and remained so nntil 1883, when silver mining declined, and the production of silver ores practically ceased in 1889. Abont 1881 copper ore began to attract attention. Up to the close of 1901 the total copper prodnction of the district is estimated at about 120,000,000 ponnds, three-fourths of which came from the Old Dominion mine.

In this paper Mr. Ransome discusses the general geology of the region and the mineralogy, geological occurrence, origin, and age of the ores. He then describes in detail the Old Dominion mine; the group of the United Globe mines, inclnding the Grey, the Buffalo, the Josh Billings, the Big Jonnie, the Buckeye, and the Stonewall mines; other mines in the Globe hills, several miles northwest of Globe; and some mines in schist on the western slope of the Pinal Range.

THE recent advance in the price of zinc ore, though small, about $1.50 per ton, has stimulated the ontpnt in both the Missonri-Kansas and Colorado fields. A few weeks since the Missonri mines were combining to restrict production in an effort to raise the price of ore. Recently blende containing 60% zinc has found a ready market at Joplin at $38.50 per ton. Lead has also advanced in price, and the resnlt is unusnal activity in the lead-zinc mines of the West.

A NEW PETROLEUM BRIQUETTE is being manufactured in Germany. The composition is 1000 parts of crnde petrolenm, 150 parts of soft soap, 150 parts of resin and 300 parts of caustic soda. The mass solidifies at about 120°, when the briqnettes are run through a bath which thinly coats them in such a manner as to make them impervious to the elements and very clean to handle.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

Nome reports say there is more activity in and around Nome in mining than ever before. The creeks are margined by dumps, which are daily increasing in number and size. Early spring cleanups are expected to prove heavy. Machinery has been largely employed during the winter season. Solomon river section has been the scene of much winter work. Operations on Poluk creek have been pushed. The installation of plants will lessen the cost preliminary to work in 1904. Miners on the Inmachuk are meeting with success, according to reports. At the Big Hurrah M. Co.'s plant on the Solomon river forty men have been steadily at work throughout the winter in sinking and drifting. Assessment work on the Irish Hill properties has been increased, the amount not being limited to $100 to the claim. A large amount of work has been done on Hastings creek. They report opening the old channel. An early snowfall was of benefit to the men on Dexter and other creeks. Many who had been unable before the snow to run their thawers or hoists started up under favorable conditions. At the Sugar claim the Pioneer Co. sank a shaft 233 feet deep and ran two levels. This was the first time this system was used in that district. Two pay streaks were reported to have been uncovered by the Pioneer Co., and a pay streak was found where the Bowery claim joins the Sugar claim. On the Dry Creek divide Duggan, Beacb & Connolly have had men working. Pay dirt is reported to have been struck in Newton gulch. Men on Nikkala gulch report their ground is "spotted," but they expect results in the long run.

The Carvey-McNeer group of bench claims, in Nizina section, have been sold for $100,000 to H. V. Winchell et al., says the Valdez News. The property consists of thirteen bench claims on Rex and White gulches. It is reported that the same parties have also taken over the holdings of the Chititu Development Co. Work will be started this season.

Juneau reports say the Mexican and Ready Bullion mines at Treadwell have practically suspended operations owing to a long spell of dry weather. No rain has fallen in southeastern Alaska since February 1st and the wind has blown steadily from the north. A Douglas City report says the timber through the surrounding country has dried out, leaving that town in danger from forest fires. The water system is in bad condition, the water in the pipes having frozen. Water is being retailed in Douglas at $1 a barrel. The water plant at Ketchikan has also been thrown out of use by freezing of the pipes. They are depending on snow water for domestic use. Water is scarce at Juneau and Skagway.

ARIZONA.

Cochise County

W. Kemp, manager of the Copper Belle mines in the Dragoon mountains, near Tombstone, is resuming operations, after a year of idleness.

Maricopa County.

The Chicago-Phœnix M. Co. has been organized in Chicago, Ill., to operate the Nellie Cotton group of claims, near Phœnix. The Nellie Cotton group consists of the Nellie Cotton and Mystic mineral claims, south of the Knob Hill mine. Most of the work has been done on the Nellie Cotton, where there is a showing of sulphide ore. A machinery plant is to be put in, and H. J. Cole of Spokane, Wash., is manager.

Graham County.

I. N. Stevens, superintending development work on the Lezynsky claims, near Longfellow, reports opening up a body of copper glance in the face of the tunnel which is being driven. He has crosscut through concentrating ore for 70 feet. Development work will be continued.

Electric traction has been installed in the Humboldt tunnel of the Arizona C. Co., near Clifton.

Santa Cruz County.

The Senorita Oil Co. has been organized to develop oil lands near Nogales by C. N. Thomas, G. Tuttle, C. R. Brown and P. E. Murray. This company owns land where oil indications have been found, and is arranging to put in drilling machinery.

Yavapai County.

(Special Correspondence).—G. W. Middleton, manager and vice-president of the Bradshaw M. & C. M. & S. Co., is increasing development of that property. Having opened up the ore bodies with shafts and crosscuts and then driven a 1700-foot double track working tunnel 1000 feet below the upper development, he is now building an aerial tramway from the shaft to Middleton station, 1 mile distant, at foot of the mountain. He has taken over and is enlarging the Val Verdo smelter to handle the ore of this mine. The company is a close corporation, J. R. Allen of New York president, and the seveuty claims extend 6 miles in length to ½ mile in width. Trend is along the top of a range of the Bradshaw mountains. Middleton station, on the Bradshaw Mountain Railroad, is 40 miles from Prescott. Along the western line of the property is a porphyry dike, running north and south. East of this are five ledges carrying on the surface values in gold and copper carbonates, and deeper bodies of low-grade sulphide ores. There is a total of 9 miles of pipe on the property, 6000 feet of which carries air from the compressor at the station to the mines on the hill, used to operate the air drills. There will be 1500 feet of surface tram leading to the aerial tram, which will be 4000 feet long, with a fall of 1000 feet. The power generated by the operation of the tram (estimated 30 to 60 H. P.), will be utilized to run a crusher. The tram will have a capacity of 2000 tons daily. Bins are being built at the station and the 50-ton steel hopper-bottomed cars will be loaded directly from the bins. Val Verde smelter is on the Agua Fria river, 22 miles from Middleton. The smelter site includes 1000 acres of land, which gives it control of the river, with abundant water. The slag dump will be extended across the river as a dam. Manager Middleton says the present plans should be worked out within a year, bringing the smelter capacity up to 1750 tons per day, employing 150 men, and giving work to 200 men at the mine. Among other things proposed is a tunnel 1000 feet below the present one with a length of 4000 feet. R. L. Clark is superintendent at the mine.

Middleton, March 19.

(Special Correspondence).—Last week the Button M. Co. was reorganized. The group has been worked intermittently for the past twenty-five years and free-milling ore taken out. W. Button is manager. Sulphide ores are found in deeper workings. There are three shafts, with total of 2000 feet of work, and a 5-stamp mill is up. Manager Button says sixteen tons of ore are treated per day at cost of $1.25 a ton, 1½ cord of wood being used for fuel. Water for mill is pumped from the mine. W. R. Albertson of Worcester, Mass., is president. Development work is being increased and the mill will be put in operation before April 1. It is 7 miles from Crown King.

The Tiger G. Co. owns 4 groups of claims, locally known as the Oro Belle, under management of G. J. Harrington. The groups are the Tiger (7½ claims), the Fleetwood (9), Castle Rock (9), and Standard (6). On these groups are ten separate ledge croppings, most of which have been more or less developed, there being seven tunnels having respectively 90, 100, 200, 660, 675, 673 and 1046 feet length, with numerous crosscuts. Work has been started on a tunnel which will cresscut all of these ledges and run 4660 feet. To depth of 500 feet the ore was free-milling, carrying gold and silver; below that depth it is sulphides. The company's 10-stamp mill is being increased to twenty stamps. This is expected to handle fifty tons per day and yield average of five tons of concentrates. Tables are used in concentration. Principal development work under way is sinking on the Gray Eagle ledge to secure water for mill operation. There is high-grade ore blocked out ready for stoping. The company is considering erection of a smelting plant on Humbug creek, where there is ample water. The company is composed of Illinois men, with G. S. Connelly of Springfield, Ill., president. The properties are in the Bradsbaw mountains, 4 miles frem Crown King, the present terminus of the Bradshaw Mountain Railroad. A sawmill at the camp turns out timbers for the mine and the surrounding forest provides cheap fuel.

Two small properties adjoining the Oro Belle are the New Jersey and Rapid Transit, of which J. C. Bradbury is foreman. The company is tunneling under the former werkings and has again struck the ore shoot. The Rapid Transit reports ore in its tunnel also.

Crown King, March 19.

Several sets of lessees are extracting ore from the Old Peck mine, in the Bradshaw mountains, southeast of Prescott. The main shaft is being unwatered and will be sunk to greater depth. The mill is also being repaired, says J. S. Eagan, manager.

H. La Montayne, manager of the Sultan mine, near Hillside, reports shipping last week a bar of gold bullion valued at $8000, the result of a clean-up after an eighteen-day run of the 10-stamp mill.

At the United Verde smelter at Jerome two 500-ton furnaces and one 250-ton furnace are in full blast.——The Equator smelter, near Jerome, is again in full blast, after a temporary shutdown.

CALIFORNIA.

Amador County.

At the Oneida, near Jackson, the full sixty stamps of the mill are in steady operation.

The 4-stamp mill at the Glenn mine at Volcano is running steadily on ore.——Operations on the Union Flat claim have been suspended until after the heavy rains, owing to tendency of the tunnel to cave while the ground is wet, says the Amador Ledger. The last day's run yielded $47.50 for five men.

The West Penn M. Co. of Pittsburg, Pa., which bought the Wheeler mine (the Ivanhoe) at Plymouth, is preparing to work the Wheeler. This company also proposes buying other properties. C. H. McCaffrey, superintendent, is pumping the water out of the Wheeler mine and will mill 100 tons of ore at the Bay State mill. The shaft is down 125 feet and two drifts are run. The 20-stamp mill was burned down a year ago.

Calaveras County.

An engine and mill has been put in at the Lloyd mine at Central Hill, near San Andreas.

At the Gwin mine at Gwinmine the mill is operating with ninety stamps.

Kern County.

The McKittrick Pipe Line Co. has been organized by A. H. Butler, president of the Dabney Oil Co., et al., to lay a pipe from McKittrick oil field to the sea coast in San Luis Obispo county. The Dabney property at McKittrick is 1150 feet above sea level, and the highest point the line will reach in passing over the range is at 2100 feet elevation, according to the surveys which have been made by W. E. Murray, engineer in charge. Seven pumping stations will be built. The oil averages 18° gravity. The line will be about 90 miles long.

At Amalie the Gold Peak M. Co. continues shipping ore. Manager Laynge says he has bought the Pearl and Emmet mines, giving the company a continuous lead of 12,000 feet on the Zada vein, all of which carries values. The Zada mill, under Manager Cummings, started last week. The company has also put up wire-rope aerial tramways, which are giving satisfaction. The new camp at Sand canyon is being developed.

Mariposa County.

W. B. Sayers, manager of the Roy mine, near Indian Gulch, near Mariposa, says he will put up a 2-stamp mill.

C. C. Burrell of Ellsworth, Me., owning mines at Lewis, treasurer of the White Rock M. Co., near Mariposa, states the company will begin work on the group this spring. He has arranged to put in a gasoline hoist and later an air compressor and machine drills will be used. During the summer, says Burrell, it is expected a smelter will be built of 100 tons daily capacity. E. L. Foster is superintendent.

Nevada County.

The annual report of President J. D. Hague of the North Star M. Co., operating near Grass Valley, shows during the year ending Dec. 31, 1903, the North Star mines produced total value of $736,087.31, at current operating cost of $259,164.39. Of the balance, $237,476.05 was expended on capital accounts; developments, $134,746.63; improvements, $61,987.77; property purchase, $39,772.47. and sundries, $969.18. The total output of the North Star mine during 1903 was 27,395 tons of ore, yielding $732,523.61 ($26.74 per ton), costing for all operating expenses $254,941.40 ($9.30 per ton). The production of 1903 is due in part to the rich ore body opened in 1902, between the 1100-1900-foot east levels, and developed 300 feet farther during 1903 by a winze (all in ore) to the 2300-foot level, from which were produced during past year 10,960 tons of ore, yielding $366,403.73, while from the deeper workings of the mine, opened from the Central shaft, there has been produced $366,119.88, the yield of 16,435 tons. The general average of ore hitherto mined from all the upper levels has been $18 per ton, while past year's product from the deeper workings yielded $22.27 per ton. During 1903 the workings from the Central shaft (vertical) have been extended along several deeper levels, showing continuity of the vein and its general profitable value in depth, says President Hague. Meanwhile the main raise, beginning at bottom of Central shaft (1600 feet vertically below surface), has been driven upward, following vein in good ore, and connected with bottom of upper workings, making one continuously opened mine, 4000 feet deep, measured on dip of vein from surface outcrop to present bottom level. The company owns the Massachusetts Hill and Gold Hill mines adjoining, in direction of dip of North Star vein. During the year $90,792.33 was expended in the North Star mine, and wholly in the Central shaft workings. To this item is not chargeable the cost of mining the ore which was produced from this source in 1903, as it is the sum of outlays made during the year in extending the openings and developing ore for future production. The remaining $43,954.30, charged to development account, has been expended on Gold Hill mine, where prospecting work is in progress, so far without definite results, but giving encouragement toward finding extension of the ore body from which ore was formerly produced. Of the improvement account, $23,702.64 was expended on the Wolf Creek power plant, mainly in addition of a compressor of 300 H. P. Also, $6,957.14 has been expended in improving the North Star 40-stamp mill, and $25,446.48 on account of the new 40-stamp mill, approaching completion near the Central shaft.

The fifteen stamps of El Oro mine of Maybert continue to drop steadily on ore from the Mayflower claim. Setting up of the compressor and the dynamo which is to furnish lights for the mill, hoist and underground has been completed. The work of surface improvements has been temporarily interrupted on account of the storms preventing getting in lumber and other supplies. The flume will be rebuilt during the summer. It is also proposed to add ten more stamps to the mill.

Superintendent J. H. English, of the National Hill group of mines, including the Culbertson, near Gaston Ridge, says with the opening of spring the number of men will be increased and development work will be done. The National Hill is equipped with ten stamps. The mill, hoist, underground workings, boarding house, office and adjacent buildings are lighted by electricity. The National Hill group is in the National Hill vein, being parallel with the vein of the Gaston Ridge and Plumbago, says the Union.

Plumas County.

Dunn Bros. will put in a cyanide plant below their quartz mill at the Mountain Lily mine on the North Fork, near Quincy.

G. Palmer, superintendent of the Colonial M. Co., says the shaft on the gravel claim at Mill Creek, near Quincy, has reached bedrock at depth of 90 feet. This is nearly twice the depth estimated at the beginning of work. A body of gravel was above the bedrock and is reported to yield good prospects. A sump is being put down at the bottom of the shaft. When completed, drilling will begin. The tunnels in the quartz properties, the Mountain Chief and Homestake, which are principal part of Colonial holdings, are being driven to tap lodes which show on the surface.

San Bernardino County.

It is expected the stamp mills at the Ludlow mines at Rochester will be in operation next month. The Chase group will have a stamp mill independent of the other mines, and another mill is being installed for the Roosevelt mine. There are ninety men at work at the Bagdad group, twenty-five at the Chase mine and forty at the Roosevelt. They have been blocking out the ore, running tunnels, timbering shafts. A pipe line is also being laid by the company to convey water to the mines.

Shasta County.

The Northern California Power Co.'s plant at Cow Creek, that will supply electricity to miners near Redding, is expected to be put in operation this week. It will supply power to the Afterthought mine. The plant is supplied by ditch and wooden pipe line, the wooden pipe being made of selected fir, planed concave and iron bound. The ditch is 1236 feet above the machinery. The water goes down through 4-foot pipe, the last joints being 3 feet.

Winthrop reports say the smelter at De Lamar's Bully Hill mine may have to shut down on account of lack of coke. The company has abundance of fuel at Bella Vista, 14 miles away, awaiting shipment by wagon to Bully Hill (Winthrop P. O.), but the storm, which has been in progress since February 3d, has made freighting impossible for several weeks. The season's precipitation was 54.42 inches to the 23d inst.

Trinity County.

At Hall City the bonders of the Williams mine are increasing development work and are arranging to put up a 5-stamp mill. This mine is on the Trinity side of the ridge, near Harrisen gulch.——The first milling of ore on the Eastman Gulch mine, near Weaverville, owned by Hamilton & Goodyear, is reported satisfactory. A sheet of ore has been developed in the mine. The mill is of two stamps.

It is reported the Fairview mine, near Minersville, J. H. Porter superintendent, will have thirty stamps added to the mill.

Tuolumne County.

An agreement was made recently be-

tween W. Sharwood of Soulsbyville and the Grizzly M. Co., whereby the party of the first part will "furnish and build a 20-stamp mill at the Grizzly mine for $20,000, to be paid for from ore extracted from the mine."

Work is progressing at the Longfellow mine at Big Oak Flat. The three-drill air compressor is running and on the 450-foot level east a machine drill is at work breaking ore in the stope. The mill has been put in operation.

R. T. Sorensen has resumed work on the Gold Bug mine, near Big Oak Flat. The heavy rains put a stop to nearly all prospecting work. Sorensen is crosscutting 500 feet from the east line of the Little Wonder.

Superintendent S. E. Riggs of the McAlpine mine, 4 miles from Big Oak Flat, says they have put in electric drills at the mine, which are working satisfactorily.

COLORADO.

(Special Correspondence).—There is an increase in the machinery and supply trade and indications are that it will continue to advance. In different parts of the State chambers of commerce, boards of trade or bureaus of publicity are being organized, the mining and business interests being materially benefited. Conditions in several parts of the State, especially at Telluride and Cripple Creek, are not altogether satisfactory, although at Cripple Creek it is improving. At Telluride the deportation of miners continues.

Several new railroad enterprises are being organized for opening up territory heretofore practically shut off from railroad facilities. These enterprises are mostly electric.

An important feature in the mining industry is the price being paid for zinc and the demand for this metal. In several districts it has been almost impossible to mine at a profit on account of the heavy penalty assessed by the smelters on ore carrying zinc. In Leadville and vicinity ore that was heretofore thrown on the dump on account of the zinc it contained is beginning to have commercial value. Concentrating mills are being designed to handle this class of ore—too low grade to ship to the smelters without concentrating. One property has 180,000 tons of this kind of ore on the dump. In some of the lower levels of the different mines they are not taking the ore out on account of the zinc it contains, but they are now beginning to realize its value.

Denver, March 21.

Boulder County.

At Ward the Myrtle M. & M. Co. has bought the San Blas mine and mill and is remodeling the mill. The company is putting in a fifty-ton ore roaster with fume-saving device. Manager Strong expects to be ready to operate next month.——Smith & Mitchell of the Struggler mine, 3 miles north of Ward, are building a plant at that mine. They have twenty-five men in the mine and mill and expect to start the mill in full operation next month.

Clear Creek County.

(Special Correspondence).—The Ingalls G. M. Co., operating near Idaho Springs, will put in a 30-stamp mill.

Idaho Springs, March 20.

F. A. Babcock, superintendent of the Southern M., M. & D. Co., at Silver Plume, says he will increase development of the Robert E. Lee tunnel in the spring, when they propose putting in a plant to operate with air drills. Ore has been found in the breast of the tunnel that assays in gold and silver.——Nazro & Co. have leased the Frostburg dump and will build a tramway for handling the ores. It will carry the material from the mine direct to the railroad cars.

The number of men at work on the Gold Fissure mine at Empire has been increased to extend prospecting of the acreage within lines of the company. The present workings are mainly confined to the Badger claim (the Gold Fissure), but increase of output by drifting into the adjacent territory covered by the extensions of the Gold Dirt and Tenth Legion veins is proposed. Reserves of lower grade material are being held for introduction of treatment that will be afforded by erection of a plant by the Empire-Gold Bug M. Co., says Manager Clough, of the Gold Bug. The cyanide process will be used. The building will admit of increase of tankage space to accommodate 150 tons per day, while treatment capacity of 100 tons daily will be provided at start.

The Waldorf M. Co. will enlarge the Stevens mill, near Georgetown, to capacity of at least 100 tons per day, and it is said the company will build another for treating ores from the Tobin vein, which shows 4 feet of mineral.——The Hazleton Con. Co. will build a mill for treating ores from the Baltimore tunnel and also from the Santiago mine. An aerial tramway will be built from the Santiago and the ore treated at the mill near the mouth of Baltimore tunnel.——Several other companies, among them being the Corry City, are investigating methods of treatment.

Chaffee County.

(Special Correspondence).—About 15 miles from Salida and 2 miles from Turrett, in the Turrett mining district, the Ethel G. M. Co. has opened up a body of graphite. The vein is 40 feet wide and analyses show marketable values. L. L. Miller, president of the company, is arranging to put in a mill to prepare the material for market. They have one shaft down 60 feet on the vein. The property will be developed extensively the coming summer.

Turrett, March 21.

Dolores County.

The Rockwood-Perkins-Lee-Miller Co., which have a lease upon the United Rico M. Co. group tunnel dump and a number of stopes in the Enterprise mine at Rico, has started up the mill.

Gilpin County.

Shipments of smelting and other ores, mill tailings and concentrates from Black Hawk depot to the Denver smelters and outside points of treatment for the month of February amounted to 202 cars, or 4040 tons, an increase of 160 tons over January.

Twenty men are being worked at the Hamlet mine, in Gregory district, near Central City, by the Hillside M. Co., most of whom are working under tribute. Work is being carried on in the east 365-foot level, and both milling and smelting ores are being taken out. The smelting ore is shipped both to the sampling works and to the Denver smelters, while milling ores are being shipped to three batteries at the local mills at the rate of three cords (128 cubic feet, or 7½ tons per cord) per day. W. H. Simonds is superintendent.——Dalsoglio & Co. of Central City are operating the Dump mine, Gregory district, under lease. They are operating in the 200-foot west level, where they have milling and smelting ore. The last shipment of milling ore brought values of 5½ ounces gold per cord, and the smelting ore has been returning 3 to 6 ounces gold per ton.——W. Mitchell & Sons are preparing to put in a steam plant on their Gulch property, in Lake district, near Central City. They have the shaft down 300 feet and are drifting and stoping in the bottom levels. Both milling and smelting ores are being shipped.

Sinking operations have been completed at the Cook shaft, near Central City, down 1400 feet. It was sunk an additional 500 feet. Manager Thompson has started up the Boston mill, which has been overhauled, dropping twenty-five rapid-drop stamps which are expected to handle between forty and fifty tons per day. The ore will be conveyed to the mill by electric tram line, running through the Bobtail and Bates hill tunnels.

Superintendent A. W. Rucker of the Nevada Con. G. M. & M. Co., near Central City, says the mill is in operation. It has daily capacity of 100 tons and the company expects to keep it running on ores from the King and other mines of its group. Superintendent Rucker will increase his force to 100 men in the mine and mill.

Gunnison County.

The Gunnison Exploration Co. has been organized in Denver by A. T. Morgan, T. J. Zollars, W. H. Sherrod, L. W. Van Dyke and L. G. Schwallenberg to develop and operate holdings in Sherrod and Tomichi districts.

Jefferson County.

(Special Correspondence).—The exhibit of the Colorado School of Mines of Golden at the St. Louis Exposition will be a working assay and metallurgical laboratory. A space of 25x50 feet has been assigned in the Metal Pavilion, opposite the Mines and Metallurgy Building. Equipment will consist of one coal and two gasoline furnaces and necessary accessories, four desks for chemical work and a dust proof balance room inclosed in glass. Besides the practical laboratory work, there will be eight cases for general display. Work will be done by students of the Colorado School of Mines, under direction of a committee of the faculty, consisting of President V. C. Alderson, F. W. Traphagen, professor of metallurgy and assaying, and H. Fleck, professor of chemistry. While regular assays will be made to show general methods of work, it is intended to assay free of charge all specimens that visitors may choose to submit.

Golden, March 21.

Lake County.

Manager Frank Brooks of the Diamond mine, at Leadville, says the Diamond is shipping 100 tons a day, while development work, that is being done in all directions, shows ore. The pay ore being mined shows oxidized iron material, running $18 per ton, with a 20% iron excess, and also a showing of high grade lead ore. The principal work is being done at 1020-foot level; and the main drift at this point is in 600 feet and has entered the Vega ground. The water flow at the Diamond has been reduced, and they are handling 325 gallons per minute. The Diamond has seventy men at work.

Leadville reports say operations at Little Ellen hill are increasing. A strike has been made in the Ollie Reed mine, showing gold, silver and lead. The Silent Friend, near the Ollie Reed, is also producing high-grade ore. Greene Bros., operating near the Treasure Vault, have ore and are making shipments.——F. Ballon has bought the Little Ellen lease and will increase work.——The Valley mine, it is said, has a body of ore in sight and will resume work next month.——It is proposed to drive a tunnel through Mosquito range, going down by the Diamond and the mines of Big Evans gulch.——The owners of the gold mine on Alicante expect to open up the mine in the spring. Six men have been at work all winter getting it in shape.

The Last Chance mine in Horseshoe district, near Leadville, is being operated by the Cerussite M. & M. Co. This company has also bond and lease on the Hilda, Addie, Cato, Cerussite, Wasboe, Anglesite, Big Chief, Iron Chief, Uncle Sam and E Pluribus Unum. The Cerussite placers are owned by them. During the past year they have rebuilt the concentrating mill, putting in machinery, consisting of concentrating tables, crushers and crushing rolls, revolving screens, hydraulic sizers, slime tanks, pumps and settling tanks; also an independent electric lighting plant. It has capacity of 60 tons of ore per day. In the mines work has been devoted for the past three years mostly to development of ore bodies; reserves of ore are being opened up, preparatory to mining on a larger scale as soon as connections are made with south workings from hoisting shafts.——The Peerless Maud, in same section, is being operated by H. Dyatt and producing both smelting and milling ore. This mine, as well as the Cameron, is on southern extension of the Last Chance ore shoot, says the Carbonate Chronicle. Manager Dyatt has completed sinking a new shaft on north end of Peerless Maud, and has opened up a large body of ore, from which he is shipping steadily.——On the Dora Daisy property, 1500 feet east of the Last Chance, on Mt. Sheridan, the tunnel is going ahead.

Las Animas County.

Governor Peabody, on the 22nd inst., declared Las Animas county in state of insurrection, and 380 members of the National Guard were sent to Trinidad and distributed among the coal camps. The soldiers have relieved the mine guards employed by the coal companies at $5 a day each. On arrival, Major Hill placed the entire county under martial law, ordering all saloons, dance halls and other resorts of a questionable character to close at 9 P. M. daily. All citizens having firearms in their possession are ordered to register them with the military authorities, and the sale of firearms and ammunition is forbidden. The mine owners have insisted for several months that they could not get men to operate their properties because non-unionists were afraid to go to work unless afforded military protection. Las Animas county forms the larger part of southern Colorado coal fields.

Mineral County.

Work is under way by the Humphreys M. Co. at Creede to build check dams along the creek for catching tailings from the mill and to allow slimes to settle. These dams will be 7 feet in height and several hundred feet long.

Ouray County.

The Imogene G. M. Co. is working sixteen miners, nine on the Ironton side of the range in the tunnel, and seven sinking a shaft on top of the range south from the old workings of Camp Bird mine, near Ouray. The tunnel is in 600 feet and is headed for the shaft, a distance of 4000 feet. The shaft is down 400 feet. Manager L. B. Jackson of Chicago, Ill., says more men will be put on.——The local smelter management has leased the Silver Bell dump near Ironton and several others, and is waiting for the roads to improve for hauling ore before blowing in. —— The Angel M. Co., on the south slope of White House mountain, has worked a few men during the winter and has a 4-foot body of $25 ore.

Arrangements are being made to open up and resume operations on the San Pedro group, adjoining the Camp Bird. Progress was made last season and the main tunnel is in 1000 feet. There are twenty-seven claims in the group, and it comprises most of the territory between the Camp Bird and the Revenue.

Two pumps have been added to the equipment at the Revenue mine, near Ouray. As soon as the pumps are in operation more miners will be put to work developing new levels from the two shafts on the vein. The mills of the company in Sneffles district will resume. ——Development work on the Governor mine continues steadily. Bodies of ore are exposed in the workings and a 10-stamp mill will be built. W. R. Kramer is manager. —— The number of men on the Portland group, 2 miles east of Ouray, will be increased by twelve men April 1st, says Manager D. Wood of Youngstown, Ohio. Arrangements for continuous development and mining of ore have been made. The second-class product of two cars per week has resumed shipment to the smelter.——The Atlas, a gold producer of Sneffles district, will have a 10-stamp mill as soon as the roads permit hauling. For 500 feet back from the breast of the main tunnel the ore streak averages 3 feet in width, and aside from the small high-grade shoot of gold ore the values between the walls of the vein are stated to make it a milling proposition.

San Juan County.

Work has been resumed on the Hamlet mine, above Eureka, says G. Robin, manager and part owner. The bulk of the ore is milling, and it is proposed to build a mill on the Animas river, below the mine.

The Kendrick & Gelder smelter, near Silverton, will be blown in April 15. This smelter is the property of the San Juan S. & R. Co. and has capacity of 150 tons a day. Superintendent Umbell of the Henrietta mines, of the San Juan S. & R. Co., is increasing number of men at work breaking down and shipping ore. The mine has been developed during past three years by seven levels, raises connecting the same, and drifts and stopes, all in bodies of ore which contain gold, silver, copper and lead values. The Henrietta mine is connected by an aerial tramway with the millsite and railway, capable of handling 500 tons of ore per day, but for the present will only be operated to capacity of smelter of 150 tons daily.

San Miguel County

Operations at the Keystone placer, near Telluride, will be resumed next week, says Manager R. W. Hill.

Summit County.

The 7x7-foot tunnel of the Gold Run M. & M. Co. (the Lightburn tunnel), near Breckenridge, is in 2050 feet. It is to be driven 3000 feet at least for a vein opened from surface by shaft. The tunnel prospects the ground of forty claims of the group.

Teller County.

(Special Correspondence). — The Cow Mountain M. & T. Co., operating on Cow mountain, in Cripple Creek district, has its Deep Rock tunnel in 400 feet, and will shortly put in air compressor and power drills.

Cripple Creek, March 20.

Lessee E. O'Malley & Co., who have a lease on the Hiawatha claim on Beacon hill, Cripple Creek, will put in air drills. They will pipe their air a distance of 700 feet from the El Paso mine. They have sunk the shaft to 70 feet, where ore runs entire width of the shaft. The ore is in a blue quartz, showing specks of sylvanite, says O'Malley.

At the Hot Scotch mine, on Grouse mountain, near Cripple Creek, Smith & Co. have uncovered at grass roots a body of ore, and are planning to build a 30-ton cyanide mill. They will put in rolls of 100 tons daily capacity.

Manager Wright, of the Lincoln mine, at Gillett, is plowing up the wash which yields $4 per ton. The material is thoroughly oxidized and lies in a body 25 feet wide. He is building a cyanide mill for treatment of this material.

The El Paso drainage tunnel at Cripple Creek, according to measurements made by Engineer Jaquith, is discharging 6700 gallons of water per minute. The east lateral, which starts near the El Paso main shaft on Beacon hill, has been driven for 1300 feet. The main water course, however, has not yet been cut. At the present flow, the Mary McKinney and the Elkton, together with all of the mines affected, have been drained for a depth of 50 feet. The mines are now being drained at rate of 10 feet per month.

The Ophelia tunnel (formerly the Smith-Moffat and later known as the Gold Exploration tunnel), is resuming operations. The Ophelia tunnel traverses the district of south Cripple Creek for 2 miles in an easterly direction. The breast is now under crest of Raven hill. There is at least as far to drive yet as there has been done in the past, says the Gazette, it being the intention of the tunnel company to bring the breast of the tunnel when completed to the Victor mine on the east slope of Bull hill and the farthest eastern point of the producing gold area. The tunnel is for transportation of ore and for drainage, the company not owning property in its course aside from that at the portal. In the progress of driving a number of veins belonging to properties en

route have been struck, and by stipulations of contract with the tunnel company the tunnel company will deliver the ore at any point specified by the owners of the property. Laterals will be driven. Water boxes are laid on the floor of the tunnel under the track, on which an air motor is in operation. The tunnel is being operated by three different enterprises composed of New York, Chicago and Boston men, namely, the Cripple Creek & Pueblo Railway Co., the Gold Exploration Co., and the Tunnel & Leasing Co. J. M. Parfet is manager.

Manager F. A. Wright of the Grand Central M. Co., operating between the Stratton's Independence and Gold Coin mines at Victor, is preparing to increase development work. Veins have already been cut, and one is thought to be an extension of that in the Strong mine. The shaft on the Grand Central has been sunk to 500 feet, although little farther development work has been done. It is intended to sink the shaft at least 200 feet deeper and increase exploratory work.

The annual report of President Bernard of the El Paso Con. M. Co., Cripple Creek, says that during early part of last twelve months, there were added to the mining plant two 516 H. P. boilers and a 2000-gallon pump, at total approximate cost of $25,000, and which were ordered prior to the time when it was decided that the drainage tunnel should be driven. Some of the buildings are yet to be completed, which, together with the company's contribution to the drainage tunnel fund, absorbed greater portion of the earnings during that period; the production and development during such time being curtailed owing to energy being exerted in driving and completing this tunnel. The effects from that common water carrier are far-reaching. Those mines which are known to be draining through this tunnel embrace everything in the district with possible exception of the Bull Hill locality, and it is expected this section will ultimately be drained, being indirectly connected with the other water courses. This bore is still being driven northeast with funds which were on hand when the contract with the El Paso Co. expired. He says preliminary surveys have been made for two deeper tunnels, the first of which would penetrate the El Paso at depth of 1200 feet and would be 2¼ miles long, costing approximately $250,000. The second survey is 3¼ miles in length and would cut El Paso 1900 feet from surface or 1300 feet deeper than present deepest workings and at a cost of $500,000, and be completed in three years. Whether a deep tunnel project, or a mutual pumping agreement among the leading companies will be used is not yet decided upon. Production made during year shows increase over the preceding year of 25%. The average grade of the ore is below that of the previous report. Up to Sept. 1, 1903, there was shipped 8720.66 tons of an average of $27.58 per ton. From Sept. 1 until the close of the fiscal year there was shipped 6177.97 tons of an average of $55.50 per ton. Until after completion of drainage tunnel production had been confined to levels above 335 feet, after which perhaps one-half the tonnage came from the lower levels, and about 1000 tons in the last six months was ore from the dump, averaging around $15 per ton.——Development work was much delayed during first seven months of the year, awaiting completion of the drainage tunnel. The present developed ore reserves exceed those of any previous time, and as development proceeds in lower levels they are being increased. The result of 480 feet of drifting in the 600-foot level has shown two bodies of ore for 300 feet of the distance and from which no stoping has yet been done. This ore is in grade from $30 to $150 per ton. On the 490-foot level two ore bodies have been developed, one being main ore shoot in C. K. & N. vein.

IDAHO.

Ada County.

The Statesman reports a strike in the X-Ray tunnel above Boise. This tunnel has been driven 390 feet and the last 90 feet has been in a ledge carrying sulphides. Assays run $3.90 per ton in gold. The ledge at the surface is 200 feet wide. The tunnel is 8x8 feet. Manager C. H. Packenham is preparing to put up a 20-stamp mill with concentrating tables and a cyanide plant, and also a power drill plant, track and cars. The machinery will be operated by electric power.

Blaine County.

At the Valley Creek mine, near Hailey, the 5-stamp mill is running steadily and twenty-five men are at work in the mine.

At Muldoon, near Hailey, three companies will operate, besides prospectors. One of the companies, the Argosy, that bought the Wolters claims, will begin work. Shipments are being made and a concentrator will be built in the fall.——Another of the companies is the Albany, C. Hernsheim of New Orleans, La., F. C. Mandell and M. Greene owners.——F. C. Bradley reports having 3 feet of galena and will make shipments.

Boise County.

C. H. Packenham of Boise, manager of the X-Ray tunnel, in the Black Hornot mining district, says he is arranging to put in a plant for treatment of ore, consisting of a 20-stamp mill, with table concentrators and a cyanide equipment.

Idaho County.

C. F. Macey, manager of the Iron Springs M. Co. in Rapid River district, near Pollock, says arrangements are being made for increase of development work and for building a cyanide plant this summer. He also says they will build a wagon road from Iron Springs to Pollock, the survey for which was completed last fall. A 200-ton mill will be built this season.——Ford Bros. will begin next week logging for their mill at their mining camp at Black lakes. The mill will be started cutting timbers for the cyanide plant to be built this summer by the Gold Coin M. Co. It is expected the machinery for the plant will be on the ground by July 1. It is hoped to have it in operation before snow next winter. The plant will be of 100 tons capacity.

Arrangements are under way and machinery is arriving for a stamp mill and concentrating plant to be put up on the Johnson mine on Rapid river, 8 miles from Pollock. The mine is now owned by J. P. Weyant, F. M. Henninger, H. Boone et al. of Toledo, O.

The Henrietta M. Co. has been organized to work the Irwin bar between Goff and Riggins, says the Grangeville Standard. There are ten men in the company, principally of Payette. The company has expended $5000 on a ditch from the Little Salmon river, which will be completed in time to make a cleanup before high water.——The Pittsburg-Idaho M. Co. will start work on the ditch, which it expects to construct from Lake creek to its property, the Short placer bar, as soon as the roads will permit of moving the sawmill in from Council. The company will build a flume the entire distance. They have built a bridge across the Little Salmon, below Pollock, where they will cross with the machinery.——E. W. Herchberger is working the Auchenvaugh bar, above Lucile. He expects to pipe water across the Salmon river. There are a number of other bars on which prospectors are at work, and flumes and ditches building.

Kootenai County.

Placer mining operations are resuming around Tyson. E. S. Mumford has his ground opened up and sluice boxes ready for use. The ground has been prospected and is reported to show pay dirt from 4 to 16 feet.——E. J. Kelly, manager of the Corbin interests, is preparing to start work, and R. Neil, superintendent of the Tyson Con. Placer Co., expects to start work on the Gold Nugget. These properties are provided with pipes for hydraulic work during high water. Other claims will work on a smaller scale.——The Richmond Co. is continuing work in its shaft.

Owyhee County.

Work will be resumed on Sinker tunnel, near Silver City, owned by Philadelphia, Pa., men.

The Addie mine, near Silver City, has its tunnel nearing the Calaveras ground and reports having struck pay on the vein. The shoot of ore, struck at depth of 450 feet from surface and within 100 feet of the surface workings of the Calaveras, is expected to continue under those workings.——The Trade Dollar Extension Co. is increasing work on two tunnels on its group, east of the Trade Dollar Con. on Florida mountain, and will put in power drills on arrival of the delayed electric transformers.——Sullivan & Noble, on their mines at head of Jacob's gulch, are in ore.——The Afterthought on War Eagle mountain, on which the De Lamar Co. suspended work for the winter on account of difficulty of getting supplies in through the snow, will start up again in the spring.

The American Standard M. Co., organized in Denver, Colo., holding claims in the silver-lead district of South mountain, near Silver City, will start development work next month.

Manager Stevens reports developments satisfactory in the Addie group, near Silver City. At 1400 feet from portal in the tunnel, where the Trook and Jennings vein is supposed to cross the porphyry dike, they have run a tunnel northwest toward surface workings of the Calaveras. They have opened ore assaying $20. The tunnel is still within the Addie fractoni ground. The tunnel will be 400 feet deeper than the deepest work on the Calaveras, which is only 65 feet. A mill will be built and more men are being put on.

Shoshone County.

Wallace reports say that after April 1 canvas plants will be no longer in use in the lead-silver concentrating mills of the Cœur d'Alenes. For some time the Standard mill of the Federal M. & S. Co., near Wallace, has used the only remaining canvas plant in the district. Table concentrators and Frue vanners have been added to the equipment to handle the fines.

KANSAS.

Cherokee County.

Manager Matthews of the Pittsburg Lead & Zinc M. Co., operating the Bonanza and Windsor groups in the Galena-Empire district, says the water is now down in the Bonanza and lots are being leased. The water in the pump shaft is below the 160-foot level, and next week will be down to the bottom, which is 225 feet. The mines on the land will give work for 100 men by that time. The company will put up a 100-ton mill on the Bonanza, near Galena.

The Co-operative M. Co., which has bought the Bert Stair mining ground south of Galena, has been incorporated by W. B. Stone, J. H. McClaren, J. C. Moore, G. Grant and W. E. Stair. Superintendent Stair says the water is out of the ground and the men went to work last week.——The Old Crow mill on the Windsor ground is being repaired and will be ready to grind ore next week, says Superintendent Moll.

At Baxter Springs, it is reported Gerke & Co. of Joplin, Mo., who have leased 160 acres of the J. B. Opperman ground, have entered 25 feet of ruby jack in two separate drill holes. The ore was struck at 90 feet.

MICHIGAN.

Houghton reports say sixteen producing mines at the lake turned out 14,925,000 pounds of refined copper during February, against 16,076,400 pounds in January. The appended table gives the production of the lake mines for the last six months:

Months.	Pounds.
September	15,985,000
October	16,315,000
November	16,980,970
December	17,330,000
January	16,076,400
February	14,925,009

On the basis of 12⅛ cents a pound, the lake production for February was worth $1,865,625. This month's product is expected to show a falling off even from the February figures, owing to the strike at the Copper Range mines. The output of these mines in February was curtailed 50%. The output of the Quincy was nearly double that of the previous month, owing to the settlement of its strike early in February, and this month it should return to its normal rate. There should also be an increase in the Mohawk's production, three heads being in commission at the mill.

Houghton County.

R. C. Pryor has an option on ground adjoining Atlantic's former section 16 and also Isle Royale, near Houghton. These portions are thought to carry the Baltic lode, and their exploration with the diamond drill will prove section 16 and the Isle Royale land adjoining, says the News.

The Isle Royale C. M. Co. is confining work to No. 2 shaft, which is shipping 500 tons of rock per day—enough to keep one head at the mill in operation. There is said to be no prospect of an increased output this year. The working force is 140 men. Three drills are drifting and fourteen stoping. The management is still uncertain about No. 1 shaft, the seat of the fire last fall. A wall of cement and stone is being built at the fourteenth level south. The burned workings will be flooded with water this spring and the wall will keep No. 2 dry.

The Atlantic mine, near Houghton, last week voluntarily raised the pay of trammers $2 and miners $2.50 a month.

Sinking to ninth level is under way in both Nos. 1 and 2 shafts at South Kearsarge branch of Osceola mine, near Calumet. The lowest openings in the South Kearsarge are reported showing satisfactory lode. This portion of the Osceola is comparatively a new mine.

Keweenaw County.

A hoisting engine capable of hoisting from depth of 2000 feet is on the ground for the Mohawk mine, near Allouez. A 60-drill compressor will also be put in. It is expected to be ready for operation by May 1.

The Phœnix Con. C. Co., at Phœnix, report for year ended December 31 last shows receipts from 202,823 pounds of copper sold for 12.613c per pound, $25,582; smelting, freight, cost of marketing copper and all expenses, $12,789; balance, $17,793; expended at mine, $200,826. Owing to delays incident to delivery of supplies and machinery, the company's mill was not put into commission until October 1st last. A severe winter season has interfered with surface work and transportation of rock to mill. The rockhouse at the St. Clair shaft of the Phœnix mine is completed. It is a duplicate of that built at west vein shaft last fall. Sinking in the latter shaft has reached vertical depth of 855 feet. Drifts on the lower levels are opening up copper. The Phœnix is securing thirty-five to forty tons of mass and barrel stuff each month. It is hauled by teams to Calumet and then shipped by rail to the Quincy smelters, where it is refined. The teams take supplies on return trip to mine.

Ontonagon County.

The annual report of the Mass M. Co., operating at Mass City, shows the company produced during 1903 a total of 2,576,447 pounds of copper, which was sold for $343,733, or an average of 13.3 cents a pound. But one stamp was in operation and on half time.

MISSOURI.

Jasper County.

L. J. Stevison is putting up two mills on his lease west of Duenweg.——J. W. Ground proposes building a mill at his mine on the Porto Rico group.——The Miami M. Co., operating on the Porto Rico, will begin construction of a plant at its place next month.——The Shamrock, east of Duenweg, has resumed operations after a four months' shut-down.——Wommack Bros. have begun sinking another shaft near their prospect, east of Duenweg, to be used as an air shaft.

The Wright M. Co., on the Missouri Zinc Fields land, near Webb City, last week reached their ore body with a shaft. They own nine lots. They drilled the lots last October, and at depth of 150 feet went through 20 feet of ore, which is said to assay 52½% zinc. They are sinking the shaft in the ore. This mine is west of the Missouri Pacific track and the Dicky and Black Cat mines. It is owned by J. C. Wright, F. Gilbreath and D. Matbias of Carterville.——T. Coyne is arranging to put up a mill on the South Missouri Z. F. Co.'s land, and has entered into a contract with the Missouri Z. F. Co. to furnish him with electric power to be used at said mill.

J. A. Hardy & Sons are building two mills at their mines at Centerville—one, the Little Diamond, on Center Creek ground; the other, the Osage. Both mills will be of 100 tons capacity and cost $8000 each. They will each be equipped with 100 H. P. boilers and 50 H. P. engines, crushers and rolls. The dirt will be shoveled into the crusher, and will then run over a screen, the fine dirt going direct to the jigs and the coarse dirt to the rolls. After coming from the rolls the dirt will again go over a screen, and the fine dirt to the jigs, and the coarse dirt conveyed to the rolls a second time. Each mill will also be equipped with a sluice table.

The Star mine, on the Zinc Fields lease, near Webb City, will be put in the list of producers again this week, as the air drift has been finished, says C. Hammick, lessee.

The Broker mine is a new development on the Leddy lease at Central City, says the News-Herald. A 24-foot face of jack has been opened up, to clean which a crusher, rolls and steam plant have been added. The owners are P. Leddy, D. Joseph and J. Streeby of Joplin.——H. G. Cook, J. Hennessy et al of Joplin report having made a strike at Galena on the Galena L. & Z. Co. ground. They went into the Cousin Jack shaft and struck a face of ore, all jack.——Stevenson & Bourne have opened up a lead prospect on their lease on the Sol Webb farm, south of Duenweg. In sinking the shaft they went through 30 feet of lead dirt and have begun to drift on it.——W. A. Kirkpatrick, J. M. H. Young, A. H. Hall, J. N. Martin, E. T. Jenkins, A. H. Rogers and J. W. Stephens have incorporated as the Mabel M. Co. at Joplin. The company will build a mill on its lease at Chitwood.

The Zenith mine and mill, near Joplin, are being overhauled to start again, under management of J. Carmean.——A 16-inch air compressor has been set up at the Hoosier mine, operated by F. Nicholson et al.

MONTANA.

Fergus County.

C. M. Goodell of Pbilbrook, W. G. Norman of Lewistown, with Colorado men, have organized the Moccasin Mountain M. & M. Co., and have taken over the Butterfly, Emmett and Wedge claims, south of the Kendall G. M. Co. properties in the North Moccasin district, near Kendall. They will continue development work. A diamond drill will be operated. Later, a mill will be built. The group is so situated that the securing of both water and timber is not difficult.

M. West is contracting on the Denver group on head of Plum creek, on north slope, near Lewiston. Contract has been let for additional 250 feet in the tunnel on the Denver. M. Dunn of Great Falls is part owner. The values of the ore in the Denver group are in free gold. It is

tbought a milling plant will be built this year.

The North Moccasin G. M. Co. is increasing work on its ground between the Kendall and the Barnes-King mines, at Kendall, and a milling plant on these properties is assured for this year. Manager J. H. McCormick of tbe Gold Reef M. Co. of Gilt Edge is preparing to put in a boist to be used on a shaft tbat will be sunk from bottom of gulch in which is located the Kendall mill. J. A. Drake, of the Gold Reef Co., is part owner in the North Moccasin group. The milling plant will have 100 tons daily capacity to begin witb.

Granite County.

Engineer Dorman, of Missoula, superintending building of a dredge at Harvey creek, 12 miles from Bearmouth, for tbe H. H. G. M. Co., says work is progressing. They expect the dredgers to be in operation this spring. The company has extensive placers in Harvey Creek district. The company is driving a tunnel into the mountain. A road has been built from Bearmouth to the placers.

Jefferson County.

The furnaces of the Cataract C. M. Co. plant, on Basin creek, 8 miles from Basin, were blown in last week. Pyritic smelting will be used in treating the low-grade ores of the district.

Missoula County.

H. B. Tilden of Baltimore, Md., has bought the Copper Cliff group of claims, 11 miles northeast of Bonita. They have been worked steadily since 1892. All work has been on development. The ore is said to carry 18% copper and assays $10 in gold. In the Copper Cliff claim a douhle-compartment shaft 200 feet deep has been sunk and an 800-foot tunnel has been driven on the Gilt Edge.

NEVADA.

Esmeralda County.

The mill for the Esmeralda Con. mine at Hawthorne has been completed, and hauling ore was commenced. A carload of fuel oil is on the ground. The stamps hegan dropping this week.

Douglas County.

(Special Correspondence).—F. C. Everett, managing director of the Longfellow M. & M. Co., owning the Longfellow and other mines near Gardnerville, is increasing development work. He is preparing to put in a 4-drill compressor and other machinery, including electric equipment, and also proposes building an aerial tramway 1 mile in length. The company owns placers on the Carson river, which will be worked this season. S. W. Baker is assistant manager.

Gardnerville, March 22.

Nye County.

The MacNamara M. Co. has resumed operations on its mines at Tonopah, with D. J. MacDonald as superintendent. They will drift hoth ways from hottom of the 500-foot shaft.

Storey County.

During last week occurred pay days at the Comstock mines, including tbe Con. Cal. & Va., Ophir, Mexican and Gold Hill mines, the middle mines and Silver Hill. The payroll for the month of Februaary, including Chollar-Potosi croppings and milling plant and Flowery mines, aggregated over $65,000. With resumption of work at the Butters cyanide plant and Best & Belcher mill, the monthly amount dishursed to employes will he increased to over $75,000.

Washoe County.

W. Golding, R. Sommers and F. Norris report striking ore in their Forlorn Hope mine at Olinghouse, showing the ledge 2½ feet wide. They will increase the number of men at work.

White Pine County.

Work is temporarily suspended in the main workings of the Giroux Con. C. Co. at Ely. In the meantime work in the company's Taylor mine is progressing steadily and a new shaft will be sunk. The shaft, which was sunk for prospecting purposes, is too small to meet present requirements, and ventilation is also desired.

NEW MEXICO.

Otero County.

The Jarilla M. & S. Co. has been organized to work mines at Jarilla camp and to carry on a smelting husiness. Among other properties this company has taken over at Jarilla is a five years' hond and lease on twenty claims of the Jarilla M. Co., under which the company contracts to start work of building a 100-ton smelting plant within six months. It is said the company will take over the By Chance group of mines of the Cincinnati G. M. Co. The directors are R. G. Mullen, W. S. and F. E. Boynton, F. R. Jeffrey, D. D. Hunt and J. K. Mullens of Colorado Springs, Colo., and E. E. Sidehottom, A. J. King and E. J. Dedman of Alamogordo.

Sierra County.

The Kanawha G. M. Co. has been incorporated and has bought the Sherman and Lupey mines, east of the Sierra Con. G. M. Co. properties, near Hillsboro. M. H. Straughan and F. F. McConihay of Charleston, Va., and J. and W. Kasser of Hillsboro are officers. The Sherman mine of the group has produced gold and silver, bearing copper ore.

Socorro County.

E. Craig, manager of the Last Cbance group, is preparing to put in macbinery to increase the capacity of the company's 20-stamp mill at Mogollon. It is thought the mill will be in working order again next montb.

OREGON.

Baker County.

A half interest in tbe Sucker Creek placers, of Sucker Creek district, near Sumpter, has been sold to F. Slade for $5000, wbo will overhaul the equipment and resume operations.

Grant County.

The Alamo mill, near Granite, is closed down temporarily to permit installation of a cyanide plant, says J. R. Cassin of Spokane, Wash., secretary and treasurer of the company.

Josephine County.

It is reported that native silver, associated with hismuth, has heen found hy prospectors near Grants Pass.

The Takilma Smelting Co. is preparing to huild a 100-ton smelter on the Darkis place below the Waldo and Queen of Bronze mines, near Waldo, and is expected to he in operation by July 1. The smelter is to treat ores of the Waldo and Takilma mines. A. I. Goodell is manager, and C. L. Tutt of Colorado Springs, Colo., is president.

S. Chase et al., of Portland, are developing the Oro Fino mine of Jump-Off-Joe district, near Graut's Pass. He proposes to put in a cyanide plant this spring.

SOUTH DAKOTA.

Lawrence County.

At Maitland the Garden City group has been sold for $40,000 cash. Other adjacent claims and the Waller millsite were included in the deal. J. B. Le Beau and M. McGillis of Central City, E. E. Peterson of Lead, R. M. Maloney, J. Hogarth and Y. Murk of Deadwood are interested. The claims in this group are the Garden City, Kanoka, Unionville, Hendricks, Beulah and Rochester. The adjoining claims included in the sale are the Dauntless and Big Red.

TEXAS.

The J. M. Guffey Petroleum Co. shipped recently by its steamer to Beverly, Mass., 1,000,000 gallons of refined oil for distribution throughout New England. This oil was refined at the company's refinery at Port Arthur from crude oil produced in the Beaumont (Jefferson county) and Sour Lake (Hardin county) fields.

UTAH.

Beaver County.

Development work on a property adjoining the Cave mine, near Milford, has been resumed hy the Gold Run M. Co., organized hy J. C. Dick, A. K. Tiernan, C. DeMoisey, R. J. Decker and F. C. Dern of Salt Lake City.

Juab County.

Manager J. C. Sullivan of the Raymond mine, near Eureka, is preparing to resume operations at the Raymond. It will require some little time to free the mine of water which has accumulated during the temporary shutdown. The consolidation of the Raymond and Illinois mining companies took place on the 23rd inst. Future development work on this ground will be carried on through the Raymond shaft. The Raymond shaft has been put down to 1500 feet.

In the Grand Central M. Co. ground at Eureka, Superintendent P. Donnelly says for 40 feet he has crosscut the latest development on the 800-foot level northb, without reaching the walls. Smelter returns show average of 40 ounces silver with $30 gold and fractional values in copper, the lead occurring in hunches only. At 260 feet north of crossing on which the Butterfly stope was developed the new crossing was reached.

Piute County.

The Little Marion G. M. Co. has been incorporated to develop a group of seven unpatented mining claims in Mount Baldy mining district, near Marysvale, by E. E. Jenkins, G. T. Henry and B. D. Luce, at Salt Lake City.

Salt Lake County.

The management of the New England G. & C. Co.'s mines at Bingham, which includes the Nast group, above the Boston Con., is equipping the Nast with a jigging plant capable of handling seventy-five tons of ore daily. The building is under cover and the machinery is being set up. The jigs will be operated at the mouth of the main tunnel in Muddy gulch. The product will be sent out over the Copper Belt Railroad from a point near the loading station used by tbe Boston Con. Concentrating is expected to begin by April 15th.

Work on the main tunnel by whicb the Dalton & Lark group of mines at Bingham bas been partially unwatered will be resumed next week, says Superintendent Rodgers. Until tbe draining has been completed, exploratory work and the blocking out of ores will be confined to tbe upper levels. The latest disclosure is in a raise above the 1070-foot level, where 7 feet of sulphide ore containing 4% copper and values in gold and silver has been opened. Meanwhile the management continues to add to its volume of lead ore, of which 150 tons broken down in development is sbipped monthly. D. MacVichie of Salt Lake City is manager of the Bingham Con., by which the Dalton & Lark group is owned.

At the United States R. & R. Co. smelter at Bingham five furnaces are in operation, while the sixth is expected to be blown in by April 15. With the present hattery Superintendent Hazleton says he is reducing 800 tons of ore daily, with the output of bullion containing copper, gold and silver. Meanwhile work on the lead furnaces is progressing steadily.

The Blue Point M. & M. Co. has been incorporated to operate a group of mining claims in Big Cottonwood district, near Alta. A. H. Mereditb, D. Simper, J. W. Guthrie, R. A. Cheek and J. A. Jacobson are officers.

Tbe Fortune group of twenty claims, at Bingham, formerly operated by the Fortune M. Co., has again been merged into a single group, says the Bingham Bulletin. The group as consolidated covers 300 acres. It will be operated by tbe Fortuna M. Co. of Salt Lake City, organized witb J. D. Wood, M. B. Johnson and G. F. Richards, Jr., as officers. While the mine is at present under contract to deliver ore to the Bingham Con. smelter, the company plans to increase development work for larger production and to remodel and operate the concentrating mill on the ground.

Tbe Iowa and April Fool groups (formerly the West Mountain group), consisting of fourteen claims above the Red Wing Extension in Markham gulch, near Bingham, have heen bonded to Cleveland, Ohio, parties and will be developed this summer under management of L. C. Snyder.

Summit County.

The J. I. C. mines, at Park City, have been taken over hy the West Quincy M. Co. which has been organized at Salt Lake City, with G. D. Turner as president.

Tooele County.

The Sacramento mine of Mercur produced ninety-two flasks of quicksilver during the month of Februaary. This was produced from ahout 3000 pounds of ore treated per day. Ahout 140 tons of gold ore is also treated daily.

It is reported that the Western Exploration Co., W. F. Snyder of Salt Lake City manager, proposes huilding a tramway from its Buckhorn mine in Ophir across tbe hills by way of Dry canyon, conveying to its mill ore not only from its own property, but from the properties at Gishorn (Dry canyon), among which latter are the Eureka-Ophir, Pittshurg-Utah (the Mono) and the Dry Canyon Con., the latter operated hy C. J. Garber & Co.

The Whirlwind M. Co., noar Stockton, has six full claims, with considerable work already done, and expects to increase operations this season. The tunnel on the Whirlwind, in the canyon, is in 400 feet, headed in the direction of the Miller mine, whose ore reserves will be drained and opened for transportation. J. Mercer of American Fork is president.

The Chloride Point mine on Lion hill, near Mercur, has resumed shipping ores, under Lessees Clair & Clark.

Wasatch County.

The West Quincy M. Co. of Salt Lake City has heen incorporated to operate a group of mines in Snake Creek mining district, with G. D. B. Turner, W. H. Dodge and R. E. Miller as officers. The company also acquires the holdings of the J. I. C. M. Co., at Park City.

WASHINGTON.

Ferry County.

Work at the Knob Hill mine at Republic is reported progressing. A ledge 7 feet in width has heen opened, assaying $30. The mine is shipping its ore to Nelson, B. C., at rate of three cars per week. ——The Mountain Lion is taking out ore and shipping from one to two cars per day. The mill has closed down and, it is said, will not be started up again until additional machinery is put in.——The Pearl Con. shaft is 60 feet in depth and will connect the surface and the upper tunnel. The lower level is connected with the upper tunnel. When connection has been made, ventilation will be improved and mining will be resumed in the several levels and sbipments made regularly.—— The sbaft on the Golden Eagle mine has reached a depth of 350 feet. It is going down at 2 feet per day. It is expected the Quilp ledge will be cut by May 1st.

Okanogan County.

T. James of Spokane, consulting engineer for tbe Salmon River M. Co., operating on Peacock mountain, south of Conconully, says a 100-foot contract has been finished and another contract of 100 feet given. —— H. Brown and J. B. Holford, who own a group on tbe east side of Whisky bill, have cut a body of sulphide ore in the main tunnel, in 130 feet, from which assays have been had of $20 in gold. —— The Favorite mine has shut down. —— The tunnel at the Six Eagles mine has been cutting stringers of mineral bearing quartz. The tunnel is in 1840 feet. —— The sawmill at the Prize mine is running and sufficient lumher has heen cut to complete the building for the concentrating plant. This is expected to he put in operation next month.

At the Security mine, near Loomis, tbey have opened up a gold bearing shoot of ore in the lower tunnel. The gold is distrihuted through a 5-foot ledge of white quartz. The point of contact is 330 feet from the mouth of the tunnel at depth of 150 feet. This is the third level on which tbis shoot has heen found. The Security joins the Palmer mountain tunnel group on the north, and tho ledge under development was cut in the Palmer mountain tunnel at depth of 1200 feet.

S. E. Barron, manager of the Q. S. mine, near Blue Lake, near Conconully, says the company is arranging to put in a compressor plant and otber machinery.

Stevens County.

The Edna mine (King mine) at Wailtes lake, near Chewelah, proposes putting in a smelter tbis spring, says the Independent. The ore is copper-gold hearing. —— Tbe Copper King mine, near Chewelah, is preparing to make shipments of copper ore. —— Work will he resumed on the Eagle copper mine.

T. H. Walters of Spokane of the Standard Group Marhle Co., says his company will resume work at its quarries near Bosshurg ahout May 1st and that macbinery will he put in. The Standard group consists of 200 acres of land 2 miles north from Bosshurg, on the west bank of the Columbia River, near the Spokane Falls & Northern Railroad. One hundred and sixty acres of the land is patented. The quarries contain several varieties of marble.

Whatcom County.

J. Seigfried and P. Valerius of the Bellingham M. Co., have bought the Index group of seven claims adjoining the company's property and the North American in Slate Creek district, near Bellingham, for $32,000. Ahout $10,000 worth of development work has been done in the drifts and crosscuts, a tramway, etc. The ore is exposed in several places on the main ledge, which is 20 feet wide. Valerius states the Bellingham M. Co. will huild a stamp mill on the group. The accession of tbese claims gives the company a total of twenty-seven claims.

WYOMING.

The State Board of Equalization is taxing tbe coal mines of that State 50 cents per ton of output.

FOREIGN.

AFRICA.

Transvaal.

The Niekerk mine at Klerksdorp reports under date of March 1 at deepest working poiuts the mine is opening out satisfactorily. Machinery will he put up in six weeks. A winze has been sunk below the hottom of level 170 feet east of shaft No. 2, and sample from winze assays 1 oz. 8 dwts. 20 grs. The reef is 4 feet wide. Tbey are preparing upper ground for stoping.

AUSTRALIA.

Western Australia.

Kalgoorlie reports say the Paringa Con. mine has been taken over by Bewick, Moreing & Co. and systematic prospecting has begun.

The management of the Great Boulder mine at Kalgoorlie is preparing to increase its milling capacity. It is said tbe dry process is best adapted to treatment of Boulder ore.

A find of gold is reported made at Norseman, where 200 ounces were taken out in a day. A number of nuggets have heen found.

BRITISH COLUMBIA.

Cariboo.

Work in the deep ground placer mines is reported progressing favorably. The

Cariboo G. F. Co., near Ashcroft, expects to resume after making alterations to the ladder and buckets of the elevator.—— Quartz prospects are being opened up near Keithley.

Cassiar District.

A placer gold strike is reported made on a tributary of the Liard river, below Black, or Devils canyon, 200 miles east and north from Telegraph creek. News of the find was given by a messenger sent out from one of the Hudson Bay Co.'s Liard river posts. Miners and prospectors along the upper reaches of Stickeen and Telegraph creeks are making preparatio s to leave for Liard. The cost of transportation in that section has been reduced through operations of a steamer on the Stickeen river and regular pack trains from Telegraph creek.

East Kootenay District.

The East Kootenay Placer M. Co. has conveyed to the Perry Creek G. D. Co., Ltd., all its mining property on Perry creek, near Fort Steele. The group consists of six leases on Perry creek aggregating 3 miles in length by 400 feet wide. It also includes a steam shovel on lease No. 80 on Perry creek. G. O. Foss and S. Bonnell are officers of the Perry Creek G. D. Co., Ltd.

Rossland District.

Last week at Rossland miners' wages constituting the February payrolls were paid out as follows:

Center Star	$12,400
War Eagle	10,600
Jumbo	3,100
White Bear	3,000
Le Roi	36,000
Le Roi No. 2	13,500
Rossland-Kootenay	2,500
Spitzee	1,600
L X L	700
Grand Total	$83,000

To the foregoing $10,000 may he added, says the Rossland Miner, for amounts disbursed by mines on salary accounts other than the regular payroll, which does not include salaries of managers and other executive officers.

Ottawa reports say an order-in-council has been passed placing petroleum oil on the free list when imported by mining companies for use in the concentration of ores or metal. This is at the request of Rossland mines using the oil process.

Slocan District.

The Neepawa mine at Slocan has been leased to Isaacson Bros. & J. Kinman. ——The Payne mine at Sandon is shipping the magnetized iron, produced by its zinc plant, to Trail smelter. The company is placing more powerful magnets in its zinc separator to produce a finer quality of zinc.

Vancouver Island.

The Richmond Oil Co. has started operations preparing for boring for oil at Steveston. The lumber and machinery are on the ground. R. H. Ferguson of Texas is in charge.

West Kootenay District.

J. A. Darraugh of Camborne, manager of the Tinworkers' G. M. Co. of Elwood, Ind., operating mines of Fish Creek camp, near Camborne, says arrangements are made for resumption of development on the Silver Dollar and Wide West groups. The bond on the Silver Dollar group has been taken up hy the Tinworkers' M. Co. The company also owns the Copper Dollar, but will confine work this season to the Silver Dollar, which group consists of five claims on Mohawk creek.——The Wide West M. Co., with head offices at Lima, Ohio, of which Darraugh is also superintendent, will also increase development. A 511-foot crosscut has been driven showing three galena-bearing veins.

Yale District.

(Special Correspondence).—The Yale M. Co. at Hedley, in Kamloops mining division, is completing construction of a 40-stamp mill, equipped with Frue vanners. It is thought the plant will later be increased to 100 stamps. W. K. Rodgers is superintendent of the mines and mill of the company.

Hedley, March 20.

CANADA.

The Geological Survey Department of the Canadian Government in its official summary of the mineral production of Canada for 1903 shows the total output estimated at $63,226,510, being a decrease of $500,000 from 1902. The value of the metallic products was: Gold, $18,834,490; copper, $5,728,261; nickel, $5,002,204; silver, $1,700,779. Total production of pig iron in Canada in 1903 amounted to 297,885 tons, valued at $3,742,710, of which it is estimated 42,052 tons, valued at $707,838, should he attributed to Canadian ore and 255,833 tons, valued at $3,034,877, to ore imported.

Alberta.

The International Coal & Coke Co., A. C. Flumerfelt of Victoria, B. C., president, in its annual report of operations at the coal mines at Coleman, 50 miles east of Fernie, B. C., shows work progressing satisfactorily. They are doing only development work, but are taking out 150 tons of coal a day. They expect to mine 2000 tons of coal a day, and are getting in machinery to handle that amount. It will include a complete electrical plant in the mine and tipple. Compressed air will be used for haulage. The dry walls and cribbing for the first battery of 104 coke ovens are completed, and the brick work will be put in as soon as weather permits. It is intended to build 300 more ovens next summer. The ovens have a capacity of from a ton to a ton and a half of coke. The grading of the sidings at the mine and the track to the ovens is completed.

Cape Breton Island.

The discovery is reported of nickeliferous copper ore on Cape Breton Island. The ore body is said to be 270 feet wide and carries gold and silver, besides high values in copper.

Nova Scotia.

Referring to the recent strike of gold, the Agent General for Nova Scotia says bodies of high-grade ore have been struck at depth of 950 feet, in the Caribou district, Halifax county, and that similar reports come from Isaac's Harbor.

Ontario.

United States Consul Borgholz, at Three Rivers, writes that asbestos deposits are reported to have been found in Addington county.

Yukon Territory.

Two Klondike quartz mines are shipping ore, say Dawson reports. Ore from the Klondike Chief mine, opposite the mouth of the Klondike river, is being crushed at the Matheson stamp mill. W. Foster, part owner, says the mine has 50,000 tons of free gold ore in sight. The Violet group has also started shipping ore. The company is being reorganized as the Violet Mine, Ltd. A 10-stamp mill will he built this summer. Six men this winter have sunk a vertical shaft 150 feet, at which depth the vein was crosscut, showing a width of 17 feet. The ledge has a talc seam on both hanging and foot walls.

INDO-CHINA.

The report of British Consul Little at Pakhoi shows, in comparing the Annamite workmen with the Indian, the manager of one of the mills describes the former as more tractable and enduring, and equally skillful, hut complains of difficulty of retaining them for any length of time. Taking everything into account, he considers native labor little or no cheaper than European. The present output of the Nongson coal mines is at rate of 100 tons per day. At the Hongay mines 2500 men are employed, and the surface has been removed to depth of 25 meters, it being an open-cut working. The length of the railway from the mine to the port of shipment is 11 kilometers (about 7 miles). An iron mine is being worked in the Province of Thainguyen, one of iron and manganese in Phu-lien, and one of antimony in Quangyen. Forty-nine mining claims have been registered, viz., twelve for coal; twenty for gold, mostly in Hoabinh Province; four for copper, in Vanbu, Tha nguyen and Yenhay; two for iron in Quangyen, and seven for tin and other metals. Deposits of nickel have been found in Province of Tuyenquang, and of coal at Muong Pan, in the Upper Laos. The discovery of the latter was made by the coal having been set on fire hy the natives in clearing the hills of brush. The hill has now been burning for some months.

MEXICO.

Mexico City reports say statistics just compiled show that 1,000,000 people are dependent on the mines of Mexico. There are 28,825 people employed under ground and the number employed above ground brings the total to 200,000. In addition to those actually engaged in mining, there are many indirectly dependent upon it, such as wood cutters, drivers and cart men. The families of these employes fill out the total of dependents.

Chihuahua.

S. Madero, treasurer of the Cia. Metalurgica de Torreon, owning the smelter at Torreon, says his company is increasing development work on the Sau Diego mine at Santa Barhara and the question of building a concentrating plant there is heing considered. Ore is being oponed up, hut it is low grade and will require concentration. The group is crossed by the Mexican Central's branch road to Santa Barhara. J. W. Pender is manager.

G. G. Gillett has hought the Quehradillas mine at Minas Nuevas for the Pan-American M. & S. Co. of New York for $700,000 gold. The mine has heen operated by Stallforth & Co. for four years past. It is producing eighty tons of high-grade ore daily. Pumps and other machinery are being put in, and it is said production will be increased 100 tons daily.

J. W. Pender of Santa Barbara has bought the W. G. Gibson half interest in the Socorro M. Co., owning the Socorro mine, near Ocampo. This mine is a gold property which has been idle for some time, due to differences between the owners. It is equipped with a mill, buildings, etc.

F. A. Hazzard of Whittier, Los Angeles county, Cal., is increasing development work on the Minerva mine at Santa Eulalia. A shaft is being sunk.

Coahuila.

The American M. & Dev. Co. proposes building a smelter at Torreon and an electric power plant for its mines at Velardena.

The American-Moxico M. & D. Co. has bought 700 acres of ground at Torreon, where it will erect a 1000-ton smelter. This includes part of the mountains where they will obtain the lime rock necessary for flux. They have heen buying a number of lead mines in that section.

Guerrero.

The Pacific Steel Co. of New York is reported having an option on the iron deposits on the Balsas river, in Guerrero.

Hidalgo.

El Almaden and La Providencia mines, bonded by J. M. Erskine of Mexico City, are being developed. They adjoin and consist of 100 pertenencias (247 acres). The ore is said to average 2.3% in quicksilver at bottom of shaft, which is 250 feet deep. A gold and silver vein within 30 feet of the surface shows width of 12 inches and assays 1900 grams silver and 24 grams gold.

Jalisco.

The Santa Lucia mine, near Mascota, is heing put in shape for extraction of ore. It is owned by Mascota men.——Dewey & Lockhart of Guadalajara, part owners in the Soledad mine in Ameca district, will build a concentrating mill for testing ores of the mine.

The Lupita M. Co., P. Fitzgeraid manager, is preparing to enlarge the reduction plant. Hoisting machinery is being put up. The mine is near Mascota in Hurtado district.

The Dwight Furness Co., S. e C., is sinking a double-compartment shaft and driving a tunnel on the Rosario group near Mascota, in Hurtado district. It is understood this company will also start work on the Frontera group under superintendence of W. Oliver.

The United Mexican M. & M. Co., F. W. Page manager, is preparing to put in a 10-stamp mill, sawmill, concentrating tables, pans and settlers, reverberatory furnace and chlorination plant to he erected on the Tatuani river in Navidad district, near Mascota.

The Tajo M. Co., at Rosario, will put in hydraulic machinery to work the hed of the Rosario river for gold. The tailings of the mill have been going into the river for 200 years.

Nuevo Leon.

The Norias de Bajan M. Co. is planning building a smelter at Monterey, and has stopped shipping ore to smelter No. 3 in that city. The company's mines are said to have good fluxing ores.

Sonora.

L. Killeen of Phœnix, Ariz., assistant manager of the Beleno M. Co., states that operations in those properties will be resumed in June. Three shafts are sinking, 500 feet apart, to cut the ore body pitching out of the adjoining Copete ground, which, it is expected, will be struck at depth of 550 feet. The main working shaft—double compartment—is down 327 feet. It is intended to connect the three with a drift and to carry the main shaft to 600 feet or more. In going down several stringers of copper ore carrying gold values have been cut.——Operations have heen resumed in the Copete mine, under management of C. F. Spraker of Nogales, Ariz. He is working upon the 500-foot level.

Zacatecas.

The American S. & R. Co., which has an option on the Gran Cuadra Prodigio y Anexas mine, near Zacatecas, is reported to have invested $44,849 in machinery and has sunk 40 meters upon the principal shaft of the Rondanera. This shaft is down 300 meters.

The Transvaal C. Co. reports operations progressing at the company's group in Moctozuma district, 16 miles west of Cumpas. The group consists of four copper mines and a group of gold claims. The company has 350 men employed and 8000 feet of underground work. Air compressor plants, steam hoists and twelve permanent buildings are among the improvements.

NEW ZEALAND.

The New Zealand gold returns for month of February are reported amounting to 52,011 ounces, valued at £201,066, as compared with 16,238 ounces, valued at £58,051, for February, 1903.

Personal.

M. K. Rodgers is superintendent of the Yale M. Co. at Hedley, B. C.

T. P. Rigney of Salt Lake City, Utah, is in New Mexico examining mines.

J. Carmen is superintendent of the Zenith mine and mill, near Joplin, Mo.

C. H. McCaffrey is superintendent of the Wheeler mine, near Plymouth, Cal.

D. J. MacDonald is superintendent of the MacNamara M. Co. at Tonopah, Nev.

L. L. Miller of Chicago, Ill., is in Denver, Colo., looking after mining interests.

H. C. Baisch, a mining operator of Telluride, Colo., is in San Francisco, Cal.

L. C. Snyder is manager of the Iowa and April Fool groups, near Bingham, Utah.

G. W. Boggs of Tacoma, Wash., is manager of the Morning mine near Sumpter, Or.

T. J. Bernard, a mining engineer of Sydney, Now South Wales, is in Rossland, B. C.

W. Kemp is manager of the Copper Belle mines, in the Dragoon mountains, near Tombstone, Ariz.

President Smith of the Old Dominion copper mines at Globe, Ariz., is at the mines from Boston, Mass.

D. MacVichie, manager of the Bingham Con. C. Co., is in Boston, Mass., from Salt Lako City, Utah.

L. A. Nares of Laton, Cal., interosted in northern California mines, is in San Francisco, Cal., on business.

A. I. Goodell is manager of the Takilma S. Co., operating copper mines near Waldo, Josephine county, Or.

T. S. Costello is manager of the Denver branch of the Diamond Rubber Co., vice W. W. Whiting, resigned.

C. M. Belshaw, president of the California State Miners' Association, is in San Francisco, Cal., from Antioch, Cal.

H. Joseph of Salt Lake City, Utah, has retired as manager of La Reine mines, near Eureka, Tintic district, Utah.

Geo. F. Beardsley has returned to San Francisco, Cal., from an examination of mining property near Keswick, Cal.

W. L. Cole, superintendent of the Mountain C. Co. of Keswick, Shasta county, Cal., is in San Francisco, Cal.

F. E. Shepard, president of the Denver Engineering Works Co., Denver, Colo., has returned from Salt Lake City, Utah.

W. P. Hammon, interested in dredging operations at Oroville, Cal., is in San Francisco, Cal., from a business trip to the East.

A. G. Wehe, formerly manager of the Nighthawk M. Co.'s mine at Nighthawk, Wash., has opened an assay office at Loomis, Wash.

R. J. Cory, manager of the Denver, Colo., branch of the Allis-Chalmers Co., has returnod there from a trip to Salt Lake City, Utah.

G. H. Masters of Berkeley, Cal., has gone to Gardnerville, Nev., as electrical engineer for the Longfellow M. & M. Co., near Gardnerville.

Manager R. H. Channing of the Utah Con. C. Co. at Bingham, Utah, returned to Salt Lake City, Utah, last week from California.

F. H. Bostwick, of the Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo., has returned there from a trip through Arizona.

H. McGarry of Colorado Springs, Colo., is manager of the Golden Cycle M. Co., operating the Golden Cycle mine at Independence, Teller county, Colo.

J. E. Hewston, formerly superintendent of the Norwegian mine in Tuolumne Co., Cal., is superintendent of the McKinley mine, near Fort Jones, Siskiyou Co., Cal.

S. W. Baker, assistant manager of the Longfellow M. & M. Co., near Gardnerville, Nev., has returned to Gardnerville from a business trip to San Francisco, Cal.

H. C. Holthoff, general manager of the Power & Machinery Co., Cudahy, Wis., has been in Denver, Colo., and Salt Lake City, Utah, on business connected with his company.

G. D. B. Turner of Salt Lake City, Utah, president of the West Quincy M.

Co., owning the J. I. C. mine of Park City, Utah, bas gone to Glasgow, Scotland, on company business.

S. W. Traylor, Eastern manager of the Colorado Iron Works, Denver, Colo., is on a short visit to the firm's headquarters. He expects to return to New York by April 1.

T. H. Oxnam, manager of the Palmarejo & Mexican G. F., Ltd., returned to Los Angeles, Cal., last week from the company's mines near Chinipas, Chihuahua, Mexico.

Epes Randolph of Tucson, Ariz., has been elected president of the G. V. G. & N. Ry., to succeed William Garland, who has been president of tbe road since its completion in 1894.

H. D. Conant, till recently assistant superintendent of the Lake Superior Smelting works at Dollar Bay and Hancock, Mich., bas been appointed superintendent, vice J. J. Case, resigned.

W. Zeigler has resigned as superintendent of the Granite Mountain M. Co. at Granite, Mont., and bas gone to Bingham, Utab, as general superintendent of tbe mines of the Ohio C. Co.

The directors of the Allis-Chalmers Co. have elected B. H. Warren president of the company in place of Charles Allis, who resigns on account of tbe illness of his wife, wbich necessitates a long trip abroad.

L. E. Hill has resigned as secretary and manager of the Golden Cycle M. Co. at Cripple Creek, Colo., to devote his time to leases which he holds on several Cripple Creek properties, among tbem the Theresa.

T. James of Spokane, Wash., has resigned as consulting engineer for the Salmon River M. Co.'s mines, near Conconully, Wash., and will devote his time to development of properties at Pony, Mont., and in Arizona.

Philetus W. Gates and Henry W. Hoyt, respectively general superintendent and second vice-president of Allis-Chalmers Co., are about to retire from active participation in tbe management of that company. Mr. Gates was president and Mr. Hoyt secretary and general manager of Gates Iron Works for fifteen years prior to the incorporation of Allis-Chalmers Co. in 1901. They have been prominently connected with tbe manufacturing interests of Chicago and have taken an active part in all of tbe manufacturers' associations. Tbe late P. W. Gates (father of Philetus W. Gates) was the pioneer manufacturer of Cbicago and the region west of the Allegbenies, having established his business in 1842. From 1861 to 1871 the Eagle Works Mfg. Co., of which he was president, employed about 1000 men, and in those days was a noteworthy industry. In 1871 the Eagle Works Mfg. Co. went out of existence and from it were organized Gates Iron Works and Fraser & Chalmers, each taking a portion of the business. Both of these companies in turn were taken over by Allis-Chalmers Co. in 1901. Messrs. Hoyt and Cates, after a well-earned vacation spent in traveling, will re-engage in business in Chicago.

Trade Treatises.

A model catalogue in every way is the 6x9-inch (standard size) sent by the Stephens-Adamson Mfg. Co., Aurora, Ill., the 208 pages being a compendium of information concerning the elevating, conveying and power-transmitting machinery that they furnish. It will be sent to any address on request.

From the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa., is received Catalogue No. 1077, "Type L Motors, Direct Current, Series Wound," and Catalogue No. 1078, "Westinghouse No. 91 Single Phase Railway Motor and Car Equipment." Large editions of these circulars have been printed and copies can be had upon request.

The Foote Mineral Co., 1317 Arch St., Philadelphia, Pa., is now preparing for tbe press a catalogue which is said to be one of the most complete and extensive of its kind in the entire field. The work is 96 pages, copiously illustrated and treats exbaustively of ore and mineral collections for prospectors and mining school use. A postal of inquiry will bring a copy by return mail.

Bound in red and bound to be read is the brochure on "Boot Facts" from H. J. Putman & Co., Minneapolis, Minn., which tells in a plain way about a boot they make for engineers, prospectors, miners, surveyors and any one who wants foot gear that is comfortable, durable and waterproof. That they make a good boot for mining men is shown by the testimonials tbey publish from all over the world. They will be pleased to send this book or their regular catalogue to interested parties anywbere. Address H. J. Putman & Co., 26 Hennepin Ave., Minneapolis, Minn., U. S. A.

Commercial Paragraphs.

Netland & Bolger have opened a civil and mining engineer's office at 303 California street, San Francisco, Cal.

Fairbanks, Morse & Co. of Cbicago have engaged M. Greenwood, formerly Pittsburg manager for the International Steam Pump Co., to look after tbeir steam pump business in the Pittsburg territory.

H. C. Holthoff of the Power & Mining Machinery Co., has a contract for a plant for the Takilma Smelting Co. at Takilma, Or., 45 miles from Grants Pass and 55 miles from Crescent City, Cal. Tbe smelter is to handle the gold and copper ores of tbe Waldo S. & R. Co. Albert I. Goodell is to be general manager.

The Pacific Steel Co. incorporated this week at San Diego, Cal. The company is capitalized at $100,000,000. Its objects are stated to be the construction of warships, steamsbips, locomotives and cars and to make armor plate, to deal in lands containing iron and copper deposits and operate mines for smelting purposes and to construct furnaces and mills. The company say they will construct a steel plant to cost $30,000,000.

The Sullivan Machinery Co., through their Denver, Colo., branch, have recently sold one 12x30 Corliss geared, double-drum hoisting plant and one 16x16x10x16 compressor to tbe Santa Eulalia Exploration Co., Cbihuahua, Mexico; one 17x42 first-motion, single-drum Corliss hoist to the Calumet & Arizona Development Co., Bisbee, Ariz.; one 17x42 double-drum, first-motion Corliss boist to the Calumet & Pittsburg M. Co., Bisbee, Ariz.: and three 20x22x14x24 compressors to James Degnan & Co., Wilburton, I. T.

The Sullivan Machinery Co., Cbicago, reports that owing to tbe growth of its business it is making several cbanges in tbe addresses of its different offices tbis spring, to secure larger quarters and increased facilities. The New York office, A. E. Blackwood manager, is now located at 42 Broadway, rooms 1427-28, instead of the Empire Building, 71 Broadway, where it has been located up to tbis time. On April 1st the Pittsburg office, Geo. W. Favor manager, will move from the Schmidt Building, 339 Fiftb avenue, to the Farmers' Bank Building, where it will occupy rooms 1112-13. On or about April 15th the general offices located heretofore at 135 Adams street, Chicago, will move into the newly completed Railway Exchange Building at the corner of Jackson boulevard and Michigan avenue, where they will occupy rooms 1502-14 inclusive.

The Pelton Water Wheel Co. report that there are now over 11,000 Pelton wbeels in operation in various parts of the world, in connection with electric transmission, mining, manufacturing and other industries, aggregating in excess of 1,000,000 H. P., viz.:

In the United States—	Wheels.	Aggregate H. P.
California, Oregon and Nevada	7,647	708,370
Washington, Idaho and Alaska	623	58,225
Utah, Colorado and Montana	176	24,970
Hawaii, New Mexico and Arizona	208	13,800
Middle West and Atlantic States	146	5,670
In Foreign Countries—		
Mexico and Central America	636	152,905
Various South American States	371	24,660
Australia, Japan and India	484	40,250
East and West India Islands	243	30,250
British Columbia and Nova Scotia	52	10,500
England and South Africa	77	12,220
Germany, France, Italy and Spain	341	4,820
Norway, Sweden and Denmark	36	2,800
Totals	11,040	1,089,440

The company further states: "In excess of 80% of efficiency is reported by the Gold Stream plant of the British Columbia Electric Railway at Victoria, B. C. So well satisfied is tbis company that they have given the Pelton Co. another contract which is to increase tbe output of the Gold Stream plant. This additional installation will consist of a water wheel unit for direct connection to a 1000 kilowatt Canadian-Westingbouse generator. This unit will consist of two wheels fitted with the latest type of Pelton buckets and needle nozzles with pilot control, and are to operate under an effective head of 600 feet. The wheels will be mounted one on each end of the main shaft, which will be carried on ring, oiling, ball and socket Pelton generator type bearings, and the wheels will be completely enclosed in sheet steel housings, mounted on heavy bed plates, made also to carry the armature of the generator, thus making a complete iron-mounted integral unit with the Westinghouse engine type generator. This unit will give considerable reserve capacity to this plant, which bas been operating most successfully for a number of years past."

Latest Market Reports.

San Francisco, Marcb 25, 1904.

METALS.

Silver.—Per oz., Troy: London, 25⅞d (standard ounce, 925 fine); New York, bar silver, 55½c, refined (1000 fine); San Francisco, 55⅛c; Mexican dollars, 45½@46½c San Francisco, 44⅛c New York.

Copper. — New York: Standard, $12.50; Lake, 1 to 3 casks, $13.00; Electrolytic, 1 to 3 casks, $12.87½; Casting, 1 to 3 casks, $12.75; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 15s spot per ton.

It is stated tbat since Jan. 1, 1904, the monthly consumption of copper in the United States has been 16,000 to 17,000 tons, and exports have reached about 57,000 tons per month. As tbe production of American mines bas not exceeded 33,000 tons per month during this period it is evident that the stocks on hand at the beginning of tbe year must bave been drawn upon beavily to supply the deficiency, still the price shows no advance, and, in fact, it is said that large amounts of the metal have been sold in Europe at a fraction under tbe market quotations.

Following are the figures of German consumption of foreign copper for the month of January, 1904, compared witb tbe same period of 1903-1902:

	1904. Tons.	1903. Tons.	1902. Tons.
Imports	9,391	6,829	9,705
Exports	676	795	1,482
Consumption	8,715	6,034	8,223

Lead. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £12 5s ℔ long ton.

Spelter.—New York, $5.15; St. Louis, $5.00; London, £21 17s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

Tin.—New York, pig, $28.85@29.12½; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 31c; less, 32c; bar tin, ℔ lb., 32¼@35c. London, £130 2s 6d spot.

Platinum. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

Quicksilver. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

Babbitt Metal.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

Solder. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

Zinc.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

Nickel.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

Aluminum.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

Iron.—Pittsburg, Bessemer pig, $13.85@14.35; gray forge, $12.60; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

Steel. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$15 50@16 00
Foundry Northern 1	14 00@14 25
Northern 2	13 50@13 75
Northern 3	13 00@13 25
Southern 1	13 60@14 35
Southern 2	13 10@13 85
Southern 3	12 60@13 35
Forge	12 10@12 60
Charcoal	15 00@15 50
Billets, Bessemer	24 00@24 00
Bars, iron	1 45@ 1 50
Bars, steel	1 40@ 1 45
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	13 00@13 50
No. 1 cast, net ton	12 00@12 50
Iron rails	17 00@17 50
Car wheels	14 50@15 00
Cast borings	4 00@ 4 50
Turnings	8 00@ 8 50

Lumber. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higber; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

Nails.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

Lime.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

Cement.—Imported, $2.15@2.40 ℔ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ℔ bbl. in sacks, 4 sacks to bbl.

GENERAL SUPPLIES.

Antimony. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

Powder.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11⅞c; less than one ton, 13⅞c. No. 2, 40%, carload lots, 10c; less tban one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

Caps.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

Fuse. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

Candles.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

Chemicals. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potasb, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; cbloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

Bone Ash.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

Coal. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Antbracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

Oils.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtba or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

White Lead.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

Red Lead.—500 lbs. and over at one purchase, ℔ lb., 6½c; less than 500 lbs., 7c.

Litharge.—Pure, in 25-lb. bags, 8@9c ℔ lb.

Borax.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

Manganese.—Pure, ℔ lb., 60c.

Sodium.—Metal, ℔ lb., $1.00.

Bismuth.—Subnitrate, ℔ lb., $2.00.

Mercury.—Bichloride, ℔ lb., 77c.

Molybdenum.—$2.00 ℔ lb.

Chromium.—90% and over, ℔ lb., $1.00.

Phosphorus.—American, ℔ lb., 75c.

Silver.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

Aluminum.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

Uranium.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

MINING AND SCIENTIFIC PRESS.

Whole No. 2280.—VOLUME LXXXVIII. Number 14. SAN FRANCISCO, CAL., SATURDAY, APRIL 2, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Utility of the Canvas Plant.

The canvas slimes plant is a distinctive feature of gold milling practice in California. It was first introduced in that State in 1884, and was known at that time as the Morris table, from the inventor. Prior to this, however, the use of various fabrics for concentrating gold from fine sand and from crushed ore, tinstone from its gangue, and other heavy substances from the lighter material with which it was associated, had been employed. As early as 1879 the sulphurets from the Homestake mills in South Dakota were concentrated on strips of brussels carpet, and in California mills heavy blankets and gunny sacks had been used for the same purpose. Long before this the Brazilian miner concentrated his gold on bullock skins, and even this was nothing new, as the ancient miners of the old world did the same thing in the same way centuries before. The California canvas plant, as now operated, is the refined result of the crude earlier practice, and it has now been carried to such a nicety that, under competent direction, an extremely close saving of values is obtainable from gold mill tailings. Elsewhere herein is an article on this subject, in which the author describes his practice at the Gold Bank mine in Butte county, Cal. The methods there employed differ materially from those employed at similar plants elsewhere, and are worth studying. Although he states he had an opportunity to experiment with the tailings from the concentrating mill of the Bunker Hill & Sullivan mine, at Wardner, Idaho, and states that his results were satisfactory, the management there has discarded the slimes plant. The discontinuance of the use of canvas tables at this property, despite the good results previously reported as having been obtained, may represent the difference between the men in charge of the plant at two periods of time. One was a careful, painstaking experimenter, the other a workman whose duty was to look after the canvas plant, which he did, probably to the best of his ability; but the personal equation is a large one when comparing results obtained on canvas plants. The difference is much greater, usually, than would be found in the work of two men in charge of concentrating machines of almost any design. These, once properly adjusted, will do about the same kind of work continuously unless some radical change takes place in the ore or in the volume of material or water coming onto the machine. This change will quickly manifest itself on the upper end of the belt or the lower end of the table, and would promptly attract attention. In a canvas plant any change is not so quickly noticeable. The pulp flows continuously over the tables for hours, and any change occurring is not detected until the pulp is shut off and clear water turned on, and possibly none would be noticed then in most instances, but a change is detected by assaying concentrates and tailings.

The place where the slimes plant appears to find its particular field of usefulness, and to operate to the best advantage, is at those mills where the stamp duty is high; where the relative size of the particles coming from the mill have a very wide range—from slimes to grains as large as will pass a 900-mesh screen—and where the pulp goes direct to the concentrating machines without hydraulic classifying being practiced. The natural result follows. It is found that all of both coarse and extremely fine particles of sulphide cannot be caught on the machines, and the canvas plant gets the tailings with their values lost from the machines. Without doubt, if hydraulic classifying were introduced, and the pulp properly classified before being sent to the machines, the canvas plant would receive tailings of far less value, and, in some instances at least, be made to operate at a profit. The class of work that well made mechanical concentrating machines can perform is well illustrated at several large canvas plants in California, where the sulphurets concentrated on the canvas tables are recleaned on machines of special design, running at a speed and stroke suited to the class of material they are required to handle. The result is satisfactory. However, the canvas plant is comparatively inexpensive, and so long as hydraulic classifying by experienced men is neglected in the average gold mill, there will remain a wide field of usefulness for the canvas plant as a means of concentration.

Fig. 1.—Elevated Sluiceway. (See Page 226.)

Fig. 2.—Stream Thrown by Two-Step Pressure Pump. (See Page 226.)

Fig. 3.—The Plant in Operation at McCoy, Colo. (See Page 226.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:
NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, ARPIL 2, 1904.

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Title to Unpatented Claims.

There seems to be an impression among many that unpateuted mining locatious are not subject to taxation, the idea seeming to be that as the Goverument has not passed title by patent to the locator the title rests in the Governmeut. It is not easy to define the nature of the estate acquired and held by the possession of a valid mining location, but from the early history of mining the title acquired by a miner to his claim by location was absolute so long as he complied with the statutory provisions. The claim was recoguized as real property, was liable to sale on execution, aud was subject to taxation. With passing years this idea has not changed materially, nor at all. A mining location properly made, and upon which all the requirements of the law have been complied with, is property in the strictest sense of the term, as much so as a patented claim. As a matter of course, if the claim holder ceases to comply with the law regarding claims so located, his rights in the estate cease and the claim reverts to the public domain, and is then subject to relocation by any person, a citizeu of the United States. The miner's title to his unpatented claim is founded upon the law of possession. In the early days of mining there was no other way of maintaining possession of mining claims than by complying with certain local laws and requirements. These local laws, rules and customs came, iu time, to be the foundation of the mining law as it exists at present. In establishing rights under the mining law the fact was recognized that no person could enter upon a claim legally held by another, on the plea that he had no title, as the title was still vested in the Government. The fact of possession was considered sufficient evidence of title. To be in possession does not involve the necessity of an actual residence upon the mining claim. If a mining claim be legally located upon the public domain, and all the acts performed in connection with such location as are required by the Federal Statutes, State and local laws, the locator is said to be in possession, and he has a legal title to the claim to the exclusion of every one else—even the Government—aud he may maiutain this right so long as he complies with the requirements of the law.

Selection of a Process.

In new mining camps the selection of a process to treat the ores, which may differ in character from those with which the operators have been familiar elsewhere, is an important matter. There are numerous recognized processes, usually bearing the name of the inventor, or of the district where first introduced, or the process may be knowu by a name suggested by the materials largely employed in its application — the chlorinatiou process, lixiviation process, cyanide process, Patio process, Washoe process, etc. Each of these processes have usually many variations, and sometimes they are made up of a combination of processes such as amalgamation, concentration and cyaniding. The various processes which have proven successful are those which have been evolved in some particular district after a long series of experiments, often accompanied by repeated failure in the earlier attempts. Not infrequently the process which eventually solves the difficult metallurgical problem is the result of fortuitous discovery, though more often it comes from studied trial of well-known chemical reactions. In the early history of the Black Hills of South Dakota the telluride ores were found most difficult to treat. Numerous processes were tried, and failure after failnre, both mechanical and chemical, resulted, but finally three processes were found each of which treats those ores, saving a high percentage at nominal cost. These are the chlorination process, the cyanide process aud pyritic smelting. The first two are independent of other ores than the telluride ores themselves. The other depends upon being able to obtain the necessary fluxes and pyritic material at low cost. All students of metallurgy are familiar with the Washoe process, which was worked out at such great cost, aud after repeated failnres, on the Comstock, but while well adapted to conditions on the Comstock, the Washoe process is not adapted to the telluride ores of South Dakota or to those of Colorado. At Tonopah, Nevada, the mill men are searching diligently for a suitable process to work those ores, but as yet only partial success has rewarded these efforts. The Washoe process will not accomplish this without auxiliary apparatus. It is evident that the sulphide ores of that camp must be crushed dry, roasted, aud then treated. Possibly after roasting they would be found amenable to the Washoe process. Roasting, simple amalgamatiou and cyaniding have been suggested. Also a combination of roasting, cyanidation and subsequent lixiviation of the silver is another idea as yet untried on a commercial basis. The ores are of good grade, and when a railroad makes Tonopah easily accessible the result will be as in the Black Hills—new brains, new money and experience will quickly solve the problem of recovering the values from those ores.

In the selection of a process, the investigator must be free from prejudice, and not wedded to some particular theory or invention. The broad-minded liberal experimenter will more quickly reach a satisfactory solution of such a problem than he who plods wearily along the same old trail, endeavoring to adapt the ore to his pet process or theory. Processes must be adapted to ores, for ores cannot be adapted to a process unsuited to it without preliminary expense which may render the operation a commercial failure.

Labor on the Rand.

After months of effort on the part of mine managers and others with influence on the Rand iu South Africa to secure permission to import Chinese laborers to work in the mines there, the settlement of the matter seems almost as far distant as in the beginning of the agitation. It has now partaken largely of a political nature, in which the positive necessity for cheap labor to continue operations on the Rand seems to be lost sight of. The opposition from Australia is largely due to the labor element in politics there, though in what respect the affairs of the Rand concern Australia is difficult to understand. The mines of the Rand were largely profitable in their early history, though worked with native Kaffir labor, aud, without doubt, they would have proven profitable also had they been worked exclusively with skilled white labor; but now, the great depth at which most of the companies are working, and the still greater depth at which most new concerns must operate, has placed a different aspect upon the situation. The mines, to be profitable at all, must have cheap labor. As it seems impossible to obtain this among the natives of the surrounding States, the mine managers have turned to China as a country able to supply this need. Even the skilled workmen employed on the Rand have signed the petitions asking that the Chinese be permitted to come into South Africa, realizing that, unless relief be obtained from some direction, the mines must close down, throwing thousands out of employmeut and hopelessly tying up millions of iuvested capital.

Comparative Cost of Shaft Sinking.

In shaft sinking cost is always an interesting and important feature. Elsewhere herein is an interesting description of the rapid sinking of a shaft in Rhodesia, S. A., on the Kleinfontein mine. In this article is giveu in tabulated form the cost of sinking. One of the items to attract atteution is the statement that 1404 cubic feet of timber were employed in the work, costing about $365. This would make a total of about 16,800 feet, board measure, the usual method of measuring timbers. The dimensions of the timber used are not given, but presuming that 8x8-inch timbers were employed, this quantity would scarcely timber more than 80 feet of an ordinary vertical shaft, without lagging, ladders, guides, etc., it is evidcnt that either very little timber was placed in this shaft, if vertical, which is improbable, or that it is an incline, in which only foot wall plates were laid. The difference in the expense of timbering a vertical shaft with full sets, aud merely placing sills in an incline, is a large item, amouuting in this case to not less thau $4 per foot for timber alone, not figuring laggiug, etc., besides the additional expeuse of framing and placing, which would probably have increased the expense to over $14 per foot, bringing the total cost of the shaft to about $80 per foot, and possibly somewhat more. This simply emphasizes the necessity for explicit statements as to the conditions under which costs are made in mining, when these figures are to be used for the purpose of comparison with costs elsewhere. The work done in the shaft in Rhodesia is evidence of good work performed, in which white labor was largely employed and rapid headway made, the whole being a compliment to the management, but a study of the conditions and costs shows it not to have been much cheaper than the shafts sunk elsewhere under somewhat similar circumstances and conditions, though the speed with which the shaft was sunk has seldom if ever been excelled in hard rock mining, beiug an average of 5.67 feet per day for a continuous period of five months.

THE introduction of the metric system in Great Britain is now under consideration in the House of Lords, the matter being in the hands of the committee on weights and measures. It would be a great improvement over the existing systems. The principal objection to the introduction of the metric system in England and the United States comes from mechanical engineers and manufacturers, who claim that its adoption would meau the necessity of an entirely new system of gauges, machines, etc., involving great expense. This is an important consideration, of course, but it would require only a few years in America to adapt ourselves to a system, the advantages of which may be compared to the superiority of the decimal monetary system of the United States over the cumbersome English coinage of pounds, shillings and pence.

THE statements of most of the larger companies operating in Western Australia show that a considerable amount of money is constantly expended in new development work. For instance, the report of the Great Boulder, at Kalgoorlie, for December last shows an expenditure of about $1.45 on dead work or development for each ton of ore extracted. This is a matter too often neglected in mines, the management of which is above reproach. Few mines can endure for long periods without carrying forward development work contemporaneously with the extraction of the known ore bodies. It is a necessary feature of good mining to carry on exploration while exhausting the reserves.

CONCENTRATES.

THE mineral sample from J. S. J., Los Angeles, Cal., is semi-opal and of no value.

THERE are few if any mills in California or on the Pacific coast crushing through an 80-mesh screen, but where such extremely fine crushing is desirable it is usually done in ball mills.

PLACER and lodo claims not patented, as well as those that are patented, are subject to taxation, and also subject to sale on execution by the proper officer in default of payment of such taxes.

SO FAR AS KNOWN, ore is not as yet reduced wholly by electricity, although electricity is employed to a considerable extent in metallurgical processes. It is employed chiefly in depositing metals from solutions.

QUICKSILVER squeezed through canvas or drilling from amalgam always contains a small amount of fine gold which passes through the mesh of the fabric. This fact is not detrimental to the mercury, as it aids in amalgamation, the presence of gold in the "silver" being desirable.

THE mineral from Indian Gulch, Cal., is pyrophillite, a mineral of the talc species, though pyrophillite is an aluminous silicate, and talc is a basic metasilicate of magnesium. The specimen has no value other than as a cabinet specimen. The purple color is due to iron oxide. The normal color is usually a pale whitish green, or clear white.

GEOLOGISTS are not agreed as to the origin of Yosemite valley, Cal. Some believe it to be of glacial origin, others think it due to the dropping of a great block of granite between two walls. Still others think that both of these causes are in a measure responsible for the formation of the valley, but the topography has since been changed somewhat by erosion.

THE friction incident to cars rounding a curve is due chiefly to the fact that the flanges of the wheels "bind" on the inner surface of the rails. This friction is largely reduced by employing car axles made in two sections, the ends meeting underneath the car midway between the sides. It may also be further reduced by lubricating the curved rails with crude petroleum.

GOLD, silver and wolframite are associated in ore from Yellow Creek, 2 miles south of Lead, S. D., and in other localities of that vicinity. This is an unusual combination. Several years since a large quantity of wolframite (a tungstate of iron and manganese) was shipped from a mine at Lead. Wolframite is often found associated with tin ore, but heretofore, rarely known with gold.

LEAD was first mined in southwest Missouri and at Mine La Motte, but later zinc appeared in quantity as the mines went deeper. The zinc industry in time eclipsed that of lead production, and now the output of lead is considered a by-product of mining operations as compared with zinc. In recent years numerous large bodies of zinc ore have been discovered near the surface.

THE value of a grain of placer gold depends upon the fineness of the gold. By fineness is meant the number of parts of pure gold contained in 1000 parts. A grain of pure gold is worth $0.0375. Placer gold is paid for according to the value of the gold it contains, nothing being paid for the silver content unless there be a large amount of silver present, with correspondingly less gold.

IT is believed a shaft can be sunk to a depth of 8000 feet, as far as mechanical difficulties to be overcome are concerned, but the heat developed at that depth may prove an insurmountable obstacle. It is not believed that water will be encountered in great amount below 4000 feet, and the heat which may be anticipated at greater depth will vary to a great extent in various regions.

IN chemistry the term atom is frequently used. An atom is the smallest possible amount of matter into which an element can be divided. It is the unit of the chemist. A molecule is made up of atoms. Thus one atom of iron combines with two of sulphur to form pyrite (iron sulphide). It is written FeS_2. An ion has been described as an atom or group of atoms, which are positively or negatively charged with electricity.

IT is a good plan to always provide large storage bins for ore either in the mill or at the breaker. There appears to be no objection to having these bins in the mill and at the breaker as well. It is never economy to dump ore from cars upon the ground, to be shoveled up later into cars again. The cost of shoveling a thousand tons will go a long way toward building a bin to hold the ore from which it could be reloaded into cars by gravity.

DURING 1901 there were shipped from a mine in the State of Georgia 747 tons of asbestos, valued at $13,490, and in 1902 the production was 1010 tons, worth $12,400, or about $12 per ton. Asbestos of merchantable quality occurs in Riverside, El Dorado and Tehama counties, California, and also in Gila county, Arizona, in North Carolina, in Maine and numerous other places. A large amount is mined in Canada. A specimen would have small value.

THE practice of scraping mill plates with a chisel is a bad one and is only permissible where the ore is rich, and is not good practice even then. When gold amalgam is removed so completely from the plates, it becomes necessary in the next run to give the plate more attention on this account than would otherwise be required to get the plate in good condition again, and in a mill where low-grade ore is being treated this condition is intensified.

IT is not uncommon to find stalagmites and stalactites of iron oxides forming in mine workings, from dripping water containing ferrous solutions, mostly derived from oxidizing pyritic ore. Assays made on samples of this material in some of the gold mines in California have shown the presence of gold in the iron thus formed, in one instance to the extent of $3 per ton. Whether the mine water contains gold in small amount in solution is not known to Concentrates, but it is not an unreasonable supposition that it does.

THE mineral specimens from North Yakima, Wash., are: No. 1, dolomite with small amount of pyrite, and also copper ore, the latter partly oxidized. This rock often occurs in vein-like masses, and is believed to be the result of alteration of an intrusive rock mass. It is sometimes gold bearing. No. 2, vein quartz with abundant mispickel, (arsenical iron pyrite) probably auriferous. This ore is sometimes rich in gold. There is also a small amount of pyrite present. The greenish-yellow color is due to the arsenic. No. 3 is infusorial earth.

A NATIVE amalgam of mercury, gold and silver occurs, but is rare. It is known in several European mining regions, in Chile and British Columbia. Native mercury, containing no gold, though sometimes a small amount of silver, occurs in many cinnabar mines. It is found usually at or near the bottom or lower edges of deposits of cinnabar, and is due to reduction of the sulphide by natural causes. The appearance of metallic mercury in a quicksilver mine is looked upon by some as an indication of the approaching exhaustion of the ore deposit in depth.

THE specimen of smooth, glossy, green rock from British Columbia, presumed to be ore, is serpentine and of no value. Serpentine is abundant in many parts of the world and occurs in dike-like sheets and irregular masses, sometimes of great size. It is a metamorphic rock, due to alteration of basic olivine and peridotite-bearing rocks, also from the alteration sometimes of hornblendic and augitic rocks. Serpentine is similar to talc, but the former is completely decomposed by sulphuric acid, and talc is not at all decomposed by it. Serpentine contains more water of crystallization than talc.

A CLAIM located by K. in 1900, and sold by him in 1902 to M., and M. failing to do the assessment in 1903, the claim became subject to relocation at midnight December 31, 1903, and not a minute previous. If K. relocated the claim at any time or hour prior to that date and time the claim was really not subject to relocation. If T. waited until 1904 to relocate he would be legally entitled to the claim, but it is a matter which would probably require the decision of a court. If the claim is valuable it would be wise for T. and K. to compromise and divide the interest in the property, as it would be difficult for either to establish their exclusive rights to the relocation.

IN the metallurgical process as practiced in the mints of the United States, the last portion of a large "melt" of refined gold is allowed to remain in the crucible, and is called a "king." It contains iridium and other rare metals, which, being heavier than the gold and less fusible, settle to the bottom, where they are found as crystals. The gold is dissolved by means of aqua regia (nitro-hydrochloric acid), and the crystals of iridium which may be present are recovered. The iridium has a higher melting point than the gold, and as the heat employed in melting the gold is too low to fuse the iridium, the two metals do not alloy. The "kings" are sold by the Mint to the manufacturers of gold pens, who work them up.

THE most satisfactory way in which to make comparison of the relative cost of various kinds of power is by the cost per horse power per month. Steam, electricity and water power are the three kinds most generally in use in the mining regions of the West. In some districts there is also power derived from gas, gasoline, distillate and other types of engines. No comparison of the relative cost of water, steam and electric power can be given without a complete knowledge of conditions obtaining at the place where the power is to be employed. Free water power is usually the cheapest, and water power bought from water companies is often cheaper than steam. Electric generators require a steady power in order to secure the even operation of the dynamo.

TO PREVENT SKIPS from overturning in a shaft sunk at a high angle, the bail or draw bars must be secured near the top of the skip. But skips of this description cannot be made to dump automatically. Automatically dumping skips have the draw bars secured near the bottom, at the sides, or underneath the bottom, and are provided with a lug on either side, near the top of the skip, which prevents the skip from turning over in a direction away from the rails, but which permits the bottom to be lifted from the track when the upper wheels pass out on the flat track above the ore bin or chute at the surface. Some skips are also provided with a latch, which is released by a lug at the proper point, which permits the skip to be automatically dumped. Grooves for the rear wheels are not necessary, as has been proven at many mines where automatically operated skips are in use.

THE latest volcanic eruption in the United States is not definitely known, but it is thought to be that at what is known as Cinder Cone, about 10 miles east of Lassen peak, in Shasta county, Cal, which is believed to have been in eruption within 100 years. There is every evidence of this eruption having occurred within a recent period. Many of the trees killed by the gases and hot ashes are still standing. At the time of that eruption a large amount of lava welled up in the crator and quiotly flowed down into a large lake, dividing the body of water into two separate bodies of water — Snag lake and Lake Bidwell. After the lava flow ceased there were numerous violent explosions which cast hundreds of bombs into the air, and these are found scattered about the surrounding lava field. Following this cinders continued to be thrown out by the crater, and these accumulated to the height of 600 feet above the lava field, forming a broad flat truncated mass, the ideal type of a cinder cone. There are numerous other cinder cones in that portion of California, but for most part they are covered with timber and brush, and have been extinct many years.

WHERE it is desired to estimate the number of tons of quartz taken from a mine and stacked ready for shipment to mill or smelter, there are several ways in which it may be done. If the ore is to be sacked, after sacking weigh ten or more full sacks and get the average weight per sack. This weight multiplied by the number of sacks will give the total weight in pounds. If the ore be of too low grade to justify the expense of sacks and sacking, vertical walls of the large pieces of ore should be built and the surplus thrown in the interior space. Leveling the top, the cubic contents may be ascertained by measurement and the number of tons by the number of cubic feet in one ton. In the case of quartz, 20 cubic feet. In that of galena, about 6.6 cubic feet. Lead carbonate, 7.5 cubic feet, etc. In the case of oxidized ores of lead, copper, etc., if there be much quartz, lime or other relatively light gangue present, a greater quantity will be required to make a ton. If the ore be too fine to build walls and no bin is available, the weight of the ore may be estimated by forming it into a conical pile. Then measure the diameter of the base of the pile of ore, in feet, square this and multiply by 0.7854. This will give the area in feet. Multiply this result by one-third the vertical height of the cone and divide the result by 20, which will give approximately the number of tons in the pile. Example: A circular pile of ore is 14 feet in diameter and 6 feet high. The square of 14 feet is $196 \times 0.7854 = 154$ square feet $\times 2 = (\frac{1}{3}$ the height$) = 308 \div 20 = 15.4$ tons of quartz ore.

WHERE veins occupy a fault fissure the direction of relative movement of the walls of the fissure may be usually ascertained by comparing the wall rocks on opposite sides of the vein. It is not known that veins occurring in the plane of a reverse fault are better than those which occupy normal fault planes. Careful investigation may show the fact that one portion of a vein may be in a reverse fault, and another distant portion in a normal fault, one wall having swung on a pivot, as it were. Often faults have had a greater lateral than a vertical movement, and the lateral movement is not noticed at all, because no evidence of such movement is sought. The grooves so often seen on the walls of a vein have in most instances been produced by movement subsequent to the formation of the vein, and not infrequently two, three, or even more systems of grooves are found, indicating a long period of movement, the forces operating from various directions. Many believe that the direction of trend of ore shoots is indicated by the direction of the grooves and striations, but the fact that these grooves and striations are found crossing each other proves that they cannot always be depended upon to indicate the trend of a shoot. Moreover, where there are several shoots in a vein, these do not always have the same trend. Two shoots in a vein have been known to have a directly opposite trend, as, for instance, one trends northerly, the other southerly, these two overlapping in depth and forming one shoot. In the early history of a mine the management is often uncertain where to locate the main working shaft, owing to the erratic distribution of ore bodies, and lack of knowledge of their general trend. This is a matter which only the further development of the mine can determine. Where there are very deep "grooves," or rolls in the walls, these are more dependable as indicators of the direction of trend of the ore shoots than mere striations on the polished surfaces of the quartz or wall rocks. In many veins it is clearly evident that the valuable ores have been deposited later than the great mass of the vein. "Pay streaks" are not uncommonly later than the barren portion of the vein accompanying them.

The Pump in Placer Mining.*

Written for the MINING AND SCIENTIFIC PRESS by J. A. YEATMAN.

It is well known that there are many placer deposits that cannot be reached by natural hydraulic heads without great expense. The working of these deposits may be undertaken by establishing a pumping plant and handling the water through giants as in gravity-pressure plants.

The idea is not a new one, but the question of the size and character of the pumping plant has never been determined in a satisfactory mauner until recently.

The event of the step pressure pump for handling large quantities of water against high heads operating at a high efficiency has pointed out possibilities that could not be considered for any other class of pumps.

Step pressure pumps have large capacity, are very much lighter than other pumps for a given capacity, are easily transported and installed, do not wear out like pluuger pumps when handling muddy water, will even handle water containiug sand and small gravel without clogging, or undue wear or great loss of capacity or efficiency. The facility with which the pressure may be raised aud lowered at the will of the operator makes these pumps desirable factors in placer installations where pumping heads are required.

The following description of a placer plant using artificial pressure head produced by one of these pumps, was installed by the writer for the United Iron Works of 32 Fremont street, San Fraucisco, Cal., for Stewart & Hawkins at McCoy, Colo., during the past year, and is of interest.

The accompanying cuts illustrate the general character of the installation.

The deposit was adjacent to the Graud river iu Eagle couuty, Colo. It extended back on a sloping hillside for about 800 feet; it was 12 to 30 feet to bedrock. The material was assorted gravel and sand, including stones up to 7 inches in diameter. The gold was very fine and associated with black sand. The best values were found on a clay stratum close to bedrock. It was considered advisable to install the elevating plant on the lower side of the property and sluice the gravel down to the elevator and send the material through a long sluice, draw off the fines and send them to a gold saving station, consisting of a series of Rose gold boxes, dischargiug the tailings into the Grand river.

The plant was of 100 miner's inches capacity and was for testing purposes for proving the character and worth of the deposit. The power equipment consisted of a 12x14-inch steam engine operating at 160 revolutious per minute, and a 54-inch by 16-foot boiler, which, under working conditions, produced 65 H. P. The pump took its water from the river 150 feet distant through an 8-inch pipe line, and discharged into a 12-inch pipe line 200 feet long, which was split, sendiug part of the 100 miner's inches to the elevator and part to the giant.

The elevator lifted 22 feet vertical aud required 60 miner's inches for its operation, and the balance was used to feed the same after the material had been sluiced close to the elevator. The sluice run was 24 inches wide, 16 inches deep, and set on a grade of 6 inches to 12 feet—twelve boxes, long-riffled throughout, elevated as shown in the cut (Fig. 1). Near the lower end an undercurrent was established and the fines drawn off and seut to the gold saving station. When in operation the water ran 4 inches deep in the sluice. The pump was a 7-inch of the two-step pressure type, having a capacity of 1125 gallons per minute. It was speeded for 160 feet head and operated at 850 revolutions per minute. The pump was set 10 feet above water level to avoid the high water of the spring season. When pumping through the 2¼-inch tip on the giant, the gauge ou discharge line near the pump showed a pressure of sixty-five pounds per square inch, and the giant operator was able to throw a stream 233 feet horizontally, and was able to establish a sluice run 100 feet distant and carry waste into the river, as shown in Fig. 2.

The pump operated silently and without end thrust, and its performance was more than was expected.

The fuel used was pinon pine and cedar, which was laid dowu at the plant for $2.50 per cord. Only two cords per day of ten hours would be required.

Five men operated the entire plant aud were distributed as follows: One man took care of engine and boiler, one operated the giant, one looked after the elevator, another after the gold-saving station, the cook completing the party.

Five thousand pounds of refined concentrates were caught in twenty days' run, before operations had to cease owing to the severity of the weather. Subsequently, advices are to the effect that the ground proved out, and that a larger plant will be installed.

It may be worthy of note that the pressure was raised to 105 pounds per square inch, nearly equal to a head of 250 feet, and its performance closely noted, and it was found in this material that very little advantage was gained. The conclusion was that the best results with fuel were to be had with more water and less pressure—just sufficient to loosen material in place. It was also noted that most gravels, even where packed and cemented to stand in vertical walls, would respond to pressure corresponding from 100 to 160 feet.

It is believed the above method will open up gold deposits yet untouched.

The following tables, showing the duty of giants with given volume of water per minute under stated pressure, together with other data, will be of use to hydraulic engineers and placer miners:

TABLE OF H.P. AND FUEL REQUIRED FOR PUMP TO PRODUCE HYDRAULIC HEADS OF 200 FEET

Miners Inch = 11.25 U.S. Gallons.

CAP. M. I.	CAP. GALLONS PER MIN.	CAP. CU. FT. PER SEC.	H.P. @ 70%	SIZE OF ET'S STEAM PUMP	COAL IN LBS. FOR 12 HOURS PER H.P.	TONS OF 2000 LBS.	BBL. OF OIL 42 GAL.	CORDS OF WOOD	GAL. OF GASOLINE
50	562	1.2	41	5"	2460	1.2	4.4	2	50
75	843	1.8	62	6"	3690	1.8	6.7	3	75
100	1125	2.5	82	6"	4920	2.4	8.9	4	100
125	1406	3.1	103	7"	6150	3.1	11.1	5	125
150	1687	3.7	124	8"	7380	3.7	13.3	6	150
175	1968	4.4	145	9"	8610	4.3	15.5	7	175
200	2250	5.0	164	10"	9840	4.9	17.8	8	200
225	2531	5.6	185	10"	11070	5.5	20.0	9	225
250	2812	6.2	206	10"	12300	6.2	22.2	10	250
275	3093	6.8	227	12"	13500	6.8	24.4	11	275
300	3375	7.4	246	12"	14760	7.4	26.6	12	300
350	3937	8.6	267	12"	17220	8.6	28.9	14	350
400	4500	9.9	328	14"	19680	9.8	35.5	16	400
500	5625	12.4	410	14"	24600	12.3	44.4	18	500

*See illustrations on front page.

DUTY OF GIANTS AND LIFT TIPS
SHOWING GALLONS DISCHARGED PER MINUTE AND THE HORIZONTAL AND VERTICAL DISTANCES IN FEET REACHED BY JETS

DIA. OF NOZZLE INCHES		PRESSURE AT NOZZLE								
	PRESS. IN LBS.	20	30	40	50	60	70	80	90	100
	HEAD IN FEET	46.2	69.3	92.4	115.5	138.6	161.7	184.8	207.9	231
1"	GALLONS	110	134	155	173	189	205	219	232	245
	HOR. DIST.	70	90	109	126	142	156	168	178	186
	VERT. DIST.	43	62	79	94	108	121	131	140	148
1 1/8"	GALLONS	131	170	196	219	240	259	277	294	310
	HOR. DIST.	71	93	113	132	148	163	175	186	193
	VERT. DIST	43	63	81	97	112	125	137	148	157
1 1/4"	GALLONS	171	210	242	271	297	320	342	363	383
	HOR DIST.	73	96	118	138	156	172	186	198	207
	VERT. DIST	43	63	82	99	115	129	142	154	164
1 3/8"	GALLONS	207	253	293	327	358	387	413	439	462
	HOR. DIST.	75	100	124	146	166	184	200	213	224
	VERT. DIST	44	64	83	100	118	133	146	158	169
1 1/2"	GALLONS	255	313	361	404	442	478	511	541	571
	HOR DIST.	77	104	130	152	176	195	212	224	240
	VERT. DIST.	44	64	83	101	119	135	149	163	175
1 5/8"	GALLONS	299	366	423	473	517	560	598	634	668
	HOR DIST.	79	107	135	157	183	204	222	235	251
	VERT. DIST	44	64	84	103	120	137	152	166	180
1 3/4"	GALLONS	347	425	490	548	600	649	694	735	775
	HOR. DIST.	81	110	140	161	188	210	230	243	259
	VERT. DIST.	44	65	85	104	121	138	154	169	183
1 7/8"	GALLONS	399	489	564	630	690	746	798	845	891
	HOR. DIST	83	113	144	164	191	215	236	249	267
	VERT. DIST.	44	65	85	104	123	140	156	172	186
2"	GALLONS	452	556	642	717	785	849	907	962	1014
	HOR. DIST.	85	116	147	166	194	218	240	255	274
	VERT. DIST	45	65	86	105	124	141	158	174	189
2 1/8"	GALLONS	513	628	725	811	888	960	1026	1087	1147
	HOR. DIST.	86	118	149	168	196	220	242	260	280
	VERT. DIST	45	66	86	106	125	143	160	176	192
2 1/4"	GALLONS	574	703	811	907	992	1073	1147	1216	1282
	HOR. DIST.	87	120	151	170	198	222	244	264	284
	VERT. DIST.	45	66	86	106	125	144	161	178	194
2 3/8"	GALLONS	640	784	905	1012	1108	1197	1280	1357	1431
	HOR. DIST.	88	122	153	172	200	224	246	268	287
	VERT DIST.	45	66	87	107	126	145	162	180	196
2 1/2"	GALLONS	710	869	1003	1121	1228	1327	1419	1504	1586
	HOR. DIST.	89	124	155	174	202	226	246	271	291
	VERT. DIST.	45	66	87	107	127	145	163	181	198
2 5/8"	GALLONS	782	958	1105	1236	1353	1462	1563	1657	1747
	HOR. DIST.	90	126	157	176	204	228	250	274	293
	VERT. DIST.	45	66	87	108	127	146	164	182	200
2 3/4"	GALLONS	858	1057	1214	1357	1485	1606	1717	1819	1919
	HOR. DIST.	91	128	158	178	205	230	252	276	295
	VERT. DIST.	45	67	88	108	128	147	165	183	201
2 7/8"	GALLONS	938	1149	1326	1482	1623	1754	1876	1988	2096
	HOR. DIST.	91	129	159	180	206	232	254	278	297
	VERT. DIST.	45	67	88	108	128	147	166	184	202
3"	GALLONS	1022	1252	1444	1615	1768	1911	2043	2166	2284
	HOR. DIST.	92	130	160	182	207	233	255	280	299
	VERT. DIST.	45	67	88	109	129	148	167	185	203

How Bullion is Received, Treated and Paid for at the U. S. Mints.*

NUMBER II.—CONCLUDED.

Written by Frank Leach, Superintendent U. S. Mint.

Upon the receipt of a lot of bullion it is weighed, put in boxes, locked and then immediately sent to the melting room to be put in condition for assaying. All metallurgists know that practically no gold is produced from the ground or the rocks but what has alloyed with it a certain percentage of silver, copper, lead, antimony, zinc, etc. These metals appear with the gold, singly or in combination, to a greater or less degree, and it is the proportion of the silver and base metals to the gold contents that establishes the fineness of the bullion.

To obtain a satisfactory determination of the value of the bullion, in the melting of the deposit there must be a complete mixture of all the metals; in other words, it must be made into a homogeneous mass, so that a chip taken from any part of the bar will truly represeut the character of the metal of all the rest of the bar. The assayer now finds the value of the precious metals in the deposit by determining the number of parts of pure gold and silver separately in 1000 parts of an ounce of 480 grains, which fixes the fineness. Thus we say a deposit is 726 fine, which means that it contains 726 parts of pure gold out of 1000 in a Troy ounce, which would give it a value of $15.00 per ounce. The increase in the number of parts of pure gold increases the fineness and consequently the value per ounce. Practically, each 48½ parts of gold in 1000 is eqnal to $1.00. To illustrate: If the fineness of an ouuce of bullion 726 fine is raised to 774½, the value of the bullion is iucreased from $15.00 per ounce to $16.01 per ounce.

As a rule, by 1 o'clock the following day the Government is ready to pay for the gold it has received from the depositor, the interim is the time necessary for melting, assaying and computing the values. The Government is very liberal in its dealings with the producers of bullion. The weights of deposit are allowed, or measured, to the one-hundredth part of an ounce. Tbe checks against errors in weighing are a guarantee from mistakes in that direction. The weighing is done by the receiving clerk on the finest scales the Government can buy.

These scales are tested and adjusted every few days by an expert employed in the mint, whose entire time is given to the care and adjusting of all the scales in use in the mint, and they are kept in a condition of absolute accuracy all the time.

The weighing is done in the presence of the depositor, and is always checked by assistant to the receiving clerk, and the bullion is not removed from the scales until the register of deposits counts up the weight and compares his count of the weight with that marked down by the receiving clerk and it is found to agree. The fraction of the hundredth part of an ounce inures to the benefit of the Government.

In establishing the fineness of the bullion, or assaying, our Government is more liberal with its customers than some of the old countries. In dealing with crude gold the fineness is determined to one-half of one-thousandth, while the practice in some countries is not to report the fractions of oue-thousandth part at all. In fine gold the United States mints report the fineness to one-quarter of one-thousandth.

There are no deductions made in either weight or fineness in receiving deposits of an ordinary character, but when a deposit is presented containing an excessive amount of base metals, or impurities, in the discretion of the melter and refiner, with the approval of the superintendent, deductions of 0.05 to 0.10 of an ounce are made to protect the Government against the loss which it would sustain in the process of refining if the deposit had been accepted at full weight.

Such deductions, however, are only made in extreme cases.

Gold bullion reaches the mint in various forms. As a rule, the larger mine owners reduce the products of their operations to bars. Deposits in this shape are most desirable, giving less occasion for dissatisfaction than in any other form.

Considerable gold comes to the mint in the shape known as "gold dust," the product of gravel mines. As a rule, this character of deposit coutains more or less impurities in the form of iron oxide, sand or particles of quartz, or minute pieces of iron and lead, much of which is scarcely discernible to the naked eye; but it all goes to make up quite a loss in weight when the deposit is melted. Experience shows that the loss in melting from the sources mentioned ranges from 2% to 6% of the original weight, the average loss running about 3% or 4%.

Tbe inexperienced depositor procures some of this gold, and when he leaves it at the mint, or with any other purchaser of bullion, he thinks it is all gold and can not understand why it should shrink in weight by melting, and is apt to think he has not been honestly treated. It might be well to say here that as soon as a deposit is received by the receiving clerk and weighed, it is put in a box, locked and conveyed to the melting room, where the operation of melting is conducted under the eyes of a person appointed by the superintendent for the special purpose of supervising the work, which is performed by several employes selected for their known character of integrity and skill.

When a deposit is ready for the assay department, it is taken to the sampler, who takes from the bar two samples, which are placed in separate papers; one is marked "A" and the other "B," with the number of the deposit. These samples are then sent in to the assayers, located in another room. They know nothing of the owner of the deposit, or the size of the bar. The two samples are then assayed, each by a different person, and each assayer writes down the result of the assay in his record book, without consulting one with the other. These books are handed in to the chief assayer or his assistant at the close of the day's operations, and he compares the results and reviews the work of the assayers.

If a case should occur where the results of an assay do not agree, then a re-assay is made. If an agreement in results can not'then be reached, it is apparent there is some base metal present in the deposit which prevents a homogeneous mixture in melting, and the bar is sent back to the melting room and treated to overcome the trouble.

A very considerable proportion of the receipts at the mint comes in the form of amalgam cakes, which arises from the clean-up at the mines in the shape of amalgam, and retorting of the same. This form of deposit gives the greatest percentage of loss in melting, for the reason that not one deposit in a hundred is completely retorted. In other words, the miner fails to remove all the quicksilver. Of course, when he brings the bullion to the mint the quicksilver remaining in the cake gives weight to the deposit, and when the bullion is melted and cast into a bar, that process eliminates the mercury and the deposit will show a loss equal to the amount of the unretorted quicksilver present when it was brought to the mint. Amalgam cakes have been received at the mint, which, on the outside, show only a gold color; there was uothing from the general appearance to indicate the preseuce of unretorted quicksilver; but upon breaking the cakes open the center plainly showed that the quicksilver there had not been disturbed. The loss in melting in instances of this kind would be quite large. In reality the depositor has suffered no loss, for he has just as much gold after melting as before. It is the unknown presence of quicksilver that causes him to think he has more gold than is contained in the deposit. The losses in melting of this character of deposits ranges from 6% to 12%, with an average loss of about 8%. If the producers of gold dust and amalgam cakes should provide themselves with a small furnace, melt their bullion and cast it into bars before sending it to the purchasers, there would be removed the greatest source of disappointment in dealing with buyers of their products.

The idea prevails to some extent that people bringing bullion to the mint get back their identical gold in such denominations of coin as they desire. Such a plan of operation of the mint is wholly impractical. To conduct the business under such a system would require each individual deposit to be refiued by itself, made into ingots and carried through all the process of coinage separately from other lots—a procedure which would increase the cost so much that the expense of turning the smallest deposits into coin would probably equal the value of the gold itself. The Government pays the depositor for all the gold contained, and for the silver, with a slight deduction, which is explained in the uext paragraph. The Government does not make any allowance for other metals that may be present in deposits, except for copper, under certain conditions meutioned below.

The Governmeut has found that it is impracticable to extract all the silver contained in gold deposits in the process of parting or refining. By experience it has been determined the proportion of silver that remains with the gold is one-ninety-ninth of the gold contents, and, for this reason, in settling with a depositor, an amount equal to $\frac{1}{99}$ of the gold is deducted from the amount of silver found in each deposit. Consequently, 990 is fixed as the standard for fine gold—that is, bullion must have 990 parts pure gold in 1000 parts to be classed as "fine gold"; the remaining 10 parts of silver is equal to $\frac{1}{99}$ of the gold; hence, the rule of deduction of $\frac{1}{99}$ of the weight of gold in all deposits above described.

The process of assaying is one of analysis, determiniug the proportion of metals in deposits, and custom has fixed 1000 parts as the sum of uuits, each division of which sum represents the various proportions of metal to the whole. Thus, the assayer finds a sample of bullion to contain 800 parts gold, 150 parts silver and 50 parts base metals, the bullion would then be classed as 800 fine, i. e.:

800 parts gold.
150 parts silver.
50 parts base.

1000 parts total number of units.

It is not practicable to have a table of values showing the worth of an ounce containing other than 900 parts of gold.

This fineness has been fixed as the best standard to figure values in all mint transactions, affording the simplest method and guaranteeing exactness in accounts. Therefore, theoretically, we do not know the value of this deposit containing 800 parts gold in each ounce, so we must reduce it to ouuces coutaining 900 parts. We will say this deposit has a gross weight of 50 ounces, so there would be 50 times 800, or 40,000 parts of pure gold in the whole; divide 40,000 by 900 (900 parts of gold bcing the mint standard ounce) and you will have 44.444 ounces standard, or, in other words, you will have nearly 44½ ounces where each ounce has 900 parts purc gold out of 1000 of the value of $18.60½, equal to $826.88. Now, as to the silver, which also must be reduced to standard: There are 150 parts to the ounce, and 50 times 150 equals 7500 parts, divided by 900 gives 8.33 standard ounces, from which must be deducted an amount equal to $\frac{1}{19}$ of the weight of the gold, which is .44 of an ounce, leaving 7.89 ounces of silver which must be paid for at the ruling price of silver, say, 50 cents per standard ounce, the present rate, or $3.94, making a total of $830.82 for both metals.

Charges.—There will be deducted by the Government from the total value of the deposit as determined above, $1 melting charge, 4 cents per ounce on the gross weight of the deposit—50 ounces—or $2, which is the cost for refining the bullion, or, in other words, separating the metals and putting the gold and silver in conditiou for coinage. Iu addition, the depositor must pay for the amount of copper necessary to make coiu of the gold he has brought to the mint, aud that is an amount practically equal to $\frac{1}{11}$ of the standard weight of the gold, or 4.04 ounces, which, at 2 cents per ouuce, amounts to 8 cents, no charge being made for the fraction of an ounce. All the charges on this deposit amount to $3.08, which is deducted from the total value of the gold aud silver allowed in the deposit. The balance is turned over to the owner of the bullion or his order.

The fact that these charges are imposed upon deposits of gold bulliou frequently raises the question in the minds of some of the customers of the mint whether or not there is such a thing as the free coinage of gold. The affirmative sometimes is most energetically opposed until the statement is made that if the depositor should bring his gold already prepared for coinage—that is, with the excess of silver and base metals eliminated, and alloyed with the proper amount of copper as required by law—there would be only one charge made: that of the dollar for melting and determining the character of the bullion. These items of expense are preliminary to getting the metal in shape to melt into double eagles or half eagles.

No part of the cost of actual coinage is taxed to the producer of the gold; that is all borne by the Government. The charges for melting and refining barely cover the cost of the work as required by law.

However, the mints are not money-losing as well as money-making institutions. The total earnings of all the mints and assay offices of the United States for the fiscal year ending June 30, 1901, reached the large sum of $12,381,966.51, while the total expenditure by the Government in the support of the assay offices and the operations of the mints for the same period of time was only $1,737,625.66. This sum not only includes wages, cost of supplies, etc., but the losses and wastages and every known expense; so the net profit to the Government for that year's operations was $10,644,340.85. The net earniugs for the following year were about $1,000,000 less. The report for the last fiscal year is not yet printed.

The bulk of the profit arises from the seigniorage on the silver and minor coinage. The seigniorage, of course, is the difference between the bullion value of the metal in a coin and the coinage value. The larger part, or about three-fourths, of the net profit mentioned above, accrued from the extensive coinage of standard dollars.

* Trans. Cal. Min. Ass'n.

A well attended meeting was held on March 24th at Seattle, Wash., by the charter members of the North Pacific Society of Mining Engineers. Several previous meetiugs had been held, but at this one the organization took definite shape. A constitution and by-laws were adopted and officers were elected. The qualifications of members was definitely fixed, and is confined to "professional mining engineers, geologists, metallurgists or chemists, or persons professionally engaged in mining, metallurgy or metallurgical engineering." The society's affairs are to be managed by a board of five persons, who are the officers. Those elected to serve for the first year are: President, Chester F. Lee; vice-president, Milnor Roberts; recording secretary, F. C. Newton; correspondiug secretary, P. C. Stoess; treasurer, C. E. Bogardus. It is the intention of the society to present papers and have discussions ou matters of mining practice, to have addresses and informal talks from prominent geologists, miniug engineers and other specialists who may be in Seattle from time to time, as well as from its own members. Open meetings will be held, to which those interested in the subject to be discussed will be invited. It is intended that this institution shall gather together the technical men of that section who have to do with mining, as well for their mutual acquaintance and benefit as the advancement of the mineral industry of the Northwest.

Relation of Employer and Employe.

A somewhat unusual social fuuction was carried out recentlу at Chloride, Mojave county, Ariz., which was so much of an innovation that it can not fail to be of interest to mine managers and their employes, as well as to the employer and employe in other branches of industry. The occasion was a diuner given to the employes of the Pennsylvania & Southwestern Development Co. (which has recently taken over the Minnesota-Connor mines and other properties of the Philadelphia & Arizona Mining Co.) by the president and general manager of the compauy, Franklin H. Griffith. After dinner, Mr. Griffith addressed the men in the following words:

Men, I look into your intelligent faces and am proud of you. I came among you a few weeks ago a stranger—a tenderfoot—from the East. To-day I look at you and feel I am among friends. You were selected from among many applicants for work, and I feel I have about me the best men in this part of the country. It would not be proper for me to say all the best meu; but I don't believe there are any better.

You have taken the keenest interest in your work; beeu ever ready to willingly do the tasks assigned you and seeing and doing many things of your own accord. Time—as to hours—did not seem to be the essential thing with you; but you have faithfully and conscientiously performed your duties and ever been looking to our interests.

It is not advisable for the general manager to go about commending individual acts; but not much escapes his uotice; therefore, I have seen your close attention to duty with much appreciation, and that is why I am proud of you; and I am proud of myself in knowing I have made uo mistake in pre-judging you.

Some one must hold the reins, and that is the part of the general manager. Each man knows his own work, but the general manager must know and keep in touch with all. He must do the directing. His guiding may not always coincide with your ideas, but you must remember he may know things and conditions of which you can necessarily have no knowledge and he is making his decisions for the best of all and from the best of rcasous. A single decision ofttimes involves thousands of dollars, for which he is held accountable by his associates; so do your duty at all times, and be sure he is doing his.

I expect to know every piece of machinery, every part, and every bolt and nut and their different uses, from the bin that first takes the ore, to the car that wheels out the tailings, and even the engine and boilers, so I can take auy man's place in the mill or out of it; not that I want your jobs—I want each of you to hold them—but I am going to be able to take them.

To our company I am its president; to you in your hours of work I am your general manager. I hope at times we may have pleasant occasions, such as this, when we can meet together socially and learn to know each other better; but I would ask that at all times you let me be your friend. As you know, everything has been shut down for many months. You kuow with what feeliugs of hope our mill whistle will souud throughout the valley to-morrow and many will take fresh courage from its voice calling you to work. We have one of the largest and best equipped plants and properties in Arizona; so let us all pull together for success.

As it is with the machinery in a mill, so it is in the industrial, financial and social world. He who can not or does not keep pace with the work and rapid advaucements of the times must drop out of the race and fiud his place lower down. It is either growth or decay, progression or retrogression. This is the inexorable law of the universe. The world recognizes with approval but one element, and that is success. It merely tolerates the mediocre and has no use nor makes no excuse for failure. The man who receives $3 per day and does only $3 worth of work never succeeds to be worth more, and is apt soon to be worth less. But the man who gets $3 and does $4 or $5 worth of work must eveutually become a $4 or $5 man, and, as his value increases, so must follow his compensation.

A man has been given brains with which to work as well as hands and feet, and he is supposed to use them, else he cau never be more than a piece of machinery to wear out and become useless.

Not only does an employe's time belong to those who hire him, but his brains, his thoughts and his best work. It is thus that the great industrial and mechanical achievements are made and the world's progress carried on.

There seems to be a very wrong prejudice against corporations. Combiuations of capital and interests are now recognized as essential to the world's development. It would be wrong to condemn all corporations as bad because some are bad. As communities are composed of individuals, so arc corporations composed of individual men. If the men composiug the corporations are bad, the corporations must necessarily be bad; if they are good, so will be the corporation.

My associates look to me for success; I look to our superintendent, he looks to you, you must look to the machinery. You are essential to my success, I am essential to you. And yet I can get along without any one of you. This may at first seem somewhat paradoxical to you; but think it over. I say it in all kindness, men, but we must understand each other. There is uot a man living, no matter how exalted or important his position may be, whose place could not be filled by another. I want you all with me—that is why I have engaged you; but if every one of you would leave to-day, while it might inconvenience me, that mill would run, for others would soon take your places. And, if I should die to-night, another general manager would come to you in my place. So it must and ever will be.

But, men, we are here to make a success, and we will do it. You look to our interests, and I promise you we will look to yours. That is fair. But don't expect too much, nor expect it too soon. Be willing to work for fair wages now, and wait for better. We have made investments of many thousands of dollars and are taking all the risks; give us a chauce to get some of it back. Don't you think we are entitled to it? You term us capitalists and yourselves working men. I say we are all here to make money. If we are capitalists and you wage earners, so then are you capitalists and we wage earners. I know not your financial condition, but I say to you that your best capital is your brains and muscle. Invest them in such a way as will bring you most happiness, but don't forget that it is very elusive, and it is more in the pursuit than in the possession, and you are more apt to obtain it in trying to give it to others.

A Proposed Filter Press Slimes Plant.*

NUMBER II.—CONCLUDED.

Written by FRANCIS L. BOSQUI.

The battery of filter presses was to consist of seven primary aud seven secondary presses of the center-feed, recess-plate pattern, each press to have fifty 42-inch plates. This large battery was made necessary by the thinness of the cake, and by the slow operations of filling and displacing. After the formation of the cake the residual moisture was to be displaced as in the test plant. The discharged cakes from the primary presses were to be dumped on a belt conveyor runuing under a series of presses, and thence carried to mullers, where they would be broken up and mixed with strong solution. The pulp from the mullers was to be elevated to the extractor vat, 35 feet in diameter and 15 feet deep, where treatment would be carried on with eighty parts solution and twenty parts slimes (dry). There were to be three of these vats, so that a seventy-two-hours' contact would be possible. The pulp was to be agitated at intervals in the extractor vats by stirrers or rotary pumps, and then pumped to the pressure tank on the hill (for which a pump would be used similar to that for the settler vats), and would be delivered thence to the battery of secondary presses. The effluent solutions were to be precipitated by means of zinc dust. The discharged cake would contain about 30% of weak solution, which would be the principal cyanide loss.

The estimated cost of treatment in such a plant, treating 100 tons per day, is given in Table I:

TABLE I.—ESTIMATED COST OF TREATMENT PER TON ON THE BASIS OF 100 TONS PER DAY.

Items.		Cost Per Ton
Power—1 pump, 150 gallons, 200 feet head	12 H. P.	
1 pump, 150 gallons, 200 feet head	12 H. P.	
Mullers	25 H. P.	
Elevator to extractor vats	5 H. P.	
Solution pumps	10 H. P.	
Agitating settlers, etc	20 H. P.	
Miscellaneous	16 H. P.	
Total	100 H. P.	
100 H. P. at $7 per month = $700 per month		$0.23
Cyanide—1.75 pound per ton		0.43
Lime—20 pounds per ton		0.06
Zinc—0.25 pound per ton		0.03
Labor—12 men on presses at $3.50 per day	$42	
2 solution and pump men	7	
2 shift bosses	9	
1 roustabout, 10 hours	3	
Total	$61 per day,	0.61
Canvas—200 yards per month	100 per month,	0.03
Miscellaneous supplies and repairs	300 per month,	0.10
Lights	60 per month,	0.02
Heating	30 per month,	0.01
Depreciation, 5%	335 per month,	0.12
Insurance	135 per month,	0.04
Miscellaneous and contingencies	300 per month,	0.10
Total		$1.78

The cost of the plant, allowing $5000 for contingencies, was conservatively estimated at $100,072, of which $48,100 was the cost (delivered) of the presses alone.

The weak points in the method described above are no doubt obvious. The experimental work showed that it would be a slow process, requiring seven or eight hours for the cycle of operations in a press. The cakes formed, though only ⅝ inch thick, were almost impermeable; they could not be sufficiently dried, and it was found impossible to wash them thoroughly. These results led to additional tests on filter pressing a pulp consisting of slimes, mixed with fine sand iu various proportions. It was found, however, that the conditions were not materially improved until a mixture was used of about 100 parts of slimes to 250 parts of fine sand, the latter passed through a 200-mesh screen. This result uaturally led to a consideration of the treatment in filter presses of the whole product leaving the Wilfley tables, after regrinding to a slime everything coarser than 200 mesh. This plan had much to recommend it. The extraction from the sands in the present leaching plant had been unsatisfactory; and as so large a proportion of the crushed product would already pass a 200-mesh (about 55%), the problem of regrinding the remainder did not seem an overwhelming one. It was only necessary to determine whether the considerably increased extraction would offset the additional cost of filter pressing, as well as the increased initial cost of a plant.

This new feature involved the regrinding of about 120 tons per day. Various forms of grinding machines were considered, and the tube-mill finally chosen as best adapted to the purpose. It was ascertained that two of these mills, 5 feet by 22 feet, requiring about 45 H. P. each, would do the work. A series of determinations made with a 6-inch laboratory press, which were confirmed with a 24-inch press, demonstrated that the maximum time taken up by the cycle of operations in a press would be about five hours, or that each primary and secondary press would have to be emptied five times in twenty-four hours. That this mixed pulp did not admit of more rapid pressing merely proved the impermeable and refractory character of the slimes. But there were several points in favor of the new method: A cake could be conveniently formed as thick as 2 inches, admitting of the use of the distance frame-type of press, of much larger capacity than a recess-plate press of corresponding cost; and the cake being more grauular admitted of perfect displacement and thorough washing and drying to as low as 22% moisture.

For the double filter press treatment of 266 tons per day, there would be required sixteen 42-inch 60-frame presses, holding seveu tons each, or fourteen 48-inch 50-frame presses, holding 7.5 tons each, or twelve 48-inch 60-frame presses, holding nine tons each. The probability that the 48-iuch press might be impracticable, left us to the selection of the 42-inch 60-frame press as the best size.

A series of tests on this mixed product indicated an extraction of from 70% to 85%. For purposes of safe calculation, however, the probable extraction in practice was placed at 65%.

The proposed method of treatment was, with few variations, practically the same as that for the pure slimes. The tailings leaving the Wilfley tables were to be run into spitzkasten, whose underflow would be led to the tube-mills for regrinding. The material finally reaching the settling vats would therefore be a combination of two products — the reground sand from the tube-mills and the overflow from the spitzkasten. It was proposed to use the present leaching plant for purposes of settling. The five upper vats are 8 feet by 10 inches deep; the lower vats, 9 feet by 8 inches deep. It was found that by settling the slimes pulp in the upper tanks, decanting off the water, discharging the pulp to the lower vats and decanting off more water, a final pulp could be obtained in forty-eight hours which would contain only about 67% water. This material was then to be pumped to the high pressure tank and delivered to the presses as in the case of the pure slimes. Owing to the longer treatment required by the fine sands, four treatment vats would be used instead of three, allowing a four days' contact with a 0.3% solution.

The estimated cost of filter pressing all the material from the Wilfley tables (266 tons), as above indicated, is given in Table II.

The cost of erecting a regrinding and filter-press plant, allowing $5000 for contingeucies, was estimated at $109,602, of which $59,200 was the cost (delivered) of presses alone.

TABLE II.—ESTIMATED COST OF TREATING ALL PRODUCT FROM WILFLEY TABLES (266 TONS).

Items.		Cost Per Ton.
Power—Same as for slimes plant, with addition of 90 H. P. for tube mills, and 10 H. P. extra for mullers, or 200 H. P. at $7 per month = $1400 per month		$0.17
Cyanide—0.75 pound per ton		0.1875
Lime—15 pounds per ton		0.09
Zinc—0.25 pound per ton		0.03
Labor—20 men on presses at $3.50	$70	
2 solution and pump men	7	
2 shift bosses	9	
2 roustabouts	6	
2 men for settlers and classifiers	7	
1 helper	3	
Total	$102 per day,	0 38
Canvas—250 yards per month	150 per month,	0.02
Miscellaneous supplies and repairs	300 per month,	0.035
Lights	120 per month,	0.015
Heating	60 per month,	0.0075
Insurance	200 per month,	0.025
Depreciation 5% on $140,000	583 per month,	0.07
Miscellaneous and contingencies (including labor on tube mills)	750 per month,	0.10
Total		$1.13

Before passing to an estimation of comparative profits, we might indicate the three methods as follows:

1. The present practice of leaching the sands, by which 62.5% of the whole product is handled at a cost of $0.65 per ton, the remaining 3000 tons per month being run to waste as slimes; extractiou of gold and silver from sands 50%.

2. The proposed filter-press treatment of the slimes in conjunction with the above leaching plant,

*Trans. Am. Inst. Min. Engs.

at a cost of $1.78 per ton of slimes; probable extraction of gold and silver from slimes 75%.

3. The abolitiou of the present leaching plant, the regrinding of all sand coarser than 200-mesh size, and the treatment in presses of the whole product from the mill (about 266 tons per day) at a cost of $1.13 per ton; probable extraction of gold and silver 65%.

A study of the comparative values per ton, of ore, slimes and sand, from the manager's annual reports of the Liberty Bell Co., justifies the assumption that the value of the slimes per ton, produced by a given ore, will be about 50% of the value per ton of that ore; and that the sands maintain a proportionate value per ton of about 34% of the value per ton of the ore. This will serve to explain Table III, which gives the estimated net profits accruing from the different grades of ore.

TABLE III.—Estimated Net Profits to Be Derived From the Treatment of Various Grades of Ore by the Three Methods.

Value of Ore.	Value of Wilfley Tailings.	Value of Slimes as now Separated in Cyanide Plant.	Value of Sands as now Separated in Cyanide Plant.	Profits Per Month in Cyanide Plant.
$10 00	$1 60	$5 00	$3 40	$5,250
9 50	3 80	4 75	3 23	4,800
9 00	3 60	4 50	3 06	4,400
8 50	3 40	4 25	2 89	3,950
8 00	3 20	4 00	2 72	3,550
7 50	3 00	3 75	2 55	3,100
7 00	2 80	3 50	2 38	2,700
6 50	2 00	3 25	2 21	2,500

Estimated Profits Per Month from Proposed Slimes Plant.	Profits Per Month from Combined Sand and Slimes Plants.	Estimated Profits Per Month from Proposed Regrinding and Filter Pressing.	Profits now Obtained From Canvas Plant.	Increased Profits Per Month by Regrinding Method Over Present Treatment.
$5,910	$11,160	$11,760	$1,000	$5,510
5,340	10,140	10,720	925	4,995
4,770	9,170	9,680	850	4,480
4,220	8,150	8,640	775	3,965
3,630	7,180	7,600	700	3,450
3,060	6,160	6,560	625	2,935
2,490	5,104	5,520	550	2,420
1,920	4,420	4,480	475	1,905

It was important to determine how low-grade an ore it would be profitable to treat by adopting the method of regrinding and filter pressing all the mill tailings.

The total cost of treatment of the ore during 1902 was $5.51 per ton.

Total cost per ton		$5.51
Cost of cyaniding per ton ore milled	$0.38	
Cost of canvas concentration	0 18	
Incidentals	0 92	0.98
Cost to mine, tram, crush and concentrate		4.53
Estimated cost of regrinding and filter-pressing tailings		1.13
Total cost of proposed treatment		$5.66

Now considering that the total cost of treatment from October, 1902, to March, 1903 (inclusive), was only $5.25 per ton, it may safely be assumed that with certain projected improvements and retrenchments, the cost might be brought as low as $5 per ton. On this basis there remains, after deducting the $0.98 as detailed above, a cost of $4.02 for mining, tramming, crushing and concentrating. Add to this $1.13 per ton for regrinding and filter pressing, and a total cost of $5.15 per ton is obtained. Then assuming 60% extraction in the present stamp mill and 65% extraction from the tailings by the proposed new method of filter-pressing, an estimated total extraction of 86% from the ore will be obtained.

On the assumption of 86% extraction and $5.15 cost per ton, a profit from various grades of ore would result as follows:

Ore. Value Per Ton.	Profit Per Ton.	Ore. Value Per Ton.	Profit Per Ton.
$10.00	$3.45	$7.50	$1.30
9.50	3.02	7.00	0.87
9.00	2.59	6.50	0.44
8.50	2.19	6.00	0.01
8.00	1.73	....	....

The foregoing statements show that a plant for sliming and filter-pressing all the tailings from the 80-stamp mill would be slightly more profitable than a slimes plant added to the present leaching and canvas plants; but that the initial cost would be greater. This excess of initial cost, however, would be more than offset by the profits, since in all probability the extraction by the sliming and filter-press combination method could be raised in practice above 65%.

A conservative estimate places the profits from a combination plant between $20,940 and $69,000 per year (on ore ranging in value between $6.50 and $10 per ton) over and above the profits obtained by the present system of leaching; this on an outlay of about $110,000.

Mexico's Mountain of Glass.

In Mexico, in the State of Tamaulipas, is found a large amount of obsidian (volcanic glass), which has been known since long before the conquest. The Aztecs and other tribes utilized the material for various purposes, but chiefly in the manufacture of knives, arrow and spearheads. Some one in Mexico has conceived the idea of utilizing the natural glass in the manufacture of various utensils of glass. Concerning it the Tampico Post has the following:

"A mountain of almost pure glass has recently been discovered near this port in a section of country almost unexplored and where no foreigner, until recently, has ever set foot. The glass is in layers and can be mined at very little expense, as it is found in huge blocks, that can be taken out without removing much earth. The only question in the way of beginning operations at once is transportation facilities, but the party in charge of the mines is of the opinion that the glass can be freighted by burros to the nearest water course, and then by boat to Tampico."

If the owners of this cliff of glass have found a way to make commercial glass of the obsidian they have made an important discovery. The composition of obsidian is entirely different from that of any artificial glass, and the natural volcanic glass, high in silica, is almost infusible, in fact to such an extent that before the blowpipe only thin splinters or the sharp edges of thin flakes may be fused.

Canvas Tables.*

NUMBER II—CONCLUDED.

Written by H. P. Stow.

The original table was 20 feet long and there was but one of them, which handled the pulp from twenty stamps. Finding the tailings too high, I experimented by building one sluice below the tail race and running a proportional amount of pulp over it, manipulating the sluice just as the whole table was operated. The results obtained were so satisfactory that I added 20 feet to the whole table, making twenty-four sluices 40 feet long. Continuing the experiment with the single sluice on the tailings, assaying the pulp at the head and tail of the sluice, I found it advisable to increase the length of the table still more and added 20 feet more, making a total of 60 feet, so that I had a table of twenty-four sluices, each 22 inches wide and 60 feet long, handling the pulp from twenty stamps, crushing two and one-half tons to the stamp. Upon adding twenty more stamps, I built a second table, the duplicate of the first, and behind it, and then ran half the pulp over one and half over the other. Each canvas was swept once in eight hours, three men being employed on eight-hour shifts at $2.50 per day. The concentrates on the vanners were running about $150 per ton and the canvas concentrates about $100. The tailings from the vanners ran about $1 per ton and from the canvas averaged about 50 cents. This seemed to be pretty good work and we ran on for a long time in that way, the canvas concentrates running from $25 to $50 per ton less than the vanner concentrates.

Upon drying the canvas concentrates they showed considerable fine sand and by panning carefully a richer product was produced, which caused us to experiment along the line of cleaning the concentrates better on the canvas. We then began to sweep the canvas less often, working on the theory, which I am satisfied is correct, that when the pulp first runs over the canvas heavy particles of sand settle in the interstices of the canvas and remain there until dislodged by the heavier particles of sulphurets, hence the longer the canvas is run the more sand will be dislodged and the cleaner the product. We then began to assay and experiment to find out how long the canvas could be run without loss. During these experiments we concluded also that the pulp could be materially increased in quantity over the sluices, and therefore turned all of the pulp over the upper table, picking it up and running it over the second table. Prior to these experiments we were sweeping each canvas, which handled half the pulp from forty stamps, once in every eight hours, and the product was worth about $100 per ton, the vanner concentrates being worth about $150 per ton. After changing and running all the pulp over each table, the product from the No. 1 table jumped from $99 per ton to $194, the material on No. 2 table remaining the same value, or $99. The amount of material caught on No. 1 table was just about one-half in the same length of time, but it was worth twice as much, while that caught on No. 2 table was clear gain, having been lost before. The results were evident on the tailings also, which formerly ran from 25 cents to 50 cents per ton, and now dropped to traces and as high as 25 cents, but usually about 10 cents per ton. As soon as the men got accustomed to handling the pulp in the new way, they began to increase the value of the concentrates on the No. 1 canvas, which they ran up to $250 and $300 per ton, sweeping the canvas once in eight hours. The No. 2 table when swept every eight hours gave concentrates worth $99 per ton, and upon changing to twelve-hour sweepings it gave concentrates worth $169.50 per ton, without any appreciable loss in the tailings, which continued to assay from traces to 10 cents per ton. Reducing the number of sweepings enabled me to dispense with one man, and from that time on two men working twelve hours did all the work, besides some outside work arouud the mill.

I finally added twenty more heavier stamps and continued to use the same two tables, running all the pulp over one and then over the other, sweeping the upper one every twelve hours, the night man making three sweepings and the day man two, thereby having time for outside work.

I have already spoken of the settling boxes which caught the overflow from the concentrator box, and they have proven of great value, as 36% of the concentrates caught on the tables does not settle in the concentrator box, but overflows and is caught in the settling box, and this material is of higher value than the main product—that is to say, that caught in the first three boxes, and after that it gets considerably less valuable and less in quantity, till in the final box it is only worth about $50 a ton, which box does not need cleaning out oftener than once in two years. To illustrate values: The inside box gave $223 per ton, the first outside or settling box $289, the second $231, the eighth and ninth boxes gave $74 and the tenth box gave $53.74 per ton.

Another series of assays gave the following results: Vanner concentrates from $90 to $115 per ton; No. 1 canvas $343 per ton, and No. 2 $250 per ton. These assays set the workmen to thinking and they attempted to increase the value of their concentrates, resulting in their getting material worth from $450 to $500 a ton on the No. 1 canvas.

During the last two and one-half years only twenty stamps have been running and eleven sluices of each table in use, requiring one attendant, who swept the upper canvas twice in twenty-four hours and the lower one once in forty-eight hours, all that is required with the decreased amount of pulp. The man who did the work was an old employe and wished to experiment toward increasing the value of the concentrates, the whole thing being done by the care in cleaning the canvas with the clear water and then sweeping it carefully. At this time the value of the vanner concentrates had fallen off to about $60 a ton and he obtained on the No. 1 canvas concentrates worth $620 and on the No. 2 canvas $372 per ton. In December, 1901, tributers worked the mine, and the sulphurets were cleaued up and assayed with the following results: The vanner concentrates assayed $107 per ton, the fine sulphurets in the settling boxes under the vanners went $285, and the canvas concentrates $740, the two tables being assayed together. A second run gave vanner conceutrates $111, settling boxes under the vanners $270, while the canvas concentrates from the No. 1 canvas went $1091, and from the No. 2 $603 per ton. The outside boxes of the upper canvas went $401, and those of the lower canvas $587. This man finally obtained concentrates on the upper canvas worth $1300 per ton. There were 2500 pounds of that value saved in 100 days.

The newer the canvas, the less the value of the sulphurets, due to its being harder to clean. Assays made some years ago resulted in concentrates worth $310 on old canvas and $173 on new canvas. By sweeping too close a thin layer of sand that seems to be caught first is disturbed, resulting in a lower grade of concentrates. Experience teaches the attendant how hard to sweep. A skilled man will sweep the width of each strip with two strokes of the broom and he walks up and down the sluice that has just been swept so as not to dislodge the sulphurets.

The conclusions I have come to are that length of canvas is more essential than the width or number of sluices, which is proved by the gradual increase of the length of the table from 20 feet to 40 feet, and then 60 feet, and finally running the pulp over two tables each 60 feet long and giving the lower table different treatment from the upper one as regards sweeping; further by the increased amount of pulp without increasing the number of sluices; the increased value of the product and the diminished value of the tailings. I do not believe in pointing out the coarse material from the pulp before running it over the canvas, as the coarse material is an advantage in keeping the canvas clean and clear of the slime that is not sulphurets but gangue, the coarse material cutting it out. It is a very great mistake to use water under pressure for cleaning the concentrates off the canvas, because that is where the loss is originally on the vanners, and consequently the more water used the greater the loss, a fact evidenced by the large percentage—36%—of the material caught in the settling boxes outside of the concentrator box, as described above. An extensive arrangement of settling boxes is very necessary, as long a time as possible between cleaning the canvas to be determined by the appearance of the canvas and the value of the tailings.

The cost of building such a table as I have described, with a suitable building, and covering it with canvas ready to use, was approximately $1000. The cost of operating two tables was: Two men per day of twenty-four hours at $2.50 per man, they doing all the work connected therewith, including cleaning up and running the concentrates up to the sulphuret shed. The canvas cost 44 cents per yard in San Francisco and has an average life of ten months, though some only last seven months, and it has run as long as sixteen months. Two men can take up the old canvas and put the new on a table 60 feet long, having twenty-four sluices, in a day and a half. My tables are lighted by windows at the upper end only and with electric lights at night, a very satisfactory arrangement.

I have the brooms made of the best fine broom straw and well wound, and made strong, and the men always hang them up when not in use, and while

*Trans. Cal. Min. Ass'n.

sweeping turn the broom around once in sweeping each sluice to prevent uneven wear.

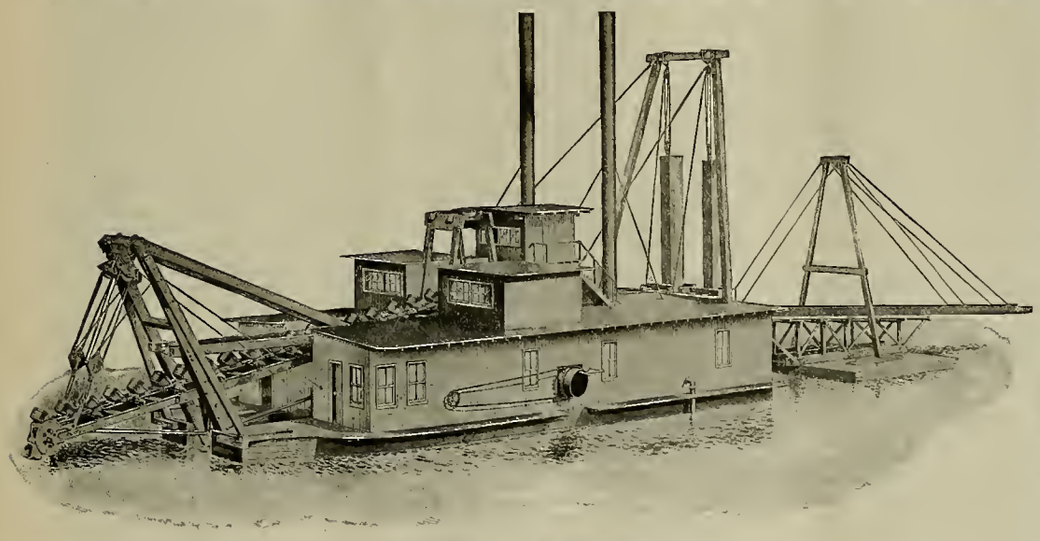
What causes tbe very high value of the concentrates I am unable to state, and I should not expect such high results everywhere, but some experiments that I have made on concentrates caught on different tables lead me to make the assertion that the grade of concentrates could be very materially raised by proper treatment in eliminating a large percentage of the sand. I do not think the table I have described need be confined to gold ores only, as this summer I was given the opportunity by Mr. F. W. Bradley to test it at the Bunker Hill & Sullivau mines in Wardner, Idaho, and succeeded in making a satisfactory test in so far as saving material that was being lost in their slimes. The values being altogether in lead and silver, it would not have proven a profitable undertaking for an outsider to lease the tailings and work them, but I believe it would be profitable for the company to introduce it.

An objection is sometimes raised that a canvas table will cause the vanner men to become careless. I have not found such to be the case. When the canvas man announces that he is doing well and his sluices look fine, I tell the vanner man about his brags, wbo then gets in and hustles.

The most important feature of the canvas table is the results obtained from it, and for years we have taken 16⅔% of the total value of the sulphurets off the canvas, which in many quartz mills is lost.

An Oregon Gold Dredge.

Herewith is illustrated the Abbie J. Champlin gold dredge of the bucket chain type recently furnished by the Allis-Chalmers Co., Chicago, to Champlin & Co., of Gold Hill, Oregon.



Gold Dredge of the Bucket Chain Type.

It is described by the builders as being operated by steam, with 8 cubic feet buckets of the alternate type, built heavy to work hard packed and cemented gravel with a large percentage of heavy boulders, and designed to dig a depth of 45 feet below tbe water line, and a depth from the surface to bedrock of 55 to 60 feet.

The bucket chain they claim to be a new design, patented, and manufactured solely by them. With the multiple lug connection they assert that it overcomes tbe trouble of bending or breaking pins, breaking the back of the bucket or of pulling out of the eye connection, and enables the use of a much smaller pin. A chain of these buckets was furnished to the Centerville Dredging Co., of Centerville, Idaho, with satisfactory result.

The grizzly is of the well-known revolving type, of ample length and diameter, and which has been found to give desirable results with minimum cost of repairs. The grizzly is made with a removable lining so that all that is necessary is to replace the inner lining, which is made in two pieces. A direct connected centrifugal pump is used with spray pipes running through the screens to clean the material thoroughly.

The gravel pump is of special patent, controlled by the Allis-Chalmers Co., lined with steel throughout, the pump taking the material passing through the perforations of the screen and elevating same to tbe sluice box. In the double lift dredge where this pump is used the claim is made that it thoroughly churns the material and puts it in good shape for working to advantage in the sluice box.

The winches for handling ladder and spuds are in one uest operated by an independent double cylinder engine, and for the swinging lines two standard double cylinder, single drum hoisting engines are used. A complete electric lighting plant of ample capacity is also furnished. The Allis-Chalmers Co. furnishes all the iron work necessary for the complete dredge, also erection drawings, together with detail drawings of tbe hull, lumber bill and bolt list, to enable customer to build the hull, and properly erect the machinery.

Cyaniding Gold-Bearing Sulphurets.*

Written by S. B. CHRISTY.

I suppose there are a great many quartz miners who remember the tune when no attempt was made to work a mine in which the free gold that was in the quartz did not pay a profit, all the sulphurets being throwu away. The discovery of Prof. Plattner of Freiberg that sulphurets could be roasted and then chloridized has made a profit of many millions to this State, because it not only enabled what was formerly a waste product to be utilized, but enabled a great many properties to be worked at a profit which had in them free gold enough to barely pay expenses.

There are limitations to the chlorination process. In the first place, it is expensive to roast the ores, and it necessitates the erection of expensive furnaces. Moreover, there are a large number of mines in the State which do not produce sulphurets rich enough to pay for extraction by the chlorination process. There are a great many more mines that produce $25 sulphurets than $125 sulphurets, so, if there could be some way discovered for handling this class of products without chlorinatiug or shipping a great distance to the smelter, it would at once make available a large number of properties which now do not pay a profit for working. Consequently, I have thought the subject well worth the time given it.

The study is full of difficulties, and it is hard to explain the details in a few minutes. In the first place, a word ought to be said as to the composition of the sulphurets. They are not always the same. There are some very distiuct differences in their composition, and in their mode of reacting with the cyanide solution. The simplest are those which contain nothing but iron pyrites and gold. In these there seems to be no doubt that the gold is, in many cases at least, merely mechanically enclosed. The late Melville Atwood gave much attention to this subject, and he has shown me specimens of pyrites with metallic gold thinner than gold leaf on the cleavage planes of the crystals. We have a number of specimens in the University museum with crystals of gold sticking out through the sides of the crystals of pyrites. In all these cases there seems to be not the slightest doubt but what the gold is mechanically enclosed.

On the other hand, there is not the slightest doubt that there are other "sulphurets" in which tbe gold is not mechanically euclosed. It is chemically combined. Notably among these are the gold ores carrying telluride combinations. There are a number of tellurides occurring in our mother lode ores, some quite rich. Besides this there seems to be a class of sulphurets composed of sulphides of iron, together with antimouide and arsenide of iron, in which the gold is chemically combined. There is no doubt but what there are these different classes, and that the latter class, in which the gold is chemically combined, is much more difficult to treat.

Besides these gold-bearing minerals there are the copper sulphides, copper pyrite and bornite, or peacock copper ore, as the latter is sometimes called. These introduce difficulties, owing to the copper conteuts. Theu, zincblende and galena are often present. They do uot, as a rule, seem to have the injurious effect on the treatment that one would expect.

The cyaniding of ordinary quartz tailings, we may say, has been solved. That is, not only the scientific, but the technical and commercial aspect of the problem has been solved. But when it comes to the treatment of these sulphides, it has not hitherto been solved commercially, although I believe it is in many cases entirely feasible to cyanide these sulphides commercially.

There are certain difficulties to be met, part of them mechanical and part of them chemical. The chemical difficulties are uow pretty well understood, and I need not say much about them, only I will lay down as the first proposition to which I call your attention:

The sulphurets should be treated fresh—that is, if we are going to cyanide them with the least difficulty, we must take them just as they come out of the concentrator. We must not let them stand piled up in heaps, to become oxidized and sour, because, when they become oxidized, acid is set free, which destroys cyanide very rapidly, and a number of complicated reactions take place that render successful treatment difficult and more expensive, though not impossible. So, the first thing to be remembered is that they must be treated as fast as they are produced. If they cannot be treated instantly, or within a day, they ought to be kept under water, so as not to be exposed more than necessary to the action of the air. If they are allowed to lie in the air they become rusty and difficult of treatment.

The secoud proposition—probably the most important of all—is that the sulpburets must be in a state of fine subdivision. Nearly all of these minerals I speak of are impervious to water and to cyanide solution, and the solution can permeate them only very slightly. A 70% extraction, for example, is very common on ores of this sort. And let me call your attention to what that means. I will suppose the grains are spheres, and that the solution permeates a certain distance and extracts all the gold. As a matter of fact, it takes all out of the outside and in diminishing quantities as it goes to the interior. But, for the purpose of illustration, I will suppose it takes a shell from the outside and extracts all the gold from it. A sphere from which 70% has been thus extracted would leave a corc two-thirds of its diameter untouched, and it will extract the gold from a shell one-sixth of the diameter. Now, suppose the solution permeates .01 of an inch in a given time, say two or three days. It will extract all of the gold from a particle $\frac{1}{50}$ of an inch in diameter. That is, you take out 100% from such a piece as that, while a grain that is only $\frac{1}{10}$ of an inch in diameter will take a shell $\frac{1}{100}$ of an inch thick, or will extract only 7%. That is, a particle $\frac{1}{50}$ of an inch in diameter will be entirely extracted in that time, and one with a diameter of $\frac{1}{10}$ of an inch will ouly yield 7%. Experience shows that this is the case.

The Utica mine has for some time been treating the concentrates produced by the canvas plant. These are in an extremely fine state of subdivision, and good results have been obtained by their treatment with cyanide solution for several years. Attempts to treat the vanner sulphurets, which are relatively coarse, have not met with success, and it has been necessary to roast and chlorinate these.

I had the pleasure of witnessing some experiments made at the Melones mine, where, under the management of W. C. Ralston, an attempt was made by F. L. Bosqui to cyanide the tailings from the mine there directly—that is, all the tailings that came from the plates were cyanided iu tanks by downward leaching. The results were not entirely satisfactory, and the method was not followed up. While I was there it occurred to me that I ought to investigate the relative extraction of sulphurets of varying coarseness. I took the tailings which had been leached for three days with a 0.2% cyanide solution. I separated them into different sizes by water sorting.

I used a vertical tube, down which the ore was allowed to settle, and up which was coming an asceuding current of water, which allowed only the coarse particles to settle through. The coarse particles from each sort thus collected were afterwards panned to separate the sulphurets, and these separately assayed. When the upward velocity of the water was 2 inches a second—mind you, the original ore only averaged $3 or $4 a ton, and the original sulphurets went about $25—the coarsest that came through under that heavy stream of water went as high as $27. It had been cyanided for three days with a 0.2% solution, and with an upward velocity of 3 inches per second the coarsest of those sulphurets went $27; with an upward velocity of about 2 inches a second the sulphurets assayed $19.63; with an upward velocity of 1 inch they weut $19.01; ½ inch, $14; and ¼ inch, $6.61, while the slimes which settled against the velocity of less than ¼ inch a second assayed only 60 cents. This goes to show very clearly, indeed, that coarseness of the sulphurets is au insuperable obstacle to the thorough and rapid extraction of the gold.

The third important fact to remember is that metallic iron in a fine state of subdivision is a great destroyer of cyanide. In the metallic state, in large masses, as iu sheet iron tanks, etc., the iron does not have much action on the cyanide. An insoluble crust of oxide of iron forms on the outside, which protects it from further action; but when the iron is in an extremely fine state of subdivision it acts very quickly, and if the iron is in the form of an impalpable powder 1 pound of iron is capable of destroying 7 pounds of cyanide of potassium, and as this is worth 25 or 30

*Abstract Trans. Cal. Min. Ass'n.

cents a pound, you can see that it is quite a serious source of expense.

In crushing ordinary quartz ore in a stamp battery, the loss from the shoes and dies runs from 2 to 2½ pounds of iron per ton of ore crushed. In concentrating the ore on vanners in the ordinary manner, nearly all the iron is concentrated with the sulphurets. So, for example, if an ore contains about 2% of sulphurets, to produce 1 ton of sulphurets will take about 50 tons of ore, so we shall have in the concentrates per ton something like 100 pounds of iron. So, if that iron were all fine enough (it is not all fine enough, of course), that which is extremely fine would be capable of destroying seven times its weight, or, if it were all fine, about 700 pounds of cyanide. Of course, most of it is too coarse to do that, but it shows where the trouble lies.

(TO BE CONTINUED.)

Wet Methods of Extracting Copper at Rio Tinto, Spain.*

Written by C. H. JONES.

The ore treated at Rio Tinto is massive iron pyrite containing up to 3% of copper, which has been disseminated through the mass by a secondary enrichment.

The well-known method adopted for the extraction of the copper consists chiefly in allowing huge heaps of the mineral to oxidize under the influences of moisture and air, and subsequently washing out the copper sulphate as soon as it is formed, by running water through the heap.

The application of this system depends largely on the state in which the copper occurs in the mineral. If it exists as chalcopyrite—$CuFeS_2$—the copper will not oxidize by simple exposure to the air, in one case it having taken many years to oxidize 10% of the copper originally present in the ore. If the copper is in the form of CuS, the oxidation proceeds very slowly. The best form for solution is Cu_2S, or copper glance, which constitutes the bulk of the copper in Rio Tinto pyrite. These statements may be made clearer from the following account of the reactions that take place during the oxidation.

When the mineral is exposed to free access of air and moisture, some ferrous sulphate is formed in accordance with the following reaction:

(1) $$FeS_2 + 7O + H_2O = FeSO_4 + H_2SO_4.$$

This ferrous sulphate becomes readily oxidized by the air to ferric sulphate.

(2) $$2FeSO_4 + H_2SO_4 + O = Fe_2(SO_4)_3 + H_2O,$$

and it is due to the action of this ferric sulphate on the copper sulphides that the copper is rendered soluble, as is shown by the following chemical equations:

(3) $$Fe_2(SO_4)_3 + Cu_2S = CuSO_4 + 2FeSO_4 + CuS.$$

(4) $$Fe_2(SO_4)_3 + CuS + 3O + H_2O = CuSO_4 + 2FeSO_4 + H_2SO_4.$$

The reaction No. 3 takes place fairly rapidly and causes half the copper to go into solution within a few months, while reaction No. 4 proceeds much more slowly, and requires, under the most favorable conditions, about two years to extract 80% of the remaining half of the copper.

Here I may add that in the laboratory at Rio Tinto a method has been worked out to determine the state of combination of the copper in any particular mineral. This method depends on the action of the mineral on various solutions under constant conditions of dilution and temperature, and, though necessarily somewhat arbitrary, it shows with considerable accuracy the form of sulphide in which the copper exists, and consequently whether the copper can be readily extracted by washing in heaps.

In practice the method adopted to bring about the desired oxidation is as follows: A site is chosen for the formation of the heap where the ground is sufficiently concave and sloping to enable the copper liquor that is formed to collect and run out at the base of the heap. On the ground is first arranged a network of air flues, made of rough stones and having an internal diameter of 12 inches. Vertical chimneys, 50 feet distant from one another, are built in the same manner and connect with the ground flues. Care is taken that the mouths of the ground flues are kept open and not covered by the ore. The mineral, the lump portion of which has been passed through jaw breakers to be reduced to pieces not larger than from 2 to 3 inches across, is now tipped from side-tip wagons at the highest part of the selected side over and around the stone flues. "Lump" and "fines" are alternately dumped until the height of the mass at the edge is about 30 feet, the upper surface of the mineral being kept level. A heap of this form approximately contains 100,000 tons of ore.

As the mineral is added, the building of the stone chimneys keeps pace, in order to have a clear opening to the top of the heap. The surface of the heap is formed into squares by means of ridges of the mineral, the size of these squares depending on the porosity of the heap. The function of these ridges is to enable the water to be run on locally over the surface of the heap in order to insure that all parts are equally washed and that the water does not run through the heap in channels. A system of gutters is also arranged so that the water can be run onto all parts of the mass. As the heap is being formed, water is run on and the copper sulphate existing in the mineral is extracted; also, the water provides the moisture for the oxidation to take place in accordance with the equations given above. The mineral in the heap is then allowed to oxidize, which it does pretty rapidly, as evidenced by the heat produced, the temperature in the chimneys rising to from 170° to 180° F. As the temperature increases, the surface openings of the chimneys may be closed in order to allow the oxidation to spread through the heap. The surface gradually shows a brownish coloration, due to the dehydration of the buff-colored basic ferric salt that forms on the top of the mass, and its gradual heating up may be noted by this drying action. The greatest care must be taken not to allow the heap to fire, for if once started it is very difficult to extinguish it. When the oxidation has proceeded as far as it is safe to allow it, water is run on at the rate of about 50 cubic meters per hour, until the soluble copper is leached out. The heap is then allowed to reoxidize and the washing is repeated. After about a year has elapsed the surface requires "retilliug," and the squares are rearranged so that the places where the ridges were before are now the middles of the squares. The gutters also are shifted. At the edge of the heap for a distance of some yards the mineral, which has become cemented, holds a considerable quantity of copper salts and is dug down into terraces in order that this copper may be extracted by washing. When the copper is reduced to 0.3% the heap is cousidered washed and the mineral, containing 49.5% of sulphur, is removed and exported as "washed sulphur ore" and utilized for the manufacture of sulphuric acid.

Successful heap washing depends on the efficient ventilation of the mass, the trouble usually being a too great excess of "fines" produced in mining the ore, which cement hard and clog up the air passages.

The copper liquor as it runs from the heap contains some ferric iron in solution, which, as will be shown later, is very objectionable. In order to remove the ferric iron the liquor is run over a smaller heap of fresh mineral known as a "filter bed," which reduces the ferric iron. This "bed" is laid inside a reservoir formed by a masonry dam across a small ravine, and the liquor after percolating through the mineral remains in contact with it until it is required to be drawn off to the precipitating tanks. When the mineral is fresh the reduction of the ferric iron takes place rapidly, due to the Cu_2S, as shown by equation 3, but the iron pyrite itself has an effective reducing action on ferric iron in solution according to the following equation:

(5) $$7Fe_2(SO_4)_3 + FeS_2 + 8H_2O = 15FeSO_4 + 8H_2SO_4.$$

The principal constituents of the liquor as it enters the cementation tanks are as follows, the figures given representing the grams per cubic meter or units per million parts: Copper 4000, ferric iron 1000, ferrous iron 20,000, free sulphuric acid 10,000, and arsenic 300. The large quantities of ferrous iron and free sulphuric acid present are due to the fact that the waste liquor from the cementation tanks after the copper has been precipitated ("salida liquor," as it is called) is pumped back and used for washing the heaps in addition to fresh water, and consequently these solutions tend to become concentrated. The liquor is then run from the reservoirs at about 300 cubic meters per hour through the precipitation tanks over pig iron in order to precipitate the copper in the form of so-called "cement copper" or "copper precipitate." These cementation tanks are arranged in series on the slope of a hill, the liquor passing backwards and forwards until it is discharged from the lowest tank of the series free from copper.

(TO BE CONTINUED.)

*Abstract Trans. Am. Inst. Min. Engs.

The Panama Canal.

At a complimentary banquet tendered in San Francisco to Mr. C. E. Grunsky, the California representative on the Panama Canal Commission, Mr. Grunsky made the following statements about the canal:

The idea of uniting the Atlantic with the Pacific ocean at Panama has been in the minds of men ever since the first white man crossed the isthmus. Examinations and surveys were made in the early part of the sixteenth century, nearly 400 years ago, and the obstacles to be overcome in carryiug out this great work have been gradually removed one by one, until at last the people of this great nation are in control and with the means at hand to carry the work to successful completion.

The difficulties in the way of canal construction have, until recent years, been less of a character involving engineering skill than such as involves statesmanship of a high order. After all of the failures that have been made in the past a project has been reported to the United States by the Walker commission, whose report is the basis for the acquisition of the properties of the French company, and this commission's plans of a canal best represent the work as it will probably be carried out.

Although the advantage of a sea-level connection between the oceans was recognized, the disadvantages, among others, of increased time of construction and increased cost of such a project led the commission to plan the canal with a summit level about 90 feet above the ocean. The canal is to be made 35 feet deep. It is to have a bed width of 150 feet. It will be 49 miles long, from the 6-fathom line on the Atlantic side to the 6-fathom line on the bay at Panama. The maximum depth of cutting where the canal crosses the continental divide will be 266 feet. In the construction of the canal the amount of dredging and earth work will be about 42,000,000 cubic yards, and 54,000,000 cubic yards of hard and soft rock will have to be moved, of which amount about 5,000,000 cubic yards lie under water. Nearly 4,000,000 cubic yards of concrete will be required and upward of 65,000,000 pounds of iron and steel will, it is estimated, be needed for the various structures on the line of the canal.

From Colon, on the Atlantic side, the canal will extend inland on low ground, closely following the Chagres river for a distance of 17 miles. The canal is there to be closed by a dam and its water surface raised, and the lake formed by the dam will be used as a canal section for a distance of about 14 miles. The next 8 miles will be in the great Culebra cut. The remainder of the canal, about 10 miles in length, will be on low ground, adjacent to the bay of Panama.

It is estimated that the value of the work already done on the canal approximates $40,000,000. This estimate has been made the basis of the proposed payment to the French company. The estimated cost of completing the canal on the lines indicated by the Canal Commission is $144,000,000. It is thought that eight to ten years should be required for the completion of the work. That this is a work of stupendous magnitude becomes apparent when it is compared with such other great works as the Suez canal, opened in 1869, which, with its length of 72 miles, cost about $60,000,000; and with the Manchester canal, 35½ miles long, which cost about $75,000,000. The last Canal Commission assumes that the annual cost of maintaining and operating the canal will approximate $2,000,000. It is thought that under the opening of the canal to traffic a tonnage of about 5,000,000 per year will pass through it and that this amount will be doubled within ten years.

Cost and Speed of Sinking Shaft of New Kleinfontein Co., Benoni, S. A.*

Written by E. J. WAY.

The cost and the speed of sinking a shaft are factors of so great importance in operating a mine that the data given in the table herewith given will be of interest and value to all engaged in practical mining; and for this reason the data are communicated for permanent and accessible record.

The figures of cost cover the period from January 1, 1903, to May 31, 1903, during which time the total depth sunk was 858 feet.

So far as I know, the cost of sinking per foot, $66.90 (£13 15s 11.04d), of a sbaft, of the dimensions 21 feet by 6 feet in hard rock, is the cheapest yet on record; and the speed of 213.5 feet per month, which was attained during May, 1903, is also the best record for speed in sinking in rock so hard as that of this shaft. During the period from January 1 to May 31, 1903, there were 144 rounds worked, involving 4032 holes, of a total depth of 28,963 feet 2.4 inches, which is equivalent to an average depth of 7 feet 2.2 inches per hole bored. These data are of added interest from the fact that the work was done practically by native labor.

COST OF SINKING EAST SHAFT, FROM JANUARY 1 TO MAY 31, 1903.

LABOR, ETC.	Cost. Total. £. s. d.	Per Ft. Sunk. £. s. d.
White wages	3,292 16 0	3 16 9
Salaries	276 8 5	.. 6 5
Native wages	1,190 4 8	1 7 9
Compounds	616 11 3	.. 14 5
Workshops	108 13 2	.. 2 6½
Steaming station	1,353 3 3	1 11 6
Rock drills	2,620 0 2	3 1 1
Surveying	40 10 11	.. .. 11¾
Transport	13 10 0	.. .. 3¾
Traveling expenses	3 0 0	 1

STORES. Description.	Quantity.	Value. £. s. d.		
Candles	207 2 boxes	135 3 4		.. 3 1
Detonators	86 boxes	16 15 4		.. .. 4¾
Fuse	2,475 coils	42 3 6		.. 1 ..
Gelatine	418 cases	1,463 0 0		1 14 1½
Iron bars, etc	696 lbs.	7 0 8		 2
Steel bars	2,528 lbs.	45 1 9		.. 1 0¾
Rails	65,445 lbs.	325 6 0		.. 7 6½
Sleepers	259	18 1 7		 5
Bolts and nuts	1,263	18 6 0		 5
Dog spikes	363	7 2 4		 2
Fish plates	3,011	35 19 4		.. .. 10¼
Nails, assorted	432 lbs.	4 15 10		.. .. 1¼
Coach screws	82	1 6 8		.. .. ½
Oils, grease		7 2 4		 2
Piping	270 feet	21 7 6		 6
Tools		11 6 8		.. .. 5¼
Timber, assorted	1,404 cu. ft.	71 16 0		.. 1 8
Sundries		89 5 9	2,321 0 7	.. 2 1
Totals			£11,836 19s 5d	£13 15s 11d

Total depth sunk, 858 feet; cost per foot, £13 15s 11.04d ($66.90).

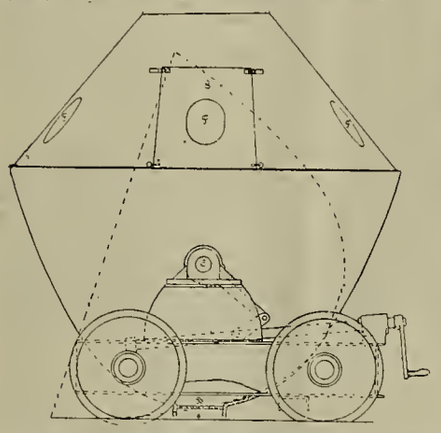
*Trans. Amer. Inst. Min. Eng.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 22, 1904.

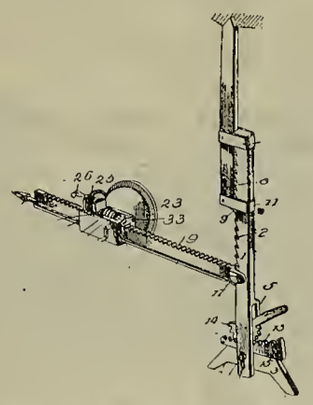
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF DESULPHURIZING LEAD ORES.—No. 755,598; A. Savelsberg, Ramsbeck, Germany.



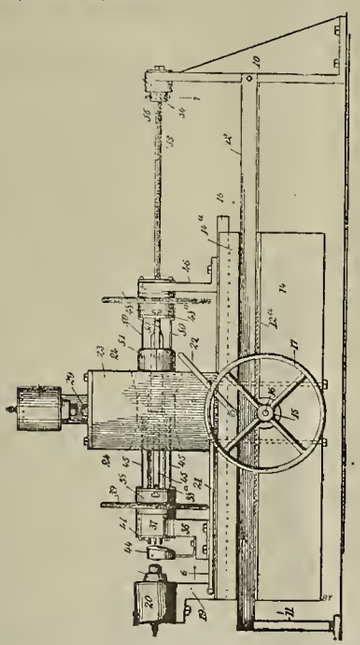
Process of desulphurizing lead ores by mixing raw ore with limestone and subjecting mixture to simultaneous application of heat and current of air in sufficient proportions to complete desulphurization in one operation.

MINER'S DRILL.—No. 755,458; W. D. Cox, Marshfield, Ohio.



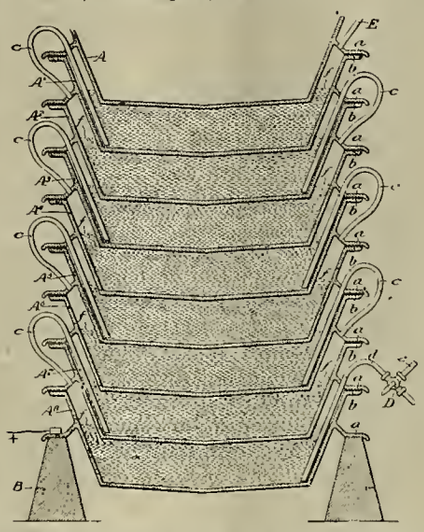
Combination with supporting means for drill-operating mechanism, supporting post, arm vertically adjustable upon post, base secured to lower end of post, pin-and-slot connection between base and post, and independent means for actuating post to raise and lower same upon base.

MACHINE FOR REPAIRING DRILLS.—755,351; J. J. Brossoit, Granite, Mich.



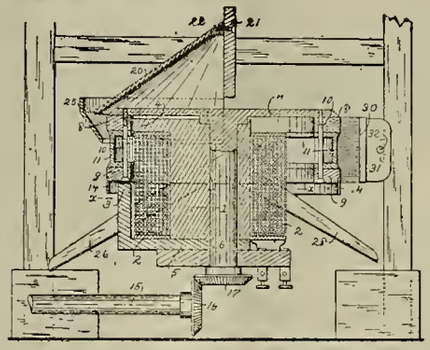
In machine for repairing drills, combination with support and hammer, of plurality of tool sections adapted to coact with hammer, spring arms to which sections are attached, hub with which arms are connected, means in which hub is mounted to turn, edgers also mounted in hub and movable longitudinally of spring arms, and means for operating edgers, means for operating edgers comprising hammer block movable toward and from edgers and hammer operating block.

MANUFACTURE OF SULPHURIC ACID.—No. 755,247; P. G. Salom, Philadelphia, Pa.



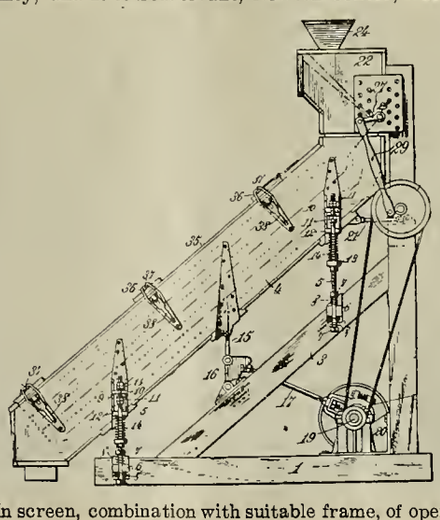
Process for manufacture of sulphuric acid, which consists of passing current of sulphurous acid gas through series of independent but communicating receptacles, each of which constitutes electrolytic cell, and progressively oxidizing current by electrolytic action, in presence of water, during passage of current through series.

ELECTRO-MAGNETIC SEPARATOR. — No. 755,282; M. Dings, Milwaukee, Wis.



Combination of drum formed of magnetizable and non-magnetizable rings revoluble on a vertical axis; an electro-magnet eccentrically located within drum; electro-magnet having one pole piece projecting at one side of magnet into proximity with inner face of drum near one end and another pole piece of opposite polarity projecting from same side of magnet into proximity with opposing end of drum; together with semi-conical distributing shield secured at upper end to framebar 21 and having its base covering side occupied by magnetic pole pieces, and concave reversing shield 25 opposing lower edge of distributing shield.

SHAKING SCREEN.—No. 755,330; T. L. Sturtevant, Quincy, and T. J. Sturtevant, Newton Center, Mass.

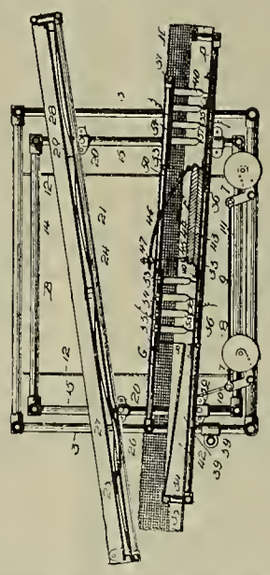


In screen, combination with suitable frame, of open-eared supports on frame, screen supporting rods mounted in supports and vertically movable therein, supporting springs on rods, springs being held between supports and adjustable nuts on rods, screen having supporting ears engaging rods at upper ends, adjustable rigid stops between which screen supporting ears play and by which movements of screen are suddenly arrested, means for vibrating screen vertically on supporting rods, and balancing springs to hold screen midway between rigid stops mounted on rods between screen supporting ears and adjustable nuts.

STAMP BATTERY GUIDE.—No. 755,525; W. S. McDonough, Ouray, Colo.

Guide for stamp mills, comprising girth or rail, continuous solid guide beam extending longitudinally thereof and having vertically extending grooves therein, section blocks arranged in same, blocks having squared ends abutting one against other for rigidity and having vertical grooves adapted to cooperate with grooves in continuous beam and form guideways for stems of mill, bolts extending through section blocks, continuous beam and girth or rail, affording provision for removing any block separately, bolts being provided with squared collars countersunk in continuous beam, to prevent bolts from turning, and elongated washers upon bolts outside of section blocks and extending vertically along blocks depth of blocks, thereby affording provision for equal distribution of strain along depth of section blocks, and lugs on washers for preventing washers from turning.

AMALGAMATOR AND CONCENTRATOR.—No. 755,230; K. Lanius, Denver, Colo.



In amalgamator and concentrator, amalgamating and concentrating trough provided with reservoirs, drain plugs in reservoirs, fixed frame located over amalgamating and concentrating trough, plates upon frame carrying series of fingers which extend down into reservoirs, arrastra located between reservoirs, which arrastra consists of block fixed in bottom of trough, and movable block adjustably connected by rods to rocking shaft, rocking shaft adapted to impart vertical movement to one end of movable block, and means for imparting jerking or jarring motion to the trough.

EXTRACTION OF COPPER FROM COMMINUTED MINERAL MIXTURES.—No. 755,302; E. A. Le Sueur, Ottawa, Canada.

Method of obtaining metallic copper from mixtures containing it, which consists in treating mixtures with ammoniacal solution containing cupric compound or compounds to dissolve desired copper, then removing portion of total copper contents of solution, and lastly in using partially exhausted solution over again to dissolve fresh copper as before.

PROCESS OF TREATING PLUMBIFEROUS ORES.—No. 755,222; E. W. Engels, Dusseldorf, Germany.

Process of treating plumbiferous ores at high temperatures and diminishing chemical and physical reactions taking place between walls of vessels employed and ores or ore products present during treatment, process consisting in conducting treatment in receptacles composed largely of clay and carborundum in relative proportion of not less than 25%, nor more than 90% of carborundum and not more than 75% nor less than 10% of clay.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

At least $50,000 will be spent this year in the Nizina section in testing and opening up the ground bended te Eastern men, says G. C. Hazelett, at Valdez, general superintendent. J. W. Gerard of New York is interested with B. Cochran, the Marcus Daly estate et al. It is net intended to make heavy productien frem the company's properties this year, hut simply to thoroughly test them and ascertain their value. If the ground proves satisfactory, preparatiens will be made te operate next year with hydraulic machinery. The company has forty-five claims. Tbo cempany is taking in fifteen men and twenty-five more will be employed after the soason opens up. Hazelett says work will he guaranteed to this number at $5 per day and board.

The Nome News says that judging from the amount of work in progress the past winter in the mines of Cape Nome mining district tho output of gold this spring will he the largest in tho history of the Seward peninsula. This, too, in view of the fact tbat none of tho larger companies are operating on an extensive scale.

ARIZONA.

Cochise County.

Tho Commonwealth M. Co., at Pearce, is building a cyanide plant, with capacity of 125 tons, to work the mill tailings. The tailings covor thirty acres. The plant will he completed and in operation hy April 20. It will work the tailings from tbe 80-stamp mill that ran fer five years. The mines here are closed down on account of caving ground. A few men are working in new ground.

E. J. Hands, a director of the Hilltop Silver-Lead M. Co., near Wilcox, says the mine is showing satisfactory results. Ore is heing taken out.

The Shattuck-Arizena C. Co. has been incerporated at Duluth, Minn., with T. Bardon, A. Guthrie, M. Pattison, A. M. Chisholm of Duluth and L. C. Shattuck of Bishee as directors, the last named heing manager. Plans for development are under way. The cempany owns 110 acres seutb of Bisbee, being the Shattuck-Costello group.

I. N. Stevens reports dovelopment work progressing on the Lezinsky group, near Bishee. He has opened the vein in the Copper Bluff tunnel to a width of 75 feet. The tunnel is in 300 feet. The ore carried in this dike is a sulphide concentrating proposition. The Copper Bluff adjoins the Chase Creek C. Co. of Arizona, and the dike aheve referred te is said to extend 6000 feet on the property of the latter, whose tunnel will cut this body. The tunnel of the Chase Creek C. Co. is in 520 feet, with a depth of 526 feet.

J. H. Knowles, manager of the Chiricahua Dev. Ce., operating at Paradise, says they have put in additional machinery and are prepared to sink a shaft 500 feet deep and to crosscut 300 feet to open up the veins. A daily stage line has heen put on between the mines and Rodee, their shipping point, on the El Paso & Southwestern.

Gila County.

Gihson & Gihson, who have opened an ore hody on the 200-feot level of their mine, near Globe, are delivering ore to the Old Dominion. They have 3 feet of chalcopyrite. They have dene considerablo development work on their mine, but the ore has paid all expenses and netted the owners a profit, says the Silver Belt. The adjoining claim, owned by P. Nigro, is also producing.

Graham County.

The engines being set up in the Detroit C. Co.'s concentrator, near Clifton, in preparation for douhling the capacity of that plant, will give it 640 H. P.——The Arizona C. Co. has added a converter to its plant, making three in all, which increases the output of Bessemer cepper. For some time past they have been averaging seventy-five to eighty tons per day of Bessemer cepper, which is 99% fine copper. For March the Arizona C. Co. reports output over 2000 tons copper.

D. M. Potter, manager of the Sierra de Ore M. Co., near Clifton, says he is preparing to put in a cempressed air plant. The tunnel is in 630 feet and is making considerahle water (which will he of advantage to the company). The tunnel is heing driven for the main lead. It has already cut two hlind leads which carry geld values.——P. J. Bennett and L. Townsend repert having struck a body of black manganese oxide and copper ore on their claim near the Rock House, on Chase creek. It is said to be a desirable smelting ore for the district.

Maricopa County.

(Special Correspondence).—W. Channel is developing a low-grade gold property near the Phœnix mine, near Cave Creek. ——J. Creath reports making a satisfactory cleanup from his last run of the arrastra on the Broadway ditch. —— A. S. Mills is developing a copper prospect in Cave Creek district, north of Phœnix.

The White Tanks M. Ce. is working men in developing its preperty and taking out ere for the smelter at Wickenburg. —— G. Hamlin says development work centinues at the Reliof mine, 15 miles nerth of Peoria.

H. E. Kell has bought the 5-stamp mill at Buckeye. —— G. Fleming will make a mill run on ore frem the claims of the late C. Fleming, near Cave Creek. Tho mill is run by water pewer.

Phœnix, March 28.

Mohave County.

The Rattan-Ruth greup, below Silver Creek, near Chloride, will be worked by the Premier Con. M. Co. The Rattan is equippod with a hoisting plant and it is proposed to devclop the mine to a depth of 500 feot.——The Minnesota-Connor mill is running on ere from the combined properties. It is proposed to supply the lack of water at the mill by pumping water from the Morrimac mine, and a plant will be put in fer that purpose.

The Mohave G. M. Co. is werking men on tho Midnight mine, near the Roosevolt group, near Acme, and is gotting out gold ore, says the Mohave Miner. Tho ere heing feund in the shaft is a sulphide. It is proposed to sink tbe shaft farther. On the J. B. Lane, sentb of the Leland, tbo company is sinking a shaft in ore. The ore vein is 18 inches in width and is said to carry $80 per ton. On the Leland and Mitchell the company is stoping a goed grade of ore. The mill is working ten stamps. With the opening up of the new ore hodies in the outside mines ard the operation of the cyanido plant, the mill will be run to its full capacity.

A wagon road is heing graded from Vivian to Silver Creek, near Cbloride, thence to the Burlock and Black Mountain mines to the north. The road reaches the Burlock and Black Mountain mines, hut there is ½ mile to he completed on the Vivian end of the route.

The Kennan mill, on the San Cloud mine, on the lower Sandy, south of Kingman, is ready to start dropping stamps. The mines are heing developed and hodies of gold ore are showing.——B. Blanchard of Phœnix is working men on his mining claims on Bill Williams Fork. On one of them three shifts are sinking a shaft and a hody of gold-copper ere has heen opened up. Blanchard has three camps on tbe Fork and in all the mines ore is heing ohtained, says the Mohave Miner.

Santa Cruz County.

J. M. Bailey, of San Francisco, Cal., for Eastern men, has bought for $100,000 the Wandering Jew mine in the Santa Rita mountains, near Nogales, says the Berder Vidette. The Wandering Jew is a silver-lead proposition.

B. Daniels is increasing development on the Huntington greup of mines (formerly the Bextrom), west of Nogales 16 miles and 2 miles north of the international line. He has run a tunnel 360 feet, cutting feur ledges at depth of 375 feet, yielding silver ores. The fourth or main ledge he reports showing high-grade sulphides of silver.

The Humholdt M. & R. Co. has heen organized and has taken over the Trench mines and adjacent properties near the World's Fair mine, near Harshaw, in the Patagonia mountains. This group includes the Humholdt, Josephine, Good Luck, Red Bird, Mocking Bird, Chicago and Indian Chief. The officers are C. N. Thomas, C. R. Brown, R. Farrel and P. E. Murray, the last-named heing manager. These mines have not heen worked since 1897, when they closed on account of lew prices of lead and silver. There are two shafts, 500 feet deep, 250 feet apart, connected, and with 3300 feet of development work on the levels. The company will unwater the workings, extract and concentrate the ores already developed and do further development.

Yavapai County.

The White G. M. Co., operating a group of gold claims in Black Rock district, south ef Big Bug, has let a contract for 300 feet of sinking, says Superintendent L. White. The group has 1200 feet of development work. The ore is free milling and runs $5 a ton. The work has been done on two claims.

The framework of the aerial tramway for the Bradshaw Mountain C. & S. Co., near Crown King, is completed, and stretching the wire rope is under way. By April 15 it is expected the tramway will he in operation.

The Pick and Drill M. Co. is putting in a whim and will increase development work. The company owns a group of claims adjoining those of the Baumann C. Co., in Agua Fria district, near Prescott.

ARKANSAS.

Boone County.

The Susquehanna mill, near Harrison, is turning out cencentrates which are hauled te Harrisen. —— The McIntosh mill is again in operation after several years idleness.

Cincinnati, O., men have erganized the Cincinnati Zinc Ce. and have bought properties in the zinc fields of Boene and Marion counties. They are developing the same. The company intends to operate in connection with its zinc mills a smelter, and will handle ore for entire district. M. L. Henderson, ef Cincinnati, O., is president, with E. Lyons, H. N. Bankard, Jr., W. D. Henderson, D. Weiskopf, L. C. Strauss, A. Ullman, A. P. Campbell and M. C. Cartall, directers.

Marion County.

Tho new lead and zinc mill at Dedd City, built by Iola, Kan., parties, is in operation.

CALIFORNIA.

Amador County.

(Special Correspondence).—The Phœnix reduction works at Drytown has heen sold to the president ef tho Shenandeab M. Co., operating near Plymouth. It is understood the intention is to treat the concentrates from the Fremont Con. and the Bunker Hill mines, near Amador City.

A Cbicago, Ill., company is reopening the Burlingten mine, seuth of the Balliol mine, near Sutter Creek, and will put in machinery. F. O. Courtmarsh, of Mokelumne Hill, is manager.

E. C. Loftus has hought the hoisting plant of the Balliol mino and, as soon as the reads are passahle, will take it te the Santa Ysahel mine, near Quartz, Tuolumne ceunty.

Progress is heing made on the preliminary work for the proposed electric railread from Ione to Sutter Creek and Jackson. Jackson Dennis, of Sutter Creek, is interested in the project.

Sutter Creek, March 30.

T. A. Marsino says the Union Flat mine, near Volcano, has beon opened up, and the company is taking out gravel. This gravel lies under the lava cap, and sinking and drifting is dene to get it to the surface for washing.

Calaveras County.

It is reported that the Mountain King mine, near Hodson, has been sold to Allen & Littlefield of San Francisco, who prepose to put up a 60-stamp mill.

At West Point several properties are ready to he opened this spring. Of these, is the Old Buns tunnel, ewned hy W. Congdon, A. Lund and W. Shultz, and bonded to M. Hitchcock. The ledge averages 2 feet and the ore is said to run $60 a ton in gold. They are sinking. In the spring machinery and a hoist will he put in. The Leckweod, Blazing Star and other mines are idle at present, hut the Blazing Star dump is heing sorted and said to be paying. A 5-foet ledge ef ore is said to show in the bottom. The Continental is working and will put on men. The North Star mine, owned hy J. Goldson, reports having struck another ledge running 8 to 12 inches in width. A goed many small properties are heing worked and several arrastras are running.

Work will he resumed at the Finnegan mine, near Angels.——Operations at the Spring Gulch mine have heen suspended temporarily on account of excess of water.

Inyo County.

J. Coulter, of Randshurg, has hought the 2-stamp mill at Teagle's and will move it to his mine at South Park, in the Panamint Range, near Ballarat.

The 10-stamp mill of the Millspaugh M. & M. Co., at Millspaugh, was started last week.

Kern County.

W. H. Nelson and G. Philips have leased the Magpie mine, near Randshurg, and have hegun werk.——It is reperted the Suspension Ridge M. Co., operating in the Argus Range, has started work on its group.——Shipsey & Montgomery have a lease on the Hector claim of the Ashford M. Co.

Nevada County.

The California Grass Valley G. M. Co. has heen organized to develop the California mine, in Deadman Flat district, 3 miles southwest of Grass Valley. The officers are G. R. Tuttle, I. Haas, L. P. Larue. Operations will hegin this menth.

Plumas County.

Superintendent Kling of the Emigrant Hill mine at Elizahethtown, owned hy Seattle, Wash., parties, has men at work cleaning out a ditch of the Plumas Water Co., which serves the mines in Elizahethtown district. He also has men cleaning out a cut on Emigrant hill in preparation for operations at that point.

In the shaft at the Colonial mine, near Quincy, a heavier pump is heing put in. The bedrock is comparatively seft slate, says the Independent. The shaft drains the heldings of the Colonial Co. lying seuth of it.

San Diego County.

The stamp mill ef the Cleveland-Pittsburg M. Co. is in operation again with 200 tens of gold-bearing ere on the dump.

Shasta County.

The Old Diggings mine en Sacramento river, near Redding, has been sold te the Broda M. & S. Ce. ef New York for $40,000. It is said the company will build a smelter. The plant will be en a site near the Texas mill on the Sacramento river. It will have a capacity of 100 tons daily. The main ore body of the Keystone is said to he 150 feet from wall te wall and several shafts have been sunk en it. There are eight claims in the greup and they adjoin the Texas mine en the northeast. There are several smaller ledges in the group containing quartz ere which can he used for flux. One of the ledges carries values in gold. Tho main ore hedy carries peacock copper ore and specimens show native copper.

Siskiyou County.

The Johnsen mine at Oro Fine, which has been closed down for fifteen years, has been bonded to the Medina M. Co. of Washington. This company is operating other preperties at Oro Fino, and will open up the Johusen mine this month. The mine will be put in eperation as soen as the weather permits sinking a shaft from the 400-foot level. A 10-stamp mill and the Barker ditch, carrying water right from Kidder creek, is included in tbe salo.

Full operations continue at the Smuggler mine on lower Humbug creek, near Hawkinsville, ground sluicing with plenty of water. The top ground is sluiced off for 20 feet down, leaving 10 to 15 feet of hedrock gravel for hoisting into sluices hy derrick.——The McKinley quartz mine on Humbug has men getting out gold-bearing quartz and running a tunnel.

Tuolumne County.

The Black Oak mill, near Soulsbyville, is drepping twenty stamps. About twenty men are at work, but this number will he increased.——The Vine Springs mine, near Columbia, continues making hullion shipments, and in the past five weeks $6000 has been sent eut, says the Independent.

A strike is reported mado on the 600-foot level of the Bell mine of El Rico M. Co. at Tuttletewn. While cutting a station at that point, 10 feet of a vein of high-grade milling ore was opened up. Work is progressing on the 20-stamp mill.

C. W. Sheridan, F. O. Lancey and D. B. Gilliam have started work at the Alta claim, 6 miles southeast of Groveland. There is a 100-foot tunnel on the claim, and tbis will he run to cut the vein.

The water in the Rawhide mine, near Jamestown, has heen pumped out helow the 1300-foot level. The mill is dropping forty stamps. At the App mine they are operating forty stamps. More men will he added.

The Eclipse G. M. Co. is preparing to increase development work on the Markham and twelve adjoining claims near Groveland. The properties comprise 220 acres, says Superintendent De Sallier.

Over 30 feet of snow is reported on tbe summit, assuring a good water supply for the Mother Lode for this season, says the Banner.

The demands of the union miners out on strike at the Rawhide and App mines, near Jamestown, are given as follows hy the Mother Lode Magnet:

All underground men	$3 00
All surface men (minimum)	2 50
Hoisting engineers, for eight hours	3 25
Amalgamators, for eight hours	3 00
Concentrator men, for eight hours	3 00
Chlorination men, for eight hours	3 00
General blacksmith	4 00
Tool sharpener	3 50
Head timberman	3 50
Sawmill man	3 00
Carpenter	3 50
Pumpman	3 25

Nine hours day and eight hours night to constitute a shift's work. Abolition of compulsory boarding house. Doctor fee of $1 per month to be optional with employes No discrimination against any union men for any part they have taken in this strike. That the App difficulty he settled in conjunction with and on the same basis as the above. The discharge of all men now employed at the App mine.

At the Duffield mine, near Carters, development work continues. Ore is still heing hauled to the mill and the stamps are dropping The ore is said to yield $20 per ton in gold and carries sulphurets also.——Glines & Barnes, having a hond on the Black Hawk mine, near Seulshyville, are unwatering and retimhering the shaft.——Superintendent A. Bryant has men at work on the Cerdova mine, near Arrastraville, and three eight-hour shifts are sinking.

Yuba County.

The Priestly dredger on the Yuha river, near Smartsville, was carried down the river and wrecked during the heavy storm of last week. It had not heen in operation recently. The Yuba river

reached a height of 20 feet at Marysville, and at the Government barrier sites at Daguerre Point the pile driver and equipment were carried away.

COLORADO.

(Special Correspondence).—The smelters and reduction plants have declared a reduction in treatment charges on certain ores. With treatment charges at a minimum, in addition to the rich strikes being made, mining in all sections of the State is improving.

New oil wells are being struck in the Florence field in Fremont county. Prospecting for oil in Boulder county and other fields continues. Drilling in the Debeque field, Mesa county, is progressing satisfactorily.

Suit has been commenced between the Theresa and Golden Cycle Cos. at Cripple Creek over the apex rights, the Theresa being complainant.

Denver, March 29.

(Special Correspondence).—A party of Pittsburg, Pa., mining men has offered $100 for the best article written by a School of Mines student on a new and cheap method of handling gold ore that cannot be treated economically under existing conditions by either concentrating or smelting.

Golden, Colo., March 28.

Boulder County.

J. Annear, superintendent of the Wood Mountain mine at Wallstreet, says the mill and mine are being put into shape to resume operations. Preliminary work in way of repairs and changes at the mill has been done. Additional machinery, including slimers, will be put in.

Erie, Pa., men have incorporated the Erie & Colorado C. Co. to take over and develop the copper dyke running through the South Magnolia district, near Eldora, says the Eldora Record. The properties embrace half a mile on one of the dykes running through Magnolia district, said to he extension of the dyke being developed by the Calumet C. M. & S. Co. The lands of the Erie & Colorado Co. are near the Moffat railroad.

Superintendent J. Roboson of Georgetown is opening up the tungsten properties of J. J. Trevarton in Nederland district, near Boulder, and has put men to work.

Clear Creek County.

Leasers in the Mendota mine, near Georgetown, report satisfactory results, and a heavy tonnage is going out. O'Connell & Barmettler, who have bought the Sipe lease on the Frostberg vein below the Victoria tunnel level, have their hoisting plant in operation and have begun shipping. Sinking will he continued, after which a number of drifts will be run for developing the ore body. There are several sets of leasers at work and all are taking out high grade ore. Manager J. Old says he will replace the compressor plant with heavier machinery in order that deeper and more extensive development work may he done.

The Swan group of mines on Silver creek, near Georgetown, have been hought by R. C. Wyvell et al. of Minneapolis, Minn., and a company will be organized. A heavy plant of machinery will be put in. This mine is southwest and near the Joe Reynolds mine.

Chaffee County.

The United States G. & C. M. Co. has heen organized at Salida for operating in the mining districts adjacent to Salida. The company is composed of Pittshurg and Philadelphia, Pa., men. It has a bond and lease on the Independence mine on Cameron mountain, and is preparing to equip it with machinery, says D. Heaton, manager. In Badger Creek district he has hought the Copper Glance mine. On the Independence he will hegin sinking the shaft as soon as machinery can he placed. The Independence is in Cameron Mountain district. The shaft is down 295 feet and shipments of high-grade ore have heen made. The company will sink the shaft to 500 feet.

Custer County.

The Murphy M. Co., operating the Silver Bar mine, will build a 200-ton reduction plant. Work of construction will begin this spring. Development work is increasing, says Manager Murphy, of Florence. The mill will be so built that it can he enlarged to 500 tons a day capacity if necessary. D. J. Patterson of St. Louis, Mo., T. Gardner and E. P. Thompson, of Lawrence, Kan., are part owners.——The New Kaolin Co. has hought additional ground and now has 1200 acres, including an option on the W. B. Wadsworth claim. Its holdings extend from the city limits of Silver Cliff to Rattlesnake mountain.

The Wolcott G. M. & M. Co., which has ore reserves in the P. & O. mine, near the Bassick mine, near Silver Cliff, is planning a mill to treat the ore on the ground. This company will also make other surface improvements at same time.——The Valley M. Co. is preparing to reopen its Camel mine, and has begun unwatering the shaft.

Dolores County.

The Smuggler-Alta group of mines, on the Dunton side of the range from Rico, will be worked during the present season, says Manager Larson, who has put men on cleaning up and retimbering.——The mill at the mouth of the Group tunnel, near Rico, is turning out concentrates.

El Paso County.

Superintendent J. D. Hawkins of the United States R. & R. Co. says arrangements are made for building a $15,000 cyanide plant in Colorado City and work begun. The plant will be run in connection with the Colorado-Philadelphia mill, and 20,000 tons of the dump will be handled per month until the 1,000,000 tons in vicinity of the company's property is all treated. Superintendent Hawkins also says the Philadelphia mill will resume handling Cripple Creek ore this week. The cyanide plant will be built for handling "weathered" tailings, and will consist of a number of open cyanide tanks with necessary mechanical adjuncts. The chlorination process at the Colorado plant will not be changed, hut that part of the mill will be utilized to treat the dump in connection with the cyanide plant.

Gilpin County.

Stewart & Co. of Denver are working the Smuggler mine in Moon gulch, near Central City, under lease and bond, and they are sinking the shaft on the vein and will do other development work. Work on the tunnel has been discontinued temporarily, says Manager H. A. Stewart.

The Blue Grass M. Co. continues running its 10-stamp mill steadily on ore from the Champion dump. The group is at Phœnix and developments are heing kept up at the Lone Star and Tenderfoot mines. Iowa men are interested.

The Gunnell shaft building and plant of machinery, near Central City, were destroyed by fire last week. Superintendent Neldemeyer has hegun work clearing away and will put up new buildings and heavier machinery. The property is owned by the Gunnell G. M. & M. Co. It is estimated the damage to the machinery, loss of building and probable damage to the shaft will represent a total of $50,000.

Hinsdale County.

H. A. Avery of the Klondike M. & Mfg. Co., owning the Black Wonder group at Sherman, near Lake City, says he is preparing to further explore and develop the Black Wonder vein.——C. Forherg resumed work last week on his Double Standard crosscut.——Ten men have been added hy the Hanna M. Co. to the numher at work.

Men are at work getting the Hidden Treasure mine and mill, near Lake City, in condition to resume operations, says Manager P. C. McCarthy. L. Kafka has the lease.

Lake County.

In Upper Evans gulch at Leadville the Best Friend mine is closed down on account of had air, hut the lessees are planning additional machinery. They have driven a tunnel 1200 feet long, connecting with the Best Friend shaft. The mine is operated hy Priddy, Harvey & Thielan, under lease and contract.

The Fryer Hill M. Co. at Leadville is continuing work on its properties and is maintaining shipments of ore to 2500 tons a month, says Manager Newell.

Operations have heen started up hy A. Dyatt through the Mikado territory, near Leadville. He has a lease on the Allegheny mine, which he formerly worked. The work will be conducted through the shaft of the Mikado mine, at depth of 800 feet.

La Plata County.

The Empire G. M. Co., composed of Canon City men, has a group of twenty claims in the mineral helt 16 miles east of Durango, on Small Hopes mountain. Men are at work and shipments of ore that run $100 per ton are going to the smelter. At depth of 200 feet the inflow of water was so heavy that deeper development could not he done, so the company will start a 1500-foot tunnel into Small Hopes mountain, which will afford drainage of the veins traversing it. To facilitate work on the tunnel, company has air compressors, machine drills, piping, ore cars and rails on the ground. The tunnel will cut the Small Hopes vein at depth of 900 feet and at same time develop territory on line of tunnel.

San Juan County.

The Green Mountain M. & M. Co. proposes huilding a concentrating plant near Silverton. The waters of Stony Pass and Cunningham creeks will be utilized for steam power.——R. R. Barr has started work on his group of claims on Eureka mountain, near the Sunnyside mine, near Eureka. One of the claims carries the mineral stephanite ("hrittle silver").

San Miguel County.

The ground covered by the lease of V. U. Rodgers and F. Fox on the San Bernardo mine, near Trout lake, near San Miguel, is reported showing satisfactorily. This summer they expect to make shipments. They have sublet a portion of the mine.

The Carribeau and Montezuma group of mines, 1 mile from Ophir, owned by Eastern men, as the Yellow Mountain M. Co., continues under development with thirty miners at work. By May 15th it is expected the property will be in shape to enable the production of sufficient ore to keep the company's concentrating plant running steadily, says Manager F. T. Axtell. Preparations are being made at the mill for beginning treatment of the ore. Additional machinery is going in, and plans for enlargement of the concentrating plant are under consideration. Concentrating tables will be put in. A water motor has been set in place for the utilization of surplus water for power purposes, which will reduce the cost of operating the plant. The mines and mill will give work to 100 men the coming summer.

Summit County.

The Lightburn tunnel of the Gold Run M. & M. Co., near Breckenridge, is working men in the main tunnel, in 2050 feet, and men are driving the hranch tunnel or crosscut ahead. It is in 1100 feet and is expected to cut a known lead-silver-gold ore vein when it reaches the 1500-foot point. Ventilation is maintained by air pipes from an electrically driven blower; the electricity is obtained from the Gold Pan plant at Breckenridge, 2¼ miles from the mine. These two tunnels are being driven to explore and develop a group of fifty lode claims which are owned hy Cripple Creek and Pennsylvania men. The group is on Mineral hill, near head of Gold Run.——Second-class or concentrating ore is being piled up on the dump of the Providence-Colorado M. & M. Co. awaiting milling facilities. First-class ore is in the ore hin ready for shipment. It is high grade in lead and carries gold and silver values. The drifts at 100 and 150 feet have shown up ore suitahle for concentration. H. S. Whitehead of Breckenridge is superintendent of the mine, which is on eastern slope of Gihson hill, near the Extension and Jumho groups.

The West Side (Engle) concentrating mill in Breckenridge, under lease to the Puzzle Leasing Co., after several months of idleness, has started up again, says Manager Hoyle, on ore from the Puzzle-Gold Dust strike.

Teller County.

At the Gold Coin mine at Victor, owned hy the Woods Investment Co., they have unwatered the 1100 and 1200 foot levels and have put men to work there. By unwatering these two lower levels the company will be ahle to get out ore from the Gold Coin vein, also the Little Montana dyke. The Gold Coin vein, when opened on the tenth level, or 1000-foot point, measured from 12 to 15 feet between walls and gave returns of from one to three ounces gold per ton. Besides these, there are a numher of other ore shoots that can be worked, says Manager Woods. The pumps are raising water at the rate of 500 gallons per minute.

On west side of Cow Mountain, near Gillet, a surface strike is reported made hy W. Mellon, showing a body of mineral 2 feet in width at grass roots. Assays range in value from $10 to $60. Mellon is preparing to sink a shaft 100 feet and start lateral work.——Work on the Clinton tunnel, on same hill, which starts at a point on southwest side, between the Spinney mill and the Short Line railway hridge, will he begun this week. The portal of the tunnel is 11 miles northeast of the Victor mine. The tunnel is expected to run in 3000 feet, gaining depth of 2000 feet at the terminus. The tunnel project is owned by the Clinton Con. M. Co., composed of Rochester, N. Y., men. A numher of veins and dikes of Bull hill trend in direction of Cow mountain. Some ore has been mined in the valley hetween the two hills and operations are in progress at several points.——F. Eakins, W. C. Ahhott and H. A. Raibling have a lease on a portion of the upper workings of the Wild Horse mine on Bull hill, owned hy the United M. Co. The terms of the lease include construction of a cyanide plant on the mine for treatment of all low-grade ores. The lease covers all the old workings of the Wild Horse mine from the 500-foot level to the surface, part of this ground having been explored below the fifth level. The lessees agree to perform 50 feet of work per month, either drifting or crosscutting, and further agree to huild a 50-ton cyanide plant. The royalties are graded from 30% to 50% (on all ores marketed that average above five ounces). The lease is for five years.

The leasing company operating on the Dexter mine on Bull hill, Cripple Creek, is sinking the main shaft to the 1000-foot point to recover the vein opened on the 900-foot level of the Blue Bird. Meanwhile the leasing company continues to send out occasional shipments from their workings from the 300 to the 500-foot point. They are screening and sorting the ore, the returns running two ounces gold per ton.

After an idleness of eight months, operations will be resumed next week on the Carbonate Queen mine of the Ophir G. M. Co., near Cripple Creek, says D. Sullivan of Denver, one of the company. Shipments were made last spring and summer. A depth of several hundred feet has been attained and levels run in several directions. C. Oliver is superintendent and also of the Dead Pine, owned hy the Ophir Co.

The Cripple Creek mill at Gillett will be ready for treatment of ore this week. The company will handle ore from the Bolivia, Belle Plain and King of Diamonds claims on Lincoln hill, and owned by the Lincoln G. M. & M. Co. This mill will treat fifty tons of ore per day.

IDAHO.

Cassia County.

The Shoshone Falls Power Co., Ltd., has been incorporated, with principal offices at Boise, to develop power at Shoshone Falls, on the Snake river, Twin Falls and Augur Falls. I. B. Perrine of Blue Lakes and R. M. McCollum, S. H. Hays, R. W. Faris and W. S. Bruce of Boise are directors. It is expected machinery for developing at least 20,000 H. P. will be put in.

Blaine County.

The mill at the Tiptop mines at Hailey, and owned hy J. Q. Packard, is ready for operations. It will use water pumped from the mines. The mill is of twenty stamps. The water used has heretofore been pumped from Rock creek, a vertical raise of 900 feet in a length of a mile. This station has been dismantled and the hoiler moved to the mine, where it will be used to keep the lower workings unwatered. The Tiptop mines show hodies of gold and copper hearing ores.

W. A. Stanton of Salt Lake City, Utah, manager of the Queen of the Hills mine, near Hailey, says he is preparing to resume in May. Additional machinery will he put in.——The flow of water tapped near tbe 1200-foot level of the Minnie Moore is under control, while at the Relief, an extension of the Minnie Moore, the management has opened up a body of milling ore on the 400-foot level.——The heavy snowfall iu the region is causing some uneasiness and, unless the thaw is anticipated and the hridges hy which the Wood river is spanned are strengthened, the installation of machinery on the other side will be delayed, says W. A. Stanton.

Boise County.

H. L. Fisher of Idaho City has an option on the Belshazzar group of gold-hearing quartz claims, 1½ miles southwest of the Gold Hill mine, at Quartzburg.

Custer County.

Owing to a breakage of machinery at the White Knob C. Co.'s mines, near Mackay, the smelter has been closed down for a month.

Elmore County.

The Tahoma mine, near Atlanta, is reported honded to Salt Lake City, Utah, parties for $200,000. The property has a mile of underground work on it, and is equipped with a 10-stamp mill, assay office, hunk houses and other buildings. S. J. Baldwin of Boise, manager, left to-day to make an examination of the mine for the Salt Lake people, to determine what work should be done this summer. He will probahly visit Salt Lake and Chicago before his return in the interests of the mine and its owners. When Mr. Baldwin was seen he refused to have anything to say regarding the deal further than to admit that he was going out to examine the property, and that such a deal as ahove mentioned had been made.

Shoshone County.

The Kellogg tunnel of the Bunker Hill & Sullivan mine at Wardner, in over 2 miles, is opening up the ore body uncovered in Nos. 7 and 8 tunnels. On No. 7, which is 500 feet above the Kellogg tunnel on the dip of the vein, the stope was 450 feet long and in one place 105 feet wide. This was at depth of over 2000 feet on dip of vein. The ore hody is cut in the Kellogg tunnel at depth of between 2600 and 3000 feet on dip of vein, which is at 45°. No. 7 is 250 feet above No. 8. The hody of ore is said to average 15% in lead and from seven to eight ounces in silver.

Electric power from Spokane falls, 100 miles distant, will he furnished to operate an additional 500 H. P. compressed air plant in the Morning mine at Mullan, Sept. 15. T. L. Greenough and P. Larson of Spokane, Wash., own the Morning. Three years ago a 1000 H. P. com-

pressed air plant, with 100-drill capacity, was put in at the Morning mine, said to be the largest compressed air plant in the West. The machinery has been working steadily since that time, but the output of the mine is increasing so that 500 H. P., with 50-drill capacity, will be added. It will be driven by an electric motor.

Washington County.

The Fidelity C. Co. of Portland, Or., reports Superintendent Trevor, has started operations at the company's property at Seven Devils, near Weiser. Ore will be taken out and shipped to the Ladd smelter at Mineral.

MICHIGAN.

Houghton County.

The annual report of the Isle Royale C. Co., near Houghton, for year ended Dec. 31, 1903, shows, compared with 1902:

	1903.	1902.
Gross value copper product....	$411,313	*$425,125
Running expenses at mine.....	307,437	400,539
Miscellaneous expenses.....	56,618	60,446
*3,134,601 pounds, at 13.12 cents.		
	1902.	1903.
Tons rock stamped.....	263,672	199,493
Pounds mineral obtained.....5,219,305		4,408,615
Percentage refined copper in mineral.....	68.374	71.102
Percentage refined copper per ton of rock stamped	13.5	15.7
Product fine copper (pounds)....3,560,748		3,134,601
Cost per pound at mine, exclusive of construction.....	11.23c.	9.81c.
Cost per pound construction.....	0.29c.	
Cost per pound exploration.....	0.24c.	0.23c.
Cost per pound of smelting, freights, Eastern express commissions and all other charges.	1.69c.	1.81c.
Total cost per pound of refined copper.....	13.45c.	11.85c.
Cost of mining and stamping per ton rock stamped	$1.25	$1.54
Cost of stamping per ton.....	26.44c.	28.84c.

President Bigelow says it had been hoped that with the openings tributary to No. 1 shaft, showing some improvement during the latter part of the year, better results would be obtained during the coming year. However, in the latter part of December the shaft was destroyed by fire, and they are at present simply mining enough rock from No. 2 shaft to keep one head busy at the mill. It has not yet been decided whether No. 1 shaft will be retimbered at present or not. As detailed in report of superintendent, explorations with diamond drill showed a copper-bearing lode in southern part of the property, which appeared to be an extension of the Isle Royale lode. It is intention in the spring to locate this lode on the surface and do work upon it, and on the result of this exploration will depend largely whether they at once retimber No. 1 shaft, or decide to spend the money in opening at the new exploration.

The Champion mine at Painesdale is preparing to put in a gyratory crusher, said to be the first in the Lake copper section.

Sinking in No. 8, or the Mesnard, shaft of the Quincy mine at Hancock has reached a depth of 2700 feet, says the News. Drifts are being extended north from No. 6 shaft of the Quincy mine under the workings of the Franklin. It is expected the upper drift will reach the line of No. 8 shaft about the same time that sinking reaches that level. The management expects to have the Mesnard connected with the old workings by March, 1905, when much of the rock that is now hoisted through the northern shaft will be handled to greater advantage through No. 8. Fully 50% of the tramming in the mine is being done by electric haulage.

Keweenaw County.

The Mohawk M. Co., operating near Allouez, reports for year ended Dec. 31 last, sales of copper (6,284,327 pounds at 13.11 cents), $823,941; sales of mohawkite, $14,467; working expenses at mine, $474,503; smelting, freight and cost of marketing copper, $69,680; general expenses, $7966; total expenses, $552,149. There was $218,076 expended in additions to plant and for new machinery. The balance sheet of the company of Dec. 31 shows, among other items, cash on hand, $25,103; copper on hand and copper bills, $180,860; cash and supplies at mine, $75,321. The mine began regular production in June, 1903, with two heads of stamps, and not until the latter part of Feb., 1904, did the third head go into commission. In regard to sales of "mohawkite," the report says the cross fissures carrying it have gradually become barren, and work has been discontinued on them. The company has united with other companies, allied in management, in erecting smelting works, which will go into operation about July 1. The rock in 1903 yielded 1.09% in copper, or 21.79 pounds to the ton, and it cost 8.78 cents a pound to get it out of the mine and to the market, and, including construction, the cost was 11.02 cents.

Ontonagon County.

The Victoria C. Co.'s mill at Victoria will have two heads and a new arrangement of rock crushers and grinders, which will send the rock under the heads crushed finer than at most of the mines in the district, says the News. The heads and machinery are worked by compressed air.

Rock from the Michigan mine at Rockland is averaging 40 pounds of mineral copper per ton stamped. Shipments to the Mass mill, where one head is used, average 235 tons daily, but it is planned to increase shipments until the head is treating its full quota of 500 tons.

MISSOURI.

Jasper County.

The Prime Concentrating Co. of Carthage has been incorporated by M. H. Teel and K. Birkbead of Wobb City, and J. G. Kirksey and H. L. Shannon of Carthage. The company is equipping a plant at Joplin to operate as a sludge mill.

H. Murray of Nashville, Ill., interested in the Joplin-Kentucky M. Co., owning a mine and mill on the John Jackson ground, west of Joplin, says he is arranging to resume operations. The mill has been idle for a year. The plant has been overhauled.

The Conqueror Z. M. Co. has started its new mill on the Cardinal mine at Midway. The mill has capacity of 150 tons and is equipped with automatic feed. The company has two shafts down to ore and a third one is being sunk. W. Houk is manager.

At Webb City an Iowa company has taken an interest with Prince & Co. on the Porto Rico mine and they expect to put up a mill. —— The Little Hoosier (heretofore the Ashcraft) mill, north of Webb City, is being torn down and rebuilt.

The Thoroughbred M. Co. of Joplin has been incorporated by F. Nicholson, B. H. Collins, J. W. Trick and C. W. Nicholson of Joplin and T. C. Jones of Webb City. ——G. A. Noel and L. Lands of Webb City have subleased eight lots on the lease of the Carthage L. & Z. M. Co. of the Palmer land at Kendricktown. They are under contract to put down a 5x7-foot shaft, put in pumps, etc., and operate the mine.

The Alliance M. Co., composed of C. Moore, A. Corbin, L. J. Stevison and Eastern men, has a lease on the Mussellmann land, west of the Mattes & Booker lease and south of the Ruby mine, on the High Ball lease, near Joplin. A shaft sunk on a drill hole strike is down 112 feet, with ore struck 5 feet above where the drill showed ore.——Negotiations are under way to consolidate all the interests of the Center Valley M. Co. under one management and reopen the idle properties. Pumps will be started and the ground opened for mining.

A mill is being built for the Prairie State M. Co., operating on the Continental Zinc Co.'s ground, in the west part of Joplin, says Superintendent Morsman.

Lawrence County.

The United Zinc Co. will let contract this month for sinking a deep shaft on the Expansion lease at Aurora, the intention being to tap the body of jack that has been developed by several drill holes.

Newton County.

The United Zinc Co. is completing a mill at one of its mines 2½ miles from Diamond, southeast of Joplin and 1½ mile south of the Jasper county line. The mill will be started up this week.

The Mascot mine resumed work last week after an idleness of several months, but did little on account of water shortage. The Mascot mill will be furnished dirt from the 125-foot level, which is said to be similar to that taken out at the 226-foot level and handled by the Homestake mill.

MONTANA.

The receipts for month of February of the United States assay office in Helena show a decrease of $38,864.19 compared to the receipts of same month in 1903. The greater part of this decrease is in Montana, although Washington, Idaho, Nevada and British Columbia all show a falling off. The total receipts of the office during the month were $137,563.36, divided as follows:

Counties.	1903.	1904.
Deer Lodge.....	$ 5 768 00	$ 6,287 88
Fergus.....	74,612 92	59,650 57
Lewis and Clarke.....	28,955 68	9,436 74
Madison.....	10,583 93	16,856 56
Park.....	10,518 20	13,718 90
Other counties.....	765 23	4,073 02
Idaho.....	7,730 51	2,915 80
Nevada.....	5,577 92	5 537 57
Washington.....	6,347 34	1,079 11
British Columbia	20,567 72	18,008 21
Totals.....	$171,427 55	$137,563 36
Totals for Montana	131,203 96	110,022 67

The Fergus county decrease was due to inability to send out the bullion from Lewiston, owing to irregularities in transportation of mail and express. The output was up to the standard.

Deer Lodge County.

Reports show work and developments progressing at Georgetown and vicinity, near Anaconda. The Gold Coin mine is under management of J. R. Boardman. Two of the mines are shipping ore to the Washoe smelter and more expect shipments before July 1st.

Fergus County.

The Mammoth Group G. M. Co. has resumed work on its mines north of the Gold Reef mines, near Gilt Edge. The Mammoth Co. is preparing to increase development. The first work to be done will be driving a tunnel from the mill level to tap an ore body shown in the workings on the hill above the mill, says the Argus. N. J. Littlejohn, of Lewistown, is superintendent. Ten men are at work. The 50-ton mill on the group will not be started up till sufficient ore is blocked out.

Work has suspended temporarily on the mines of the Judith M. Co. at the mouth of Spotted Horse canyon.

N. J. Littlejohn, of Lewistown, has bonded of the Cave Group M. Co. the Cave mining claim, Cone Butte district, near Lewistown. The bond specifies he shall work continuously during life of agreemont and that 10% of all net mill or smelter returns shall be paid the company.

Jefferson County.

A. A. Pelletier of the Red Bird M. Co., near Basin, is putting in machinery for the three mines that company is operating. It consists of one 125 H. P. portable boiler, one 50 H. P. engine and a 35 H. P. boiler and engine, one complete electric light system, air compressors, air drills and pumps. It is intended to increase work and take out ore.

The Golden-Sunligbt group of mines, 5 miles northeast of Whitehall, has been sold to E. Ring of Butte. The Golden-Sunlight group consists of twenty patented claims, eigbt mill sites, water rights, the Hedley Homstead, as well as the concentrator and machinery which has been in use in the development of the mines. Five of these claims have been producers for five years, leasers having shipped $250,000 worth of ore from them. The ore is principally sulphide, carrying gold and silver, while a small amount of oxide ore is also found. The mill and concentrator will be remodeled. On account of the system of leasing, it has been impossible to systematically develop the ground, says Manager Ring. All these leases have expired and renewals refused.

Lewis and Clarke County.

The Liverpool mine in Lump gulch, near Helena, has been reopened after a suspension of several years. Silver ore running 200 ounces is reported struck in the new workings.

It is reported the Ox Bow Power Co., incorporated in South Dakota, proposes building a dam across the Missouri river, near Helena. Electricity will be generated and transmitted to the mines and plants of Helena, Butte, Anaconda and other points.

Madison County.

Underground work is suspended at the Revenue mine, near Pony, and work begun on construction of a mill.

Missoula County.

The Nebraska-Montana G. M. Co. has been incorporated, with headquarters in Missoula, by G. W. Buchanan, B. L. Terry, W. N. Albright of Alexandria, Neb., B. W. Pugh of Belvidere, Neb., and T. Holt of Missoula.

Silver Bow County.

Surface improvements at the Dutton mine, near Butte, have been completed and the steam hoist is in operation. The hoisting plant has capacity for depth of 500 feet. Superintendent Rockwell says he has unwatered the shaft and resumed sinking and taking out ore. The shaft is down 250 feet. The Dutton is owned by the Butte M. & S. Co., and is between the Pennsylvania and Glengary mines in Butte district.

NEVADA.

Esmeralda County.

B. I. Potter, who has bought the Wheeler tailings at Pine Grove, has set up cyanide tanks, and will begin working the material next week. He is putting in a pump and other machinery. There are several thousand tons of these tailings.

The Jumbo M. Co. of Goldfield has been organized under Arizona laws by C. D. and H. L. Taylor, G. A. Kernick, G. E. McClelland and J. McKane as directors, to develop a group of claims in Goldfield district, south of Tonopah.

R. Gundry, superintendent of the Montezuma mines, near Hawthorne, says the company will begin work on a larger scale and expects to start shipping bullion.

Humboldt County.

The Glasgow & Western Exploration Co. is putting in two electrical ore separators at the company's Adelaide mill, near Golconda, says Manager Stalmann. Meanwhile the smelter at Golconda is being prepared for an early start.

Lincoln County.

The Caliente G. M. Co. has resumed work on the Sunset claim, near De Lamar, with G. C. Fetterman in charge. It is intended to drive a tunnel 200 feet from a point below the vein cropping to cut the ledge at depth of 150 feet.——Reports from Fay show work progressing. At the Horseshoe the mill is running eight hours per day, and with coming of spring the mill will be running twelve hours per day. Negotiations are in progress for buying water at Pike's Diggings, which will give about twice as much as the company has at present and enable the mill to work continuously.——Men are at work on the Snowflake group, owned by G. P. Smith.——The Homestake mill at Deer Lodge is running steadily. The ore is yielding satisfactory values, says Superintendent Hackett.——In the Iris mine, near De Lamar, enough ore has been opened to justify building a mill, says G. H. Smith, who is working the property on an option.

The shaft of the Pioche-Nevada M. Co., near Pioche, has cut 6 feet of galena-bearing ore, with sulphide of silver.

A. D. Cattle, manager of the New York Con. M. Co., with I. C. Stump and M. S. Briggs of New York, owning the Marie group, 6 miles north of Camp Duncan and adjoining the Capitol group of Monaghan & Murphy Co., near Searchlight, says they have started development work.

Nye County.

Forty-five miles of the Tonopah railroad are reported to have been graded and track laying is in progress. At present rate it is said trains will be running into the camp by May 15.

Washoe County.

At Olinghouse all four mills are running and the plates are showing amalgam. In the Butte & Gold Center mine they have opened the drift to the north in the lower level and have free gold values. W. C. Williams is milling ore from the Cabin claim and Gold Ledge, running $20 per ton.——W. W. Woodruff reports improved conditions at the Polar Star and Gold Treasury and says he has cut the lode which passes through the camp from the Whale to Gold Treasury.——At the Forlorn Hope 4 feet of a low-grade ore is opened at a depth of 35 feet in south shaft. Work has begun on the Crown Point.——The Springfield-Nevada M. Co. has prepared to increase impounding facilities at each mill and is beginning improvements with regard to handling of ore from mine to mill.

NEW MEXICO.

Lincoln County.

The Montezuma M. Co. is increasing its holdings of gold properties at Nogal.

Otero County.

Manager F. B. Schermerhorn says a smelter will be built at the Three Bears mine near Jarilla.

The Altamont M. Co. expects to resume work on its mines in Jarilla camp this month.

Sierra County.

Preliminary work has begun on the Good Hope and Bonanza mines near Hillsboro. A road is being built to the group.

It is reported Manager R. H. Hopper of the Bigelow G. & C. M. Co., developing a group of mines near Hillsboro, is preparing to put in additional machinery.

Socorro County.

A strike of copper ore is reported from Estey City. The ore body is 30 feet in width. Preparations have been begun for development.

L. M. Lasley, manager of the Golden Bell M. Co., operating at San Marcial, says he proposes putting in additional machinery for development work.

Taos County.

The Jayhawk G. M. & M. Co. has started sinking a shaft on its 6-foot lead at Red River. About 60 feet will be sunk and then crosscuts will be run before taking out ore for the mill.——Work will be resumed on the Midnight mine at Red River. The mine is at Midnight, at head of Bitter creek. The company has a concentrating plant and a steam hoist. The shaft is 165 feet deep, and crosscuts amounting to 6000 feet have been driven. The ore is free milling. The company is owned by Cleveland, O., men.——The Cashier mine, near Red River, will resume work and is preparing to patent four of its claims.

Platinum is reported found in Bromide district, near Tres Piedras, in the Tampa mine of the Tusas Peak M. Co., owned by Manistee, Mich., parties. It was found at the 200-foot level. The ore, in addition to 13% copper, $8 gold and $6 silver, is said to carry $26 in platinum.

OREGON.

Baker County.

The Virginia 10-stamp mill, near Sumpter, is in operation.——Van Duyn and G. Harklerood have bonded the Lone Pine

placer group of mine claims in Granite district. Preliminary work will be instituted this week and preparations for piping will be made. —— Babbington & Clark, who have leased the Bear Gulch placers near Sumpter, have started operations. The ditch has been connected with piping and a giant.

A sinking plant will be put in at the Snow Creek mine, near Sumpter, says Manager F. D. Smith. The plant will he for proving the ore shoot explored on the adit level at greater depth. Operations at the Snow Creek mine have been steady during the winter, with the full ten stamps dropping in the mill.

Grant County.

Placering will be started at the Black Butte group, near Granite, says Manager O. C. Wright of Sumpter. Superintendent E. C. Allen has made arrangements for starting work. The equipment to be used consists of two giants. Manager Wright states arrangements have been completed for adding to the water supply so as to operate all summer. That a still greater head of water may he secured for the placers, the management has outlined a system of storage reservoirs for the basin of the stream and will take up work constructing these before next winter. Operations at the quartz mines of the company have been as usual. Further development has been done on the vein, which shows width of 12 feet.

The Blue Channel Placer M. Co., operating near Susanville, has increased its machinery equipment. It has two giants and 2000 feet of piping, as well as a boiler for running a hoist to raise gravel from underground drifts.

Josephine County.

C. E. Woodrow has bonded the Ada mine, on Foots creek, near Grants Pass, which will be developed and later equipped with a mill and power plant.

SOUTH DAKOTA.

Custer County.

L. P. Woodbury of Chicago, Ill., president of the Saginaw G. M. Co., says operations will be resumed on the Saginaw mine, 6 miles northwest of Custer, on the forks of French creek. After the water is pumped out the company will run a crosscut to cut the three veins which run through the Saginaw claim proper at a depth of 200 feet.

Lawrence County.

The shaft of the Oro Hondo M. Co., near Kirk station, on the Burlington railroad, along Whitewood creek, near Deadwood, is 835 feet deep and sinking continues. It is intended to go to depth of 1000 feet before making any lateral explorations. At depth of 1000 feet a crosscut will be driven east and west on the formation. The bottom of the shaft is showing quartz ore bearing gold. The Oro Hondo is sinking a triple compartment shaft. The machinery is capable of depth of 2000 feet. There is in the Oro Hondo tract an area of 1000 acres.

The Pluma M. Co. at Pluma station, on the Burlington road uear Lead, will add forty stamps to its 40-stamp mill. They will make other changes about the mill.

Penuington County.

The Harrow & Williams graphite mine, near Oreville, will have an exhibit at the St. Louis Exposition. The vein is said to he 8 feet in width and the graphite high grade. The mine is near the Burlington railroad.

F. H. Long of Chicago, Ill., president of the Bullion M. Co., operating near Keystone, says he is preparing to increase development.

UTAH.

Beaver County.

Contracts for material with which to construct the first 800-ton unit of its concentrator at Newhouse, near Frisco, that shall ultimately be equipped for reduction of 4000 tons daily, have been awarded by the management of the Newhouse M. & S. Co., says S. Newhouse, president.

Manager Farnsworth, of Salt Lake City, of the Horn Silver mine at Frisco, says a plant will be built by the company to handle its zinc-bearing ores. He says in addition to 40% zinc contained in the ores, is an average of 9% lead, with some values in silver and gold.

The Beaver-Harrison M. Co. has heen incorporated to operate a group of mines in Beaver Lake mining district by J. J. Trenam, F. Eherhardt, B. L. Corum and E. H. Jacobs of Salt Lake City. The company has consolidated the holdings in the Beaver Con. and the Ben Harrison groups.

Juab County.

The consolidation of the Raymond and Illinois mines at Tintic, near Eureka, has heen ratified hy the shareholders. On the Illinois group a shaft has been sunk to 600 feet, with some drifting off it, while Raymond ground has heen opened to depth of 1500 feet, with five levels extended from it. The policy of the united interests is to drift in each direction on the 1500-foot level, says Manager J. C. Sullivan of the Raymond.

Six leasers are at work in the South Swansea mine at Silver, near Eureka, and ore is being shipped. The mine can be worked down to the 750-foot level, but below that water has filled the underground workings.

Millard County.

The Pluto M. Co. has been incorporated at Richfield hy S. F. Mount, D. and J. Meteer and K. and L. Mount. Twenty-seven claims comprise the holdings of the company in Millard county, 5 miles west of Scipio. Two shafts show a 2-foot ledge of ore that carries lead values in galena.

Piute County.

The Standard Power Co. has been incorporated at Salt Lake City to build an electric power plant on the Sevier river, near Marysvale, of from 4000 to 5000 H. P. capacity, and to deliver the electric power generated to the mining camps of Piute, Beaver and Sevier counties, as well as to cities and towns. W. F. Snyder, J. B. Weimer, F. Worthing and J. Long, Jr., are officers. The cost of generating power by steam is said to be from $20 to $25 per H. P. ner month, and the Standard Power Co. proposes to furnish electricity at not to exceed $7 per H. P.

Salt Lake County.

The Utah C. Co.'s new mill at Bingham is producing fifteen tons of high-grade concentrates daily, says the Reporter, and this product will begin to reach the market this week. The management of the American S. & R. Co. has contracted with the Utah C. Co. for its copper, gold and silver-bearing output from the concentrator. The contract comprehends the entire output of the Utah C. Co. for seven and one-half years, and provides for delivery within that period of approximately 35,000,000 pounds of copper, without reference to the gold and silver associated with that metal.

The Golden Spike M. M. & S. Co. has been incorporated at Salt Lake City to develop property in Big Cottonwood district, near Alta. The officers are G. Perry, P. Sibley, W. C. Tracy, T. W. Miller and C. Thorp, Jr.

The concentrator to be built at the Columbus Con. mine at Alta will have capacity of 150 tons per day, instead of less as first supposed, says T. Jacobson of Salt Lake City, president and manager. Construction will begin this month.

Machinery for the Bingham & New England mill, including a crusher, rolls and two-compartment jigs, is being set up at the Nast mine, near Bingham. The engine and other parts are on the ground and the mill is expected to be ready to run about April 18th.

W. Ochs, of Salt Lake City, has an option on the Davis-Gebhard group of copper mines at Bingham. The group, which embraces 141 acres of ground, is covered hy Government patent.

The Bingham Con. C. Co. at Bingham will begin construction by April 15 of a sampler at its smelter. The sampler will have capacity of 1000 tons of ore daily. The smelter is reducing 500 tons of ore daily with three furnaces in blast. In addition to output of its own mines, the smelter is reducing the tonnage from the Grand Central and Lower Mammoth of Tintic and the Boston Con. of Bingham, in addition to consignments acquired in open market, and by April 15 the management of the Fortuna of Bingham will begin forwarding to the Bingham Con., under a contract providing for treatment of 3000 tons monthly.

Tooele County.

The hoist at the Carisa mine at Robinson has been closed down and the leasers are working through the tunnel.

Operations have been resumed in the Old Bullion mine at Stockton under management of E. J. Dair.

T. Wiswall of Salt Lake City, manager of the Green Reduction Co., says the leaching of gold from the Geyser-Marion tailings dump at Mercur will he resumed this month, to continue steadily throughout the season. Concerning a similar undertaking at Mammoth, where the tailings from the Mammoth mill are to he handled hy his company, Wiswall says he is ready to begin building a plant as soon as the management of the mines has signed the contract.

WASHINGTON.

King County.

G. Daines of the Daines M. & M. Co. at Greenhorn, Or., and president of the Sure Thing G. & C. M. & S. Co., operating near North Bend, on the Snoqualmie river, says machinery for a 20-stamp mill is on the ground at the Suro Thing, and is being set up.

Whatcom County.

The Nooksack M. Co. of Seattle is preparing to put in machinery on its mine on Sumas mountain, near Bellingham, says Treasurer Swinehart of the company. A cyanide plant will be built to treat 200 tons of ore daily. A stamp mill plant to handle 200 tons of ore daily will also go in this spring. The buildings are all ready.

WYOMING.

Carbon County.

The Rudefeha M. Co. of Indianapolis, Ind., operating at Rudefeha, will put in a plant of machinery on the Udeville shaft as soon as spring opens, and development will he increased. The plant will consist of boiler, pump, hoist, compressor and air drills.

Fremont County.

An ore shoot has been opened in the Carissa mine at South Pass at depth of 400 feet. The owners will increase development, putting on more men, and whether the Belgo-American builds to South Pass or not, the Carissa will resume shipments of gold.

FOREIGN.

AFRICA.

Transvaal.

The Transvaal Chamber of Mines reports the gold output for month of Februrary of mines on the Witwatersrand was 282,436 ounces, and for outside mines 7066 ounces, making total of 289,502 ounces, as against total of 288,824 ounces for January. The Chamber also reports:

Natives distributed to mines during Februrary by Native Labor Association	6,263
Time-expired and other wastage	5,064
Net gain during February	1,199
Total number employed end of February	69,966

An allotment of 223 natives was made to railways, otherwise there would have been a gain in number for February of 1422.

AUSTRALIA.

New South Wales.

The New South Wales gold yield for month of February is reported amounting to 31,363 ounces, valued at £110,159, compared with 12,075 ounces, valued at £44,993 for February, 1903. The yield for first two months of 1904 amounted to 71,407 ounces, as compared with 32,386 ounces in January and February, 1903.

Qneensland.

The Queensland gold production for 1903 is detailed by the Under Secretary for Mines as follows:

Field.	1903. Stone treated at Mills.	Product. Mill Gold.	Cyanide Gold.	Gold from concentrates.	Old Tailings.		Treated at Metallurgical Works.		Alluvial.	Total Fine Gold from all sources
	Tons.	Ozs.	Ozs.	Ozs.	Tons.	Ozs.	Tons.	Ozs.	Ozs.	Ozs.
Alice River									400	290
Charters Towers	247,666	274,083	134,506		24,820	9,933	1,053	7,906	2,161	285,771
Chillagoe (smelters)										
Clermont	544	488			346	159			5,740	5,966
Clonurry Fields								*10	89	87
Coen	1,256	3,242	370						24	1,933
Cooktown Fields (Starcke)	278	501							381	797
Croydon	35,883	52,290	744		24,304	17,915	14	35		31,790
Eidsvold	200	284					3	14		256
Etheridge and Woolgar	10,430	10,229	825		12,930	7,202	11	15	353	11,682
Gladstone Fields	4,292	3,301	606	117	812	704		*316	515	4,033
Gympie, Kilkivan, Glastonbury, etc	187,935	175,478			3,753	2,706	587	1,686	586	147,622
Hamilton	5,745	7,850	63		1,709	437			1,128	5,928
Herberton (Balcooma)									69	55
Hodgkinson	6,594	5,367							100	4,568
Horn and Possession Islands	1,063	1,014							20	611
Jordan	35	24							506	469
Mareeba	67	20								18
Mackay Fields								*5		4
Mount Morgan	242,509	119,668			26,513	3,457			1,850	116,672
Mount Shamrock	1,561	483	32		5,583	3,622	71	618		2,416
Mulgrave									100	88
Normanby (Bowen)	108	171						*23	183	304
Palmer	668	478							1,245	1,606
Ravenswood	22,623	32,298	3,529	10,175	200	32	212	1,559	867	38,273
Rockhampton	4,732	2,914	121		802	496	468	1,227	200	4,086
Russell									200	188
Russell Extended	20	74								52
Stanthorpe & Pikedale Fields								*151		142
Tate and Tully									72	59
Tenningering	12	27						*1,595	43	1,568
Warwick Fields	272	253			1,308	215	5	2	188	568
Other sources								*684		644
Totals	774,493	690,537	140,796	10,292	103,080	46,878	2,424	15,846	17,014	668,546

* Product from copper and other ores.

The total from all sources, of 668,546 fine ounces of gold, is against a total of 640,463 fine ounces for 1902.

Victoria.

The gold yield of Victoria for first two months of the current year is given at 117,540 ounces.

BRITISH COLUMBIA.

Bonndary District.

The numher of men at work in Boundary mines is heing increased. The Elkhorn has added a few men and the Providence also, making sixty men at these two properties. Both are shipping ore, say Phœnix reports. Next month new work will he started at the Oro Denoro, Summit camp, which will result in shipments heing increased to 250 tons daily. Present rate is 150 tons per day. It is reported a find of ore has been made in the Emma mine, Summit camp, adjoining the Oro Denoro. It was opened in the tunnel, started below the original quarries. J. J. Campbell, of Nelson, is manager.——Last week the first of the lot of 10-ton mine cars for use in the Granby properties were put in. They are of steel and will be used in the No. 1 and No. 2 tunnels, where the small locomotives are utilized.——The Spokane Boundary M. Co. has been organized in Spokane, Wash., to take over the Last Chance group of high-grade claims, 2 miles below Phœnix. The property is equipped with machinery and has been a shipper.—— Horses are being used at the 300-foot level of the Old Ironsides mine for hauling ore cars. When the No. 4 tunnel is connected with that level, in the course of two or three months, the horses will be taken out that way.

Cassiar District.

H. H. Jones of Victoria, manager of the Rosella Hydraulic M. Co., states that the company's representative in the section of the province, next the Yukon boundary, reports the Indians have disclosed existence of petroleum seepages. The new fields are in the angle formed by the British Columbia boundary line with that of Athahasca and Yukon Territory.

East Kootenay District.

J. P. Larsen, owner of the Tiger-Poorman group of claims, on the divide between Sheep creek and the North Fork of Wild Horse creek, near Fort Steele, is preparing to work his mines. As there is ore on the dump, Larsen proposes building a wagon road down Sheep creek to the Golden and Fort Steele road and will make shipments.——A. Macleod will start work on the Approach claim, 2 miles from Fort Steele. It is a silver-lead proposition.

Rossland District.

After three months of working test of the Elmore oil process of concentration at Le Roi No. 2 mine at Rossland, H. H. Claudet, manager for the Elmore Co. at Rossland, says the average of the low-grade ore from Le Roi No. 2 is $5 a ton in gold, silver and copper. This ore is crushed in the Chilean mills, seut through a 40-mesh screen, and then the pulp passes over tahle concentrators, where $2.50 per ton is taken out. The tahle tailings are then sent to the oil plant, where an oil concentrate running $45 is produced for shipment to the smelter. That is equivalent to an extraction of 75% or 80% of the metal in the ore, and the oil process gets 55% to 60% of the values in the tailings. The plant is of 50 tons capacity, while a 100-ton plant could he run with the same numher of men, says Claudet. There have been shutdowns because of lack of oil. The loss of oil in the process is about one gallon of oil for each ton of ore treated. The cost was $2.40 per ton for the first month's treatment. It is expected to do better than that with experience and a larger plant, and the cost will be about $1.25 per ton. The Canadian duty on crude oil having been rescinded, larger and cheaper supplies of oil will he obtained from the United States. A contract has been closed for a 100-ton plant for the White Bear mine at Rossland.

West Kootenay District.

Work will be increased on the Goldfinch

mine, near Camborne, this summer, says A. F. Rosenberger, manager. —— The third monthly cleanup of the Oyster 10-stamp mill resulted in a 300-ounce gold bar of the value of $4700. The mill was in operation 700 hours and 1160 tons of rock were treated. —— The Nettie L. and Silver Cup mines at Ferguson will resume operations and take out ore about May 1st. The reduction plant is nearing completion.

W. B. Pool and J. J. Young of Nelson, part owners of the Great Northern M., Ltd., are arranging to put in ten additional stamps with other equipment for the Oyster-Criterion mill at Camborne. The mill has ten stamps, three Frue vanners, compressor plant, waterwheels and other machinery. The mill is connected with the mine by an aerial tramway. Pool & Young are also arranging for a 40-stamp mill for reduction of the ores from their Lucky Jack and Swede groups in Poplar Creek camp. The tunnel on the Lucky Jack load has been driven in 320 feet. The breast of the tunnel has a vertical depth of 175 feet. Explorations on the Swede group have shown ore. There are fifteen leads on the two groups and all carry payable ore, says Pool.

MALAY PENINSULA.

The Government Gazette gives the following tin output for the Federated Malay States for year 1903:

State.	Tin. Pikuls.	Tin Ore.† Pikuls.	Total. Pikuls.	Duty.
Perak	162,634.82	273,435.80	436,370.62	$5,057,412.82
Selangor	133,384.32	150,890.57	292,654.80	3,364,300.00
Negri Sembilan.	43,008.21	142,488.85	85,497.07	987,005.40
Pahang.....	6,161.30	10,114.07	25,275.37	174,101.96
Totals	345,488.55	491,310.29	839,807.84	$9,582,270.07

Pikuls 128.31 wolfram were exported from Batang Padang, duty collected $32.37.

† Includes pikuls 32.37 wolfram, duty collected $32.37.

‡ Includes $30.11 duty on pikuls 28.18 tin slag.

In Pahang duty was collected on 65% of the gross weight of tin ore up to June, 1903, and from July, 1903, on 68%, and in some special cases on 65% of the gross weight.

The 1902 output was: Pikuls 335,692.80 tin and pikuls 445,998.00 of tin ore. The pikul (spelled also, pecul) is equal to 133.33 pounds.

Singapore reports say the crushing for four weeks ending March 1, by the Raub G. Co., Ltd., yielded 1100 ounces gold from 2600 tons ore.

MEXICO.

Chihuahua.

B. Davis, manager of the Corralitos L. & C. Co., of northwestern Chihuahua, together with Alamogordo and Eastern men, has organized a development company to exploit mines, timber and other resources in the Southwest, includign Chihuahua, as the North Mexican Dev. Co. B. Davis is president and D. C. Sutton, of San Pedro, Chih., is manager. The company owns the Adventurera and Santo Domingo mines, both silver-gold properties, in Sabinal district on the Sierra Madre railroad.

W. D. Pearce, manager of La Luz G. M. Co. at Maguarichic, is putting in two gasoline engines at the mines.——G. W. Boyce is putting in five gasoline engines for his several mining companies at Terrazas and Victorino.

H. E. Cary of New York, with Coleman & McKay, bought the Lluvia de Oro mine, near Urique. The mine is showing up satisfactorily. The 3-stamp mill is shut down for want of water, but machinery for the 20-stamp mill is being transported to the millsite near the mine. The difficulties about timber and water rights and a millsite have been settled.

G. W. Phillips, manager of the Calera zinc mine, near Minaca, says he has sold his interests in thirty pertenencias, near the Calera mine, to Couch, Meyer & Ellis for $12,000 Mexican. The Calera Co. will put up a reduction plant as soon as the railroad from El Carpio is built.

Grading for the mill of the Dolores mine, near Terrazas, is progressing, says Manager J. G. Hardy.

The Buena Ventura M. Co. is putting in machinery, including a hoisting plant, at its mines near Parral. J. W. Pender is manager.

Durango.

E. W. Hind says he is putting in machinery and a power plant at his group of mines at Gavilanes.

Jalisco.

The Guadalupe and La Bonanza mines have been sold to Whitney & Bruckner of Etzatlan, who will put in machinery and increase development.

A. L. Waters of Guadalajara, manager of the Keystone C. S. Co., operating near Tapalpa, says their machinery equipment will be increased.

Lower California.

The Joaquina G. M. Co. of Real del Castillo has its 10-stamp mill running steadily. The company has been developing its property for a year and a half and reports ore supplies blocked out.

Mexico.

The Aguila group in the Hostotipaquailla district has been bought by the Lawson Investment Co. of Boston, Mass. The property adjoins the Cinco gold and silver mine.

Sinaloa.

F. L. Roudebush says he has bought the Guadalupana mine and extensions at Rosario, adjoining the El Taje mines. He has secured the Bonanza and Providencia mines, the San Juan group and the San Marcus group, in the eastern part of the State of Sinaloa, near the Durango line.

Sonora.

J. E. Hubinger of New Haven, Conn., president of the Provedora C. M. Co., says the company will build a railroad from its mines 35 miles to Puerto Lobos, on the Gulf of California, and that construction work will begin this year. Hoisting machinery is being put in.

The Santa Rosa mine in Sonora, 16 miles south of Douglas, Ariz., owned by Douglas men, with T. E. Rendle as superintendent, will have a reduction plant. A 25 H. P. hoist and a 50 H. P. compressor will also be put in. A wagon road has been built from the mine to the Nacozari railroad, a distance of 4 miles. Two shafts have reached a depth of 200 feet and drifts are being run from the lowest levels.

Zacatecas.

B. C. Wheeler, formerly of Colorado, is operating a silver mine in La Norica district, near Sombrerete, under a lease and option. The bulk of the ore runs one kilogram (32.15 ounces Troy) of silver per ton. The ore is being treated by amalgamation, and a mill with a capacity of forty tons per day has been built at the mine. He is interested in the Vacas-San Marcos mines in Durango.

It is roported the San Rafael mine, near Zacatecas, will be unwatered and sinking resumed in the shaft.

PHILIPPINE ISLANDS.

G. P. Hernois, formerly of Butte, Mont., reports having located coppor deposits in the northern part of the island of Luzon, near Cervantes. He writes that since the cessation of hostilities in that section the country is being developed by American capital.

TASMANIA.

The Mount Lyell M. & R. Co., at Mount Lyell, reports, from February 4 to March 2 inclusive, a total quantity of 29,666 tons of ore was treated, being 22,106 tons from the Mount Lyell mine and 7560 tons from the North Mount Lyell mine. In addition to the above there were treated eighteen tons of purchased ore. The converters produced during same period 592 tons of blister copper containing: Copper, 584 tons; silver, 61,682 ounces; gold, 1480 ounces.

The Mount Zeehan Silver-Lead Co., at Mount Zeehan, reports February output at 435 tons of silver-lead ore, containing 240 tons of lead and 34,000 ounces of silver.

Personal.

E. Ring of Butte, Mont., is in New York on mining business.

Theodore Craig of Bouder, Colo., has returned there from Chicago.

R. B. Lindsay, a mining man of Denver, Colo., is in San Francisco, Cal.

R. M. Green of Oroville, Cal., is in San Francisco, Cal., on mining business.

G. W. Boyce of Chihuahua, Mexico, is in Boston, Mass., on mining business.

H. W. Turner of San Francisco, Cal., is examining mines at Tonopah, Nev.

Arthur Winslow, E. M., is in San Francisco, Cal., from Goldfields, Nev.

W. J. Morris now represents the Selby Smelting & Load Co., in Nevada county, Cal.

Jackson Dennis, a mine owner of Sutter Creek, Cal., is in San Francisco, Cal.

G. W. Phillips is manager of the Calera zinc mine, near Minaca, Chihuahua, Mex.

J. F. Judge of Salt Lake City, Utah, interested in Utah mines, is in San Francisco, Cal.

F. C. Ganter is superintendent of the Gold Coin mine, near Greenhorn, Baker ceunty, Or.

J. B. Farish, a mining engineer of Deuver, Colo., is in San Francisco, Cal., on business.

J. L. Bryson, recently manager of El Oro M. Co. at Maybert, Cal., is in San Francisco, Cal.

A. L. Gross, mine owner of Drytewn, Amador county, Cal., is in San Francisco, Cal., on business.

G. Daines, president of the Daines M. & M. Co., at Greenhorn, Or., is in the East on business.

H. Ballard of Mount Olivet, Sonoma county, Cal., is in San Francisco, Cal., on mining business.

W. A. Stanton of Salt Lake City, Utah, is at Hailey, Idaho, looking after mining interests.

G. H. Robinson of Salt Lake City, Utah, is visiting the Britannia mines in British Columbia.

J. Annear is superintendent of the Wood Mountain mine at Wall Street, Boulder county, Colo.

T. W. Davidson of the Oregon Development Co. is in the East on mining business from Sumpter, Or.

N. J. Brandett of Dawson, Yukon Territory, interested in Klondike mines, is in San Francisco, Cal.

N. B. Knox, E. M., has returned to San Francisco, Cal., from a professional trip to Inyo county, Cal.

J. F. Hendrickson is superintendent of the Lower Mammoth mine of Tintic district, near Eureka, Utah.

Jas. G. Hardy, E. M., superintendent of the Dolores mines, west of Chihuahua, Mex., is in San Francisco, Cal.

B. I. Potter has returned to Pine Grove, Esmeralda county, Nev., from San Francisco, Cal., on mining business.

F. T. Axtell is manager of the Carribeau and Montezuma mines at Ophir, Colo., of the Yellow Mountain M. Co.

Manager F. D. Smith, of the Snow Creek mine, returned to Sumpter, Or., last week from an extended trip East.

J. Knight of Salt Lake City, Utah, is manager of La Reine mines on Godiva hill, Tintic district, near Eureka, Utah.

J. A. McIntire of Sacramento, Cal., owner of the South Keystone mine, near Sutter Creek, Cal., is in San Francisco, Cal.

L. C. Shattuck of Bisbee, Ariz.. is manager of the Shattuck-Arizona C. Co., operating the Shattuck mines near Bisbee.

J. Ross, Jr., superintendent of the Lincoln-Wildman-Mahoney mines, near Sutter Creek, Cal., is in San Francisco, Cal.

W. A. Stanton of Salt Lake City, Utah, returned there last week from mines in which he is interested at Hailey, Idaho.

G. Kays, recently assayer of the Morning M. Co. at Mullan, Idaho, will represent the company at the Helena, Mont., smelter.

F. L. Bosqui is in San Francisco, Cal., from Goldfields, Nev., where he has been making cyaniding tests on the ore of that district.

H. De C. Richards, a mine superintendent of Orleans Bar, Siskiyou county, Cal.. is in San Francisco, Cal., on mining business.

Alfred Harvey of Denver, Colo, is erecting sampling works at the Guggenheim Exploration Co.'s plant, at Flat River, Mo.

J. L. Giroux, former manager of the United Verde C. Co. of Jerome, Ariz., has established his headquarters at Los Angeles, Cal.

R. H. Battey of Minneapolis, Minn., is president and manager of the Metropolitan G. & S. M. Co., operating near Ferguson, B. C.

J. I. Wright has been promoted from assistant to chief assayer of the Federal M. Co. at Wallace, in the Cœur d'Alene district, Idaho.

W. Zeigler, formerly superintendent of the Granite Mountain silver mine, is manager of the Ohio (Columbia) mine at Bingham, Utah.

The Fulton Engine Works, of Los Angeles, Cal., are placing a 5-stamp mill on the property of the Gold Pin M. Co., near Victor, Cal.

L. E. Aubury, State Mineralogist of California, has gone to St. Louis, Mo., from San Francisco, Cal., to install the California exhibit.

President T. S. Van Vleet of the Gold Bug M. Co. of Sumpter, Or., is in the East on mining business connected with his company.

G. C. Hazelett is general superintendent of a group of hydraulic properties in Nizina district, Alaska, with headquarters at Valdez, Alaska.

M. H. Lipman of Salt Lake City, Utah, president and manager of the Lipman M. & T. Co. at Hailey, Idaho, is in the East on company business.

D. Woodrum has resigned as assayer and chemist at the Bully Hill copper mines, De Lamar, Shasta ceunty, Cal., and is in San Francisce, Cal.

G. M. Nix, manager of the Oro Hondo M. Co., returned to Deadwood, S. D., last week, after an absence of several weeks, part of which were spent at Tonopah, Nev.

H. Murray, president and manager of the Gallatin Coal & Coke Co. at Nashville, Ill., has returned there from an examination of lead and zinc mining interests at Joplin, Mo.

Superintendent C. Oliver, of the Dead Pine mine of the Ophir G. M. Co., near Cripple Creek, Colo., has been given charge also of the Carbonate Queen mine of same company.

President J. E. Hubinger and Director F. D. Wetmore of the Provedora C. M. Co., operating in Sonora, Mex., returned to New Haven, Conn., last week from the mines.

A. B. Patterson, superintendent and manager of the Octo G. M. Co., returned to Baker City, Or., last week from attending annual meeting of the company at Wheeling, W. Va.

B. C. Cook of Deadwood, S. D., has been appointed superintendent of the gold reduction plant which the Black Hills section will have in operation at the St. Louis Exposition.

H. N. Cockrell of Spokane, Wash., has been appointed superintendent of the Washington mineral exhibit at the St. Louis Exposition, and will leave for St. Louis, Mo., this week.

N. J. Littlejohn of Lewistown, Mont., formerly superintendent of the Gold Reef mines, is superintendent of the Mammoth Group G. M. Co. in same district, near Gilt Edge, Mont.

P. A. Brady, superintendent of the Belcher and Red Lion mines near Granite, Or., returned there last week from an extended trip to New York, Montreal, Canada, and other Eastern cities.

F. A. Rankin, of Eugene, Or., interested in mining properties in Blue River and Bohemia districts and in the White Swan and California mines in eastern Oregon, has returned from a business trip to Portland, Or.

Thos. H. Leggett, E. M., left San Francisco, Cal., for London on the 29th ult. He intends to return next fall when he expects to direct large dredging operations in the interest of the Valero Syndicate, Ltd., of London.

O. N. Brown, superintendent of the Spearfish G. M. & R. Co., C. E. Heizer of the company's assay office, and M. Alber, master mechanic at the mill, returned to Lead, S. D., last week from a meeting of the board of directors in Colorado Springs, Colo.

Commercial Paragraphs.

The new offices of the Commercial Railway Equipment Co. are at 42 Broadway, New York City.

Jos. Ryan and Geo. Lynch have gone to Australia as agents for the J. Geo. Leyner Co. of Denver, Colo., to introduce the Leyner drill.

The Power & Mining Machinery Co. of Cudahy, Wis., have a contract for a new mill for the Cactus Co. at Salt Lake City, Utah, states their Denver agent.

The Crocker-Wheeler Co., through their Denver, Colo., branch, have recently sold two 65 K.W. generators to the Albuquerque Traction Co. of Albuquerque, N. M.

Delivery is being made to the Santa Fe of 100 new oil tank cars, each of 9500 gallons capacity. They are intended for the California oil fields. The Santa Fe now has between 800 and 900 of these cars. Even this large equipment is taxed at times to promptly care for the growing oil business in California and Texas.

Electric power from Spokane, Wash., will be furnished to operate an additional 500 H. P. compressed air plant in the Morning mine, 100 miles distant, this year. E. A. Rix of San Francisco, Cal., says: "Three years ago I put a 1000 H. P. compressed air plant, with 100-drill capacity, in the Morning mine. It is the largest compressed air plant in the West. The machinery has been working steadily since that time, but the output is increasing so fast that more

machinery is required to handle it. I have just finished an inspection of the works and shall immediately install a 500 H. P. compressed air plant with 50-drill capacity. It will be driven by a 500 H. P. electric motor operated by power from Spokane. The Washington Water Power Co. will furnish the power. It will be the largest electric plant in the West. It will be set up in addition to the present building of the plant at Mullan, Idaho. The contract calls for it to be in operation by September 15."

F. W. BRAUN & CO. of Los Angeles, Cal., propose to have a complete and interesting exhibit of goods of their manufacture at the St. Louis Exposition, to be held at St. Louis this summer, including all of their patented labor-saving devices for laboratory use, such as crushers, pulverizers, crucible and muffle furnaces, bullion melting furnaces, laboratory cyanide plants, gasoline, crude oil and illuminating gas burners, blowpipe outfits, etc. The display will be located near the southwest corner of the Mines and Metallurgical building.

Trade Treatises.

"Blasting by Electricity," from the Ætna Powder Co. of Chicago, Ill., describes in detail the operation of their blasting machines.

The S. S. Machinery Co., from their new home, 2464-2470 Larimer St., Denver, Colo., send illustrated description of various makes of machinery they are ready to supply.

The first edition Catalogue No. 5, from the Lake Shore Engine Works, Marquette, Mich., is devoted to hoisting engines and mining machinery, with notes and memoranda of practical value.

Bulletin No. 4 of the Jeffrey Manufacturing Co., Columbus, Ohio, protrays their makes of electric mine locomotives and other electric mining plant. Bulletin No. 5 shows similar economic device in storage battery industrial locomotives, with condensed technical information thereon.

The second edition of Catalogue 54, from the Allis-Chalmers Co., Chicago, Ill., brings out the salient points concerning the Sederholm boiler, going into the subject in minute detail. Technical tables in connection with the general subject of steam use add to the value of the brochure.

Books Received.

"Easy Lessons, or the Stepping Stone to Architecture" is the title of a little volume on the principles of architecture, by Thomas Mitchell. It is written in interrogatory style, consisting of questions and answers on the subject. The volume is profusely illustrated, and contains 92 pages of interesting reading. Price 50 cents, bound in cloth: The Industrial Publication Co., New York.

Latest Market Reports.

SAN FRANCISCO, April 1, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25½d (standard ounce, 925 fine); New York, bar silver, 55½c, refined (1000 fine); San Francisco, 55½c; Mexican dollars, 45@46c San Francisco, 44c New York.

COPPER. — New York: Standard, $12.87½; Lake, 1 to 3 casks, $12.87½; Electrolytic, 1 to 3 casks, $12.87½; Casting, 1 to 3 casks, $12.75; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £58 spot per ton.

The copper market is firm, with prices unchanged. No heavy transactions in the metal are reported. The probability is that copper will be maintained at the present price for a time, as the stocks on hand, average consumption and production are generally known, and the outlook is hopeful. Buyers are placing no large orders and sellers are offering no inducements to change their attitude toward the market. Each seems satisfied to allow the existing conditions to continue for a time.

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £12 3s 9d ℔ long ton.

SPELTER.—New York, $5.25; St. Louis, $5.00; London, £22 ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.00 @ 28.35; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 31c; less, 32c; bar tin, ℔ lb., 32½@35c. London, £127 15s spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $46.50@47.00, large lots; London, £8 7s 6d; San Francisco, local, $44@45 ℔ flask of 76½ lbs.; Denver, $48.00. Export, $42.00@42.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.85 @14.35; gray forge, $12.60; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$15 50@16 00
Foundry Northern 1	14 25@14 50
Northern 2	13 75@14 00
Northern 3	13 25@13 50
Southern 1	14 00@14 35
Southern 2	13 50@13 85
Southern 3	13 00@13 35
Forge	12 50@12 60
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 45@ 1 50
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	13 00@13 50
No. 1 cast, net ton	12 00@12 50
Iron rails	17 00@17 50
Car wheels	14 50@15 00
Cast borings	4 50@ 5 00
Turnings	8 50@ 9 00

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher: redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl. .

CEMENT.—Imported, $2.15@2.40 ℔ bbl.; California carload lots, $2.00 f. o. b. at works; small lots, $2.25 ℔ bbl. in sacks, 4 sacks to bbl.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20¼c; Astral, 20¼c; Star, 20¼c; Extra Star, 24¼c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., $1.00.

BISMUTH.—Subnitrate, ℔ lb., $2.00.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—$2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 75c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING MARCH 22, 1904.

755,557. — CONVERTING MATTES — R. H. Aiken, Jerome, Ariz.

755,456.—WATER GAGE—W. Coger, Bisbee, Ariz.

755,361.—ELEVATOR—D. E. Condon, S. F.

755,459.—HARNESS—J. Cruthers, Naco, Ariz.

755,281.—TIME SWITCH—Dilhan & Mersanne, S. F.

755,118.—BEET PULLER—C. A. Dsyle, Los Angeles, Cal.

754,982.—HEATER—Jennie A. Edwards, S. F.

755,481.—ROTARY ENGINE—G. Griescbe, Berkeley, Cal.

755,483.—FRUIT CHUTE—A. Hamilton, Alhambra, Cal.

755,500.—UMBRELLA RIBS — J. O. Larrahee, Oakland, Cal.

755,506.—DIAPHRAGM—Z. J. Le Fevre, Los Gatos, Cal.

755,030.—SHOE LACE FASTENER—C. F. Miers, Ager, Cal.

755,171.—FIRE BARRIER WALL—H. Root, S. F.

755,250.—ANIMAL LEADER — H. O. Selfert, Kings Valley, Or.

755,323.—WASHING MACHINE—L. W. Smith, Anacortes, Wash.

755,408.—COOLER—J. J. Stephenson, Winters, Cal.

755,587.—PLANE—W. Ulses, Los Angeles, Cal.

755,419 —WINDOW FRAME—T. F. Ware, Steamboat Springs, Nev.

755,340.—OIL BURNER — J. M. Younger, Oakland, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

UMBRELLA RIB CONNECTION. — No. 755,500. March 22, 1904. J. O. Larrabee, Oakland, Cal. This invention relates to the combination of umbrella ribs and independent removable tips and means for connecting the two so that any rib may be attached or detached from the top notch without disturbing other ribs.

ROTARY TURBINE ENGINE.—No. 755,481. March 22, 1904. G. Griescbe, Berkeley, Cal. This invention consists of a drum having spirally disposed grooves or passages extending around it from the center toward each end and means for admitting an elastic medium under pressure either to pass through the said spiral passages from the center outwardly to drive in one direction or from the ends toward the center to reverse the motion of the apparatus. In conjunction with this drum is a casing within which it is revoluble and valves so disposed as to admit the propelling medium either from the center or the ends and to exhaust it from the opposite ends of the passages from the point at which it is admitted. These spiral passages are peculiarly constructed so as to permit an expansible action of the medium and both direct and reactionary pressure to propel the drum.

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CROSS OIL FILTER
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DELINQUENT SALE NOTICE.

EUREKA CONSOLIDATED DRIFT MINING Company.—Location of principal place of business, San Francisco, California; location of works Placer County, California.

Notice.—There are delinquent upon the following-described stock, on account of assessment (No. 39) levied on the 12th day of January, 1904, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares	Amt.
Dixon, G. W., Trustee	455	500	$2 50
Dixon, G. W., Trustee	456	500	2 50
Martin, Alex	260	100	50
Taylor, A. W.	651	189	94½

And in accordance with law, and an order from the Board of Directors, made on the 12th day of January, 1904, so many shares of each parcel of such stock as may be necessary, will be sold at public auction at the office of the company, Room 3, 214 Pine street, San Francisco, California, on MONDAY, the 4th day of April, 1904, at the hour of 1 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

CHAS. W. DIXON, Secretary pro tem.
Office—Room 3, 214 Pine street, San Francisco, California.

Capital Wanted

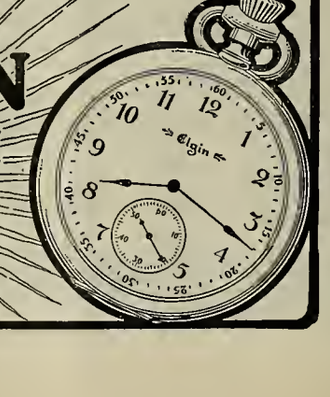
For the development of new Lead, Silver and Copper-Bearing Field, located in Coeur d'Alene Mining District, Idaho.

Plenty of timber. Money is desired to assist in locating leads, millsite, and take up water rights. For particulars, address

A. M. MUNDELL, Box 435, Wallace, Idaho.

A Place Well Won Beside the Sun

THE ELGIN WATCH



to-day regulates the world's time.

An illustrated history of the watch sent free upon request to

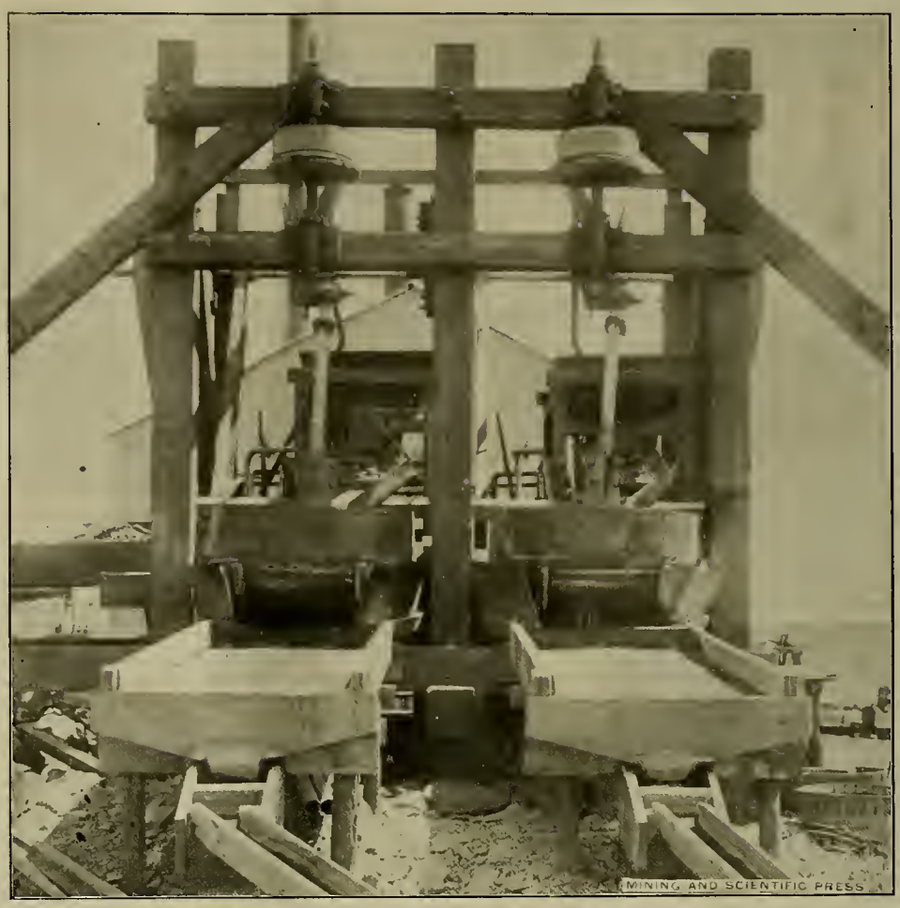
Elgin National Watch Co., Elgin, Ill.

MINING AND SCIENTIFIC PRESS.

Whole No. 2281.—VOLUME LXXXVIII. Number 15. SAN FRANCISCO, CAL., SATURDAY, APRIL 9, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

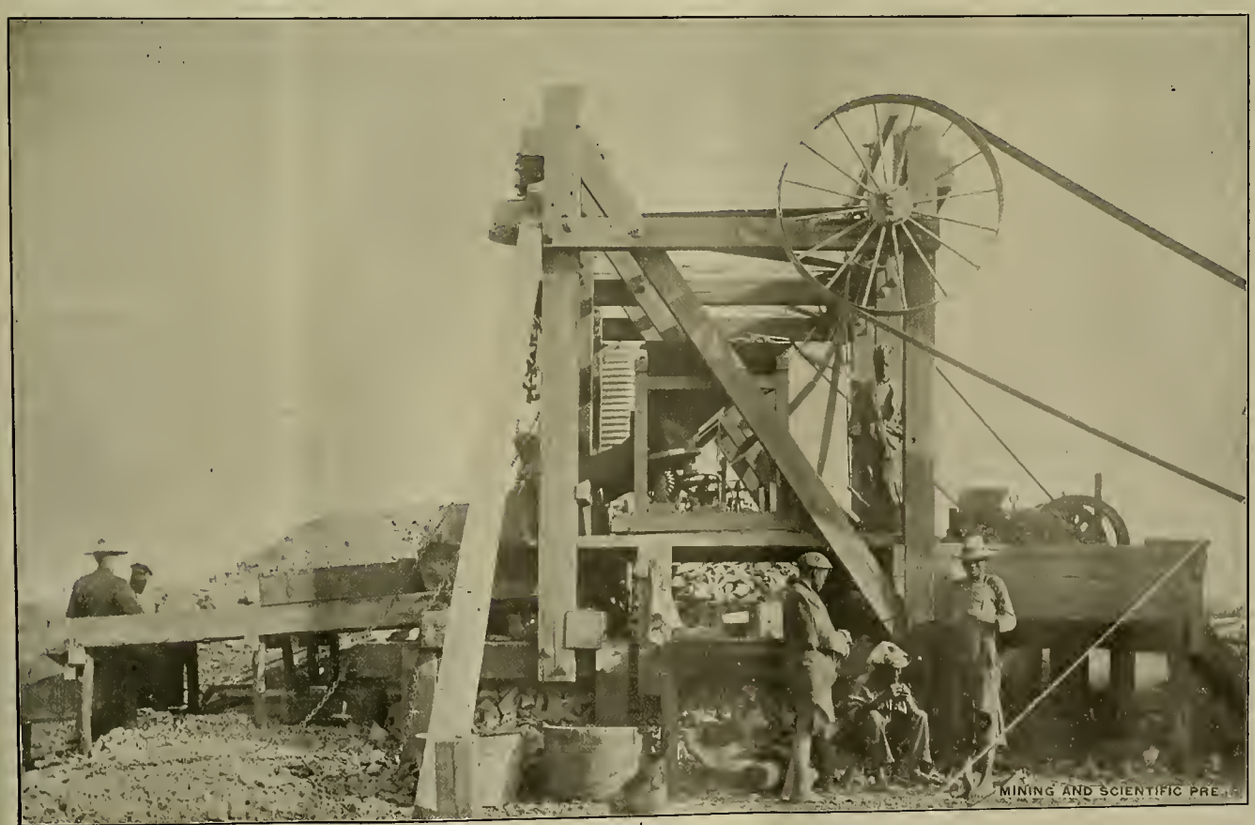
Cheap Labor vs. Expensive Construction.

It not infrequently occurs that the price of labor has an important bearing upon the methods of construction about mines, as well as upon the methods of operating a mine. Where wages are low, mining and construction methods are often permissible which under other conditions would be commercially impossible. Climate too often has an important bearing on these matters, particularly upon construction methods. The accompanying engravings illustrate a case in point. The scene is at Bulawayo, Rhodesia, South Africa, where two Kinkead mills have been set up by Fraser & Chalmers (Ltd.) of London, Eng., to grind the ore from one of the mines of that district. The mills are placed upon a substructure of heavy timbers to raise them to a sufficient height to secure the necessary grade. The ore feeder stands in the usual position, as related to the mills, but note the rock breaker which is placed a short distance above the feeder floor. All ore coming to the mill is shoveled out onto the breaker floor, fed to the breaker by hand or with a shovel, and the broken rock accumulating underneath the jaws is again shoveled onto an upper floor, and from there into the hopper of the feeder. In the United States such an arrangement would be charged to inexperienced tenderfoot management, but in South Africa the manager has a choice between cheap native labor and expensive timbers and construction, and in this case he has chosen the former. The negroes work for a few cents per day, and one might easily imagine, from their various attitudes, occupation and general appearance, that they were not discontented.



Front View of Quartz Mill at Bulawayo, South Africa.

The timber and lumber necessary to build the usual type of ore bins, with rock breaker at the top of the mill, would reach many thousands of feet (board measure), and as the freight charge alone, in addition to first cost, is about $120 per thousand, this makes mill construction very expensive in that region. The expense necessary to build the mill after the American idea, where all milling operations are performed by gravity, represents many hundred days of labor. While undoubtedly if the enterprise is an enduring one, and a large amount of ore is to be crushed, the proper mill construction would prove to be the most economical in the end, the present arrangement is doubtless a matter of expediency, and has been determined to be the best under existing conditions. In mining methods the same principles are often involved, and a system of mining is adopted which proves satisfactory and inexpensive in a country where the rate of wages is low; but, although this same system is readily applicable to mines elsewhere, the cost, due to the higher price of labor, renders it prohibitive. This is the case where ore is removed and filling placed by hand, by means of which method a wide vein of iron ore has been successfully mined in Spain; but the high cost of labor in the United States, even in those districts where labor is at the lowest, renders a method of this character impossible of adoption in this country.



A Quartz Mill in Rhodesia, South Africa.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:
NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, APRIL 9, 1904.

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Discrimination in Mine Reports.

In discussing descriptive reports of mines "on the market," it is sometimes said of the author: "His statements can be taken with much allowance—you must 'knock off' at least 50%, and then you are not safe." If this is a fact, the report is absolutely without value, as the coefficient of truthfulness is unknown, and it may as well be thrown aside. But if this man's report is unreliable, is that of he who samples the mine and reports values less than he actually finds any more entitled to absolute confidence than the former who magnifies them? Most veins and mineral deposits may be sampled with accuracy, by taking the necessary time and care. When this is done the actual assay results of these samples should be given, together with the width of each sample and a general description of the appearance of the vein and the physical conditions found at each place sampled. This makes a valuable report, whether the mine be good or bad. If good, the report is an indication of that fact. If poor, it is valuable information to know it. It seems as foolish and as unnecessary to understate as to exaggerate the values found in mine samples. The metallurgical problem is entirely separate and distinct from the sampling of the ore. Values which would indicate profit in one class of ore may be insufficient in another. Situation is another factor, as costs of mining and transportatiou may make a mine valueless for the time being, but these conditions may be changed by good roads or a railway. A mine which cannot be worked profitably through a shaft may be operated through an adit tunuel, as the expense of hoisting, ventilation and drainage are eliminated. It is not altogether the determining of the values of the ore and its amount that fixes the worth of the mine. Some years ago an elaborate report was issued descriptive of a copper property in which the statement was made that there were $11,000,000 in sight. A mining engineer was employed to investigate and he verified the report, but supplemented it with the statement that in his judgment about $13,000,000 would be required to get it out.

The Right Kind of Economy.

In all mining and metallurgical operations economy should be practiced. This is more essential in the operation of a low-grade mine or reduction plant than in one having rich ores. There are, however, two kinds of economy—that which is wisely directed and that which is short-sighted and parsimonious. The experienced manager, who must also be a good business man, does not hesitate to incur any expense in equipment or operating cost, when he can see that this expenditure will reduce the cost of production, whether it be gold, copper, iron or any other merchantable product, but the first cost, expense of maintenance and probable deterioration of any proposed investment or addition to plant should be carefully considered, and its relation to the probable output of the mine. If, for instance, a uew installation is proposed, the purpose of which will be to reduce operating cost, saving 50 cents per ton over the method in use, it should be demonstrated that the ore available will justify the expense of the change or addition to plaut. If it is known that only about 100,000 tons of ore remain, and the cost of the proposed change will reach $50,000, obviously there is no incentive to incur this new expense, for the miue exhausted, the plant remains on haud, and, if sold, will probably not pay the interest on the money invested in it. There are mines operating through small, poorly equipped shafts, where the annual expense of maintaining such shaft reaches $15,000 per annum, owing to the character of the ground through which the shaft has been sunk. There are several instances of this kind iu California, where shafts more than 1000 feet deep have been kept opeu for a decade or more at great cost, when, had a shaft been sunk in the hard wall rocks of the vein, the first cost would have come well within the aggregate expense of keeping the present shaft open during all of these years. A shaft once sunk in hard ground needs little repairs, and a far greater tonnage can be handled through it. The shafts sunk in the soft, swelling ground are constantly being forced out of line. Steel rails cannot be safely employed, and, as a result, the skips or buckets are run at comparatively slow speed. With a good, roomy shaft in hard ground, at least three times the amouut of ore, waste and other materials can be handled at practically the same expense; the mine can be worked more rapidly with a larger force underground, the top crew remaining about the same. Insurance, taxes, superinteudence, and many other expenses are no greater. When all of these things are considered, it makes the incidental expense much greater than the cost of merely keeping the old incline open. This neglect to sink a shaft in a suitable place is what may be termed parsimonious economy. It is not often the superintendent or manager is responsible for this condition of things; but the board of directors, who in their short-sightedness fail to realize the importance of properly equipping a mine. As opposed to this there are instances of extravagance in mining equipment which are equally bad. The equipment of a property with large and expensive hoisting plant to sink a prospect shaft, when it is not known auy rock of value will be discovered; the building of a large mill and construction of railroads to connect the mine and mill, before any ore has been developed, are among those of this class. Mine management requires careful, conservative and experienced men, those whose judgment may be depended upon to do the proper thing, and who are neither foolishly extravagant nor parsimonious. The saving of a few cents per ton often represents the difference between success and failure.

COPPER STATISTICS for 1903 recently issued show that the productiou for that year for the entire world was 589,361 tons, and the consumption during the same period 605,000 tons, an excess over production of 15,639 tons. This could ouly have been possible by utilizing a large portiou of the stock on hand at the end of 1902. In almost every country of the world where large amounts of copper are utilized annually the statistics show an increasingly greater amount going each year into electric construction. In Germany, for instance, it has risen from 29% of all the metal used in 1901 to 39% in 1903. Other uses show no great fluctuation in the amount consumed. It is a difficult matter to secure accurate information as to the existing copper condition. Copper, while not indestructible, is being returned to the market in the form of old metal more than any of the other base metals. This amouut varies with the price. When the price is high old copper is returned and turned out in new forms, and this metal forms no inconsiderable portion of the eutire amount annually going iuto the industries and arts.

The Alaska of To-day.

The northern papers are already reporting numerous aud rich finds in Alaska and the Northwest Territory, and the impression prevails that the movement to the Arctic region will be very large this spring. Unless new diggings, easily worked, are discovered, that section will not prove to be a good place for a man of limited means. The mineral resources of Alaska and the adjacent country are as yet little known, but sufficient has already been learned to indicate that, aside from a few exceptional spots, it is not the "poor man's country." What Alaska now needs is large capital to divert rivers, build ditches, flumes and pipe lines; construct dredgers, and to operate the mines on a large scale by modern methods. Railways and telegraph and telephone lines will follow. The mines must be opened first, to demonstrate that there is sufficient business to justify the large outlay of capital to afford these conveuiences of transportation and communication. Doubtless electric plants will also be installed to transmit power to mines and other industrial institutions. The Alaska of to-day is unlike the Alaska of early Klondike days, or even those of early Nome. The miuing methods familiar throughout the western United States have been introduced there and have been fouud as applicable to conditions in the far North as they are to Idaho, Montana, South Dakota, British Columbia or elsewhere in the Northwest. With the exception of a few important operations along the coast, vein mining has not yet been developed extensively in Alaska, but enough is already known to satisfy mining men and capitalists that that country will in the future produce a large amount of copper, coal, petroleum, and possibly also tin, as well as gold. The discovery of veins is difficult, owing to the moss and drift which covers a great portion of the country, and these difficulties are multiplied by the long winters and deep snows. Notwithstanding these drawbacks, the prospector has been at work and promising quartz discoveries have been made, the success of which will stimulate the search for others. Few people realize that the vast extent of territory covered by Alaska greater than the area of Washington, Oregon, California, Nevada and Idaho, and the indications are that the mountain ranges of this region are mineral bearing. It will be many years before the resources of the territory are developed or known.

THE Government in its suit against the Mountain Copper Co. of Shasta county, Cal., has instructed its attorney to withdraw the application for an injunction until the final hearing of the case on its merits, the copper company having agreed to pay the Government for the loss sustained. Any one familiar with the surroundings of Keswick would be surprised to learn that the forests thereabout had suffered damage from the sulphurous fumes. The timber was scattered and stunted at best before the copper company began operations there, and in the neighborhood of Keswick has mostly been cut long siuce for miniug aud other industrial or domestic uses. The general benefit to the community and State derived from the operation of the mines and smelters of the Mountain Copper Co. seems to far outweigh any damage which may have resulted to the forests of the reserve, and the expert testimony of men who are authority ou agricultural and horticultural matters determined long since that the damage to crops and fruit trees was much more than offset by the advautage of haviug the mines and smelters in operation.

CONCENTRATES.

SOLUBLE SILICATES are decomposed by hydrochloric acid, and if the solution be concentrated gelatinous silica forms.

THE mineral specimen from Silver Star, Mont., is a kaolinized quartz-bearing rock, probably granite or quartz porphyry.

BLACK FLUX, used in assaying, is a mixture of three parts flour and ten parts sodium-bicarbonate. It is employed in crucible assays.

THE small dark green mineral specimen from Grass Valley, Cal., supposed to be pitch blende, is serpentine, and contains no radium or other uranium minerals.

PITCHSTONE and pitchblende are not synonymous. Pitchstone is a volcanic glass, entirely free from phenocrysts and spherules. Pitchblende is an ore of uranium.

METACINNABARITE is an iron-black variety of mercury sulphide. It is similar in composition to cinnabar. It has a reddish-brown streak. Not a common mineral.

THE white metallic malleable metal obtained on burning the ore in the forge at Fenner, Cal., is probably metallic iron reduced from iron oxide or pyrite in the ore.

SILVER is readily tarnished by contact with sulphur or sulphurous fumes, but gold is not so affected. The so-called "oxidized silver" is really a tarnish of sulphide of silver.

THE occurrence of gold in limestone is not uncommon. There are numerous mines of this class in the Black Hills of South Dakota, and in Mono, Inyo and San Bernardino counties, California, as well as elsewhere.

STAMPS cannot be given a rapid drop with long-armed cams. The slow drop mills are provided with cams of large size, which lift the stamps from 16 to 18 inches, dropping them twenty-eight to thirty times per minute.

SOME telluride ores will show metallic gold on the surface when strongly heated, but the ore, to do this, should be rich and abundant. Finely disseminated telluride gold ore might fail to show the gold owing to the microscopic fineness of the globules.

THE best way to work a free milling gold and silver ore is by the pan process, in which bluestone, salt and mercury in the presence of heat supplied by steam are the principal factors. Silver sulphides and chlorides may be concentrated, but not readily.

THE magnetic attraction in mines is due to various causes. Track rails, iron and steel tools and machinery, and the rocks themselves in some mines, exert sufficient influence to deflect the magnetic needle, sometimes causing a variation of as much as 20° within a few feet.

THE following is given as a good flux for ordinary gold and silver ores: Dried borax, 1 pound; sodium carbonate, 1½ pound; cream of tartar (argol), ½ pound; white sugar, 1 ounce. This quantity will be sufficient for about ten charges where 25 grammes of ore are taken for assay.

THE mineral specimens from Prescott, Ariz., are: No. 1, specular iron (iron oxide): No. 2, epidote, probably due to alteration of hornblende: No. 3, tourmaline; No. 4, andesite, a volcanic rock; No. 5, quartz-porphyry; No. 6, quartz, with an incrustation of antimony sulphide (stibnite).

POLYBASITE is an antimonial silver ore—sulphur 15.0, antimony 9.4, silver 75.6. This ore is one of the complex ores of silver in which the antimony is sometimes replaced by arsenic and the silver by copper. It is iron black in color, the thin splinters cherry red. The luster is metallic.

TANKS made to hold the solution of iron sulphate, in chlorination works, should be made without nails or iron of any kind. The tank can be made by means of mortises and wedges to hold the boards tightly together. Iron is rapidly corroded by the acid and the tank would last but a short time if nailed.

A PERSON obtaining a mining concession in Mexico may dispose of the same to another in the United States, but the buyer must as soon as possible place the transaction on record in Mexico, and comply with the requirements of the Mexican mining laws which differs materially from those of the United States.

WULFENITE is molybdate of lead, occurring in tabular honey-yellow to orange-red crystals, transparent to opaque. It is found in Arizona, Nevada, New Mexico, Utah, southern California and Mexico, more abundantly than elsewhere in the United States. It often occurs in these regions with the ores of gold and silver, and prospectors are sometimes deceived when horning or panning their ores, mistaking the wulfenite for gold. It is soluble in hydrochloric acid. Wolframite is a heavy black ore, a tungstate of iron and manganese, and in no way resembling the ore above described.

GOLD is known to occur in serpentine and talc, but usually in extremely thin sheets, like the thinnest of gold leaf. These occurrences are mostly in the vicinity of a vein or fissured zone. Ore of this kind is irregular in the distribution of values and is also difficult to treat. Cyanidation by the decantation method is probably the most satisfactory way to treat such slimy ores.

SODIUM NITRATE (saltpeter) occurs abundantly near the border line of Chile and Peru, South America. It contains, beside the nitrate, sodium chloride, sulphate and iodate. Sodium nitrate is similar to potassium nitrate, but it cannot replace the latter in the manufacture of the finer grades of powder. The iodine occurring with the natural salt is now extracted separately.

THE Triassic age or formation usually consists of sandstones, shales and marls. The rocks of that age are distinguished by a red or reddish brown color. All red sandstones or shales, however, are not of Triassic age. The only minerals known to Concentrates to occur in these Triassic rocks are copper ores in the vicinity of intrusive dikes.

A SOLUTION of hyposulphite of soda dissolves lead carbonate, and other oxidized products of lead sulphide, manganese oxide, and copper carbonate, as well as silver chloride. A loose, friable silver ore containing chloride and bromide of silver might be leached satisfactorily by hyposulphite solutions. Tests should be made on fifty-pound lots, the assay before and after leaching showing the result.

THE rock specimens from Oasis, Cal., are: No. 1, quartz, evidently the result of alteration of a granular rock, such as granite or grano-diorite. It may contain gold, though none is visible in the specimen. No. 2 is a dike rock, much decayed, but probably diorite. No. 3 is quartz carrying iron oxide and showing a little malachite (green copper carbonate). This rock may also be gold bearing.

AMMONIUM AMALGAM is formed by treating a solution of ammonium chloride with a compound of mercury and sodium (sodium amalgam). It is a substance difficult to keep because of its unstability. When in the process of making the ammonia amalgam swells up, until it occupies about twenty times the volume of the sodium amalgam. It quickly breaks down at ordinary temperatures into mercury, hydrogen and ammonia.

TWENTY miners' inches of water to develop 20 H. P. would require a head of about 500 feet, though a larger amount—100 inches or more—would develop 1 H. P. per inch, on a somewhat lower head, the difference being due to friction in the pipe line. To secure this efficiency the wheel and nozzle employed should be suited to the existing conditions. A wheel either too large or too small would not produce the full power.

IN the cyanide treatment of ores, as in amalgamation, those at and near the surface are generally found to require a different treatment from those below the water line, and those of the intermediate zone are sometimes the most difficult to successfully treat, owing, usually, to the existence of more or less mineral in the form of sulphate. Often with depth silver appears in an ore which had previously been only gold bearing.

WHERE gold precipitated in the vat of a chlorination plant is of brick red instead of dark brown color, it is probably due to the fact that too little ferrous sulphate has been added. Lead, if present, will also be precipitated, and to avoid mixing with the gold, the lead should first be precipitated as lead sulphate, by addition of sulphuric acid. The clear solution is then decanted to another tank and the gold precipitated with ferrous sulphate.

IN retorting gold or silver amalgam it is not necessary to raise the heat to a point higher than necessary to volatilize the mercury. If the heat be too high the gold or silver are likely to melt and will then adhere to the iron retort and give much trouble in its removal. Mercury volatilizes at about 360° C., and gold melts at 1240° C. and silver at 1000° C., a wide difference between the volatilizing point of mercury and the melting point of gold and silver.

FREQUENTLY large ore bodies occurring within a definite zone are apparently independent of each other, being found in the form of lenses. These may appear as a succession of lens-shaped bodies following each other along a common strike, but more frequently they overlap at the ends, though they may be separated by hard and barren rocks many feet in thickness. The whole zone indicates a common origin, and what is found to be the condition horizontally is often also found to be repeated in depth.

THE Augustin process is a method of extracting silver from matte, and other products of smelting. It is accomplished by roasting the material to be treated with salt, forming the silver present into chloride, which is then leached out by means of hot salt solution, the silver being precipitated on metallic copper. By what is known as the Ziervogel process silver is extracted from roasted silver-bearing copper matte, by washing it out with hot water in the form of silver sulphate. The silver is precipitated on copper in this process also.

GOLD ORES containing considerable graphite do not amalgamate readily. Ores of this character occur in the form of lenses and zones in schists and slates. If ores of this character are crushed and run into a tank before amalgamation, a great deal of the graphite will float away on the surface of the water. The pulp may then be reground and amalgamated. The success of the operation depends to a great extent upon the amount of graphite that is disposed of. In instances where the gold is coarse, concentration without amalgamation may give good results. Gold ores containing molybdenum may be treated in much the same manner.

A LEAK in a water pipe line under pressure may sometimes be stopped by placing a band of iron, several inches in width, and supplied with lugs at the ends to clamp the band about the pipe. This band should not fit too tight, but permit of inserting sheet lead packing between the band and the pipe, which must then be calked carefully. Another method of stopping a leak on a pipe line at a joint is to turn up the edge of the outer pipe, with an old half-inch chisel, sufficiently to insert a piece of baling wire. This should completely encircle the pipe, the ends meeting. When this wire has been driven under the pipe about three-eighths of an inch a string of oakum should be caulked in and a second wire placed against it and carefully caulked. The upturned edge of the pipe may then be hammered down carefully and crimped over the wires; and if the work has been carefully done, the leak will be stopped.

A METHOD of testing zinc in ore volumetrically is to take one gram of pulverized ore, treat with 25 cubic centimeters of aqua regia in a 250 c.c. beaker; cover with a watch glass and heat until the ore is completely decomposed; remove cover and evaporate to near dryness; add 25 c.c. nitric acid containing all the potassium chlorate it will dissolve; heat gently until all of chlorine oxide has passed off and evaporate to dryness, but do not overheat; cool and add 7 grams ammonium chloride, 15 c.c. ammonia and 25 c.c. hot water; cover as before and boil one minute; filter and wash precipitate with hot 1% solution of ammonium chloride, slightly ammoniacal. If precipitate of hydrate of iron and alumina be considerable, it will include some zinc, in which case it should be redissolved in the nitric acid solution of potassium chlorate, evaporated to dryness and the residue treated with ammonium chloride and ammonia and water, as before, and the two filtrates combined. Copper, if present, will be indicated by the blue color of the solution. To remove copper, neutralize the solution with hydrochloric acid and add 10 c.c. strong hydrochloric acid in excess and place in solution a strip of sheet aluminum 2 or 3 inches square; heat solution to 70° C. until all copper is precipitated and solution is colorless; take out aluminum sheet and the solution is ready for titration with standard solution of ferro-cyanide, using the uranium nitrate or acetate solution as an indicator. Its volume should be about 250 c.c. The ferrocyanide solution is made by dissolving 45 grams of potassium ferro-cyanide in one liter of water; 1. c.c. of this solution will be equivalent to about 1 gram of zinc. The metallurgy of zinc is more complicated than that of most of the other common metals, and care in carrying out the operations must be observed throughout.

THE rocks of the earth's crust are grouped under the general terms of sedimentary, metamorphic, intrusive and volcanic. The sedimentary rocks include sandstones, shales, limestones, and certain residuary deposits, like rock salt, gypsum, Colemanite (calcium borate), etc. These rocks, when subjected to heat and pressure, are altered. The constituent minerals become changed and assume a crystalline form, and the rock becomes quartzite, slate, schist, etc. In the quartz sandstones often silica is deposited, each grain of quartz being surrounded by an envelope of silica, which assumes a crystal-like form. This is known as the re-crystallization of sandstone, the result being quartzite. This phenomenon can be studied in thin section under the microscope. All sandstones are not of this class, however, nor is the cementing material in quartzite always silica alone. Lime and iron also often act as a cementing medium. Intrusive rocks are those which are forced up into the outer portions of the earth's crust, but which are generally supposed not to have reached the surface. Among rocks of this description are diorite, quartz-porphyry, granite, etc. These rocks are called intrusive. Volcanic rocks are those which are forced up from below in molten condition, and reaching the surface overflow. These rocks are known as effusive. Types are basalt, rhyolite, trachyte, etc. There are a great many phases of metamorphism due to various causes, and it affects rocks of both sedimentary and igneous origin. Limestone is metamorphosed into marble, and diorite may be changed to amphibolite schist, clay shales may become chiastolite schist, or hard dense slate, etc. Where rocks are changed over wide areas by metamorphic processes it is known as regional metamorphism. Where the change in the original condition of the rock is due to the intrusion of igneous rock, it is known as contact metamorphism. Volcanic rocks may be solid, as in the case of basalt, or may be fragmental, as in tuffs and breccias.

Some Varieties of Wood Battery Guides.

Written for the MINING AND SCIENTIFIC PRESS by W. J. SHARWOOD.

The object of guides iu a stamp mill is to ensure the vertical position of the stems, and diminish as far as possible lateral motion and vibratiou, while reducing to a minimum the frictional resistance, both to vertical travel and to rotation. Those portious of the stems which pass iuto the guides should approximate as closely as possible to true cylinders, and, while considerable deviations are sometimes allowed, the axes of these cylinders should not only be vertical, but should lie in the same vertical plane which passes through the middle liue of the mortar bottom; the guides must be correspondingly placed.

The annexed figures, most of which are sketched without scale, show a number of varieties of wooden guides.

The earlier non-rotating mills had square wooden stems, and two pairs of parallel beams, with short crosspieces between the stems, acted as guides. Two examples of such guides, as used in the sixteeuth ceutury and taken from Agricola's treatise, are shown in Figs. 1 and 2. Almost exactly the same arrangement could be seen in Cornwall a few years ago, and is probably at the present time in use there, except that thin slips of hard wood were fastened either to the stems or guides, so as to be replaceable when worn. In some early California mills the bridge-tree was utilized to form the guide (Fig. 3).

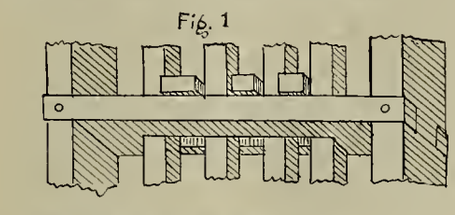
At the present time the guides proper are made detachable from the guide-beams or bridge-trees, aud the upper guide-beam is ofteu placed about 7 feet, or about half the length of the stem, above the lower—measuriug from center to center.

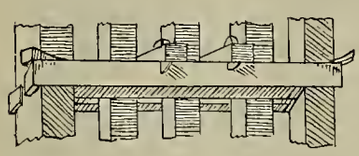
For many years most of the Californian mills were equipped with guides of the style shown in Fig. 6—solid wooden guide-blocks, 3 to 4 inches thick and 12 to 16 inches deep, each with five grooves so formed that, when the guides were placed about ½ iuch apart, the openings corresponded to cylinders of the diameter of the stems. In use they were kept at proper distance by means of keys, and held together and to the beam by collar bolts. The keys were either tapered as showu, or were flat slips of wood, or even pieces of rubber belt; if flat they were kept from slipping out by a projection, or by a nail driven through the upper end. As the guides wore, the space between them was similarly reduced by withdrawing the taper keys slightly, or by thinning the flat keys, and screwing up the nuts. Fiually, when the guides were screwed close, or if worn very irregularly, they had to be removed, faced off, and the grooves ploughed out. When adjusted or trued up it was necessary to "shim up" the back guide, so as to again bring the center liue of the stems to agree with that of the mortar. Fig. 7 gives the usual dimensions of a solid guide and beam for a 12x24-inch battery post.

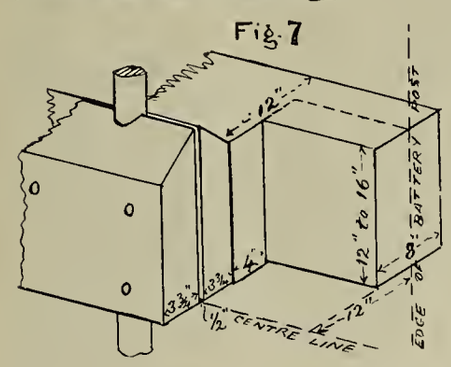
Iu some of the older mills the top and bottom guides faced in opposite directions (Fig. 4); in the newer mills the guides—of whatever make—are so placed that tbe covers are both ou the side farthest from the cam shaft (Fig. 5).

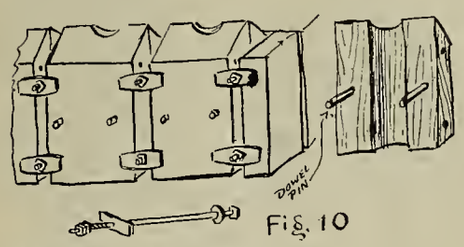
With the solid guides, especially in mills which were not furnished with an overhead "crawl" and chainblock, much time was lost in takiug off guides, as the removal of the solid front guide uecessitated the hanging up of all the stamps in a battery. With the sectional patterns any stamp can be hung up and its guides removed and replaced without interfering with the work of the others, except when the one under repair happeus to be a feed stamp. For this reason sectional guides are very much to be preferred, and a number of different styles have been devised. Some of these are shown in Figs. 8 to 15. In some, as in Figs. 8 and 11, the latter from the Camp Bird, Colo., mill, the back guide is solid, but each stem has a separate front guide or cover, the grain of the wood being horizontal; in others both back and frout are divided, and the grain vertical. Still another plan is to make the division between the two sections of each guide at right augles to the guide beam, as is done in the Acme and Fargo guides (Figs. 14 and 15), giving an end adjustment by means of wedges drawn up by bolts. The same effect is secured by the use of links and set screws in the Broughall guide (see Louis' "Handbook of Gold Milling," page 249) but both this and the Fargo have an undesirable number of parts. Another variety of the Acme, which appears to be a very satisfactory type of guide, is given in Richards' "Ore Dressing." Another class of guide has been evolved from the practice of inserting hardwood bushings into recesses in the solid guides, such as Fig. 3 or 6; an example is showu in Fig. 13, taken from a mill of English design; the Hancock and the Richards, made by the Sandycroft Foundry, are of this type. They seem to be less convenient than the forms in which each stamp has a guide which is entirely removable without in any way disturbing the work of auy others in the battery.

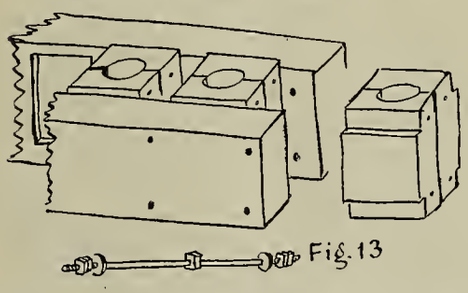
Either of the two distinct principles may be followed iu designing either solid or sectional guides; the two portions may be kept apart by wedges or keys, or the grooves may be true half cylinders, so that the two sectious must be brought close together. The latter is the preferable plan, aud is generally adopted with sectioual patterns, but in either case the covers should be tightly screwed up, so as to prevent any motion of the cover, which tends to increase the wear. If any grit is allowed to enter from above, or to splash up iuto the lower guide owing to imperfect covering of the mortar, the wear may be excessive. When once started, wear goes on with increasing rapidity, so that it is desirable to keep guides set up as closely as possible and adjust them as soon as auy play begins to show itself. The device shown in Figs. 7 and 10, taken from the Soulsby mill, of mitering the tops of the guides or guide blocks, is a very useful one, and costs practically nothing; it effectually prevents dust which may lodge on a guide from getting into the working parts. It is important to secure the guide-blocks against vertical motiou. This may be done by dowels, as in Fig. 10, if the main bolts do not pass through them. Owing to its usually wearing

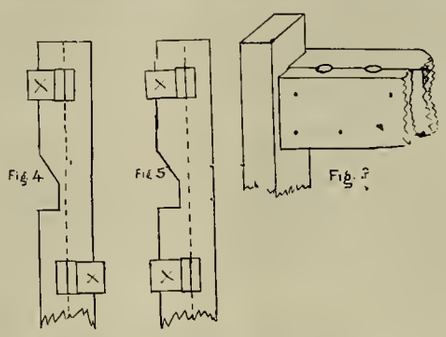


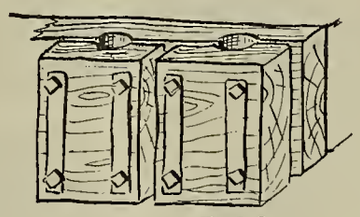


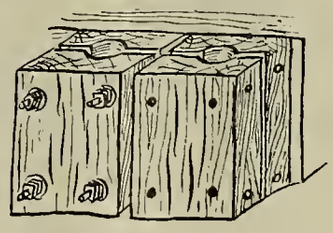


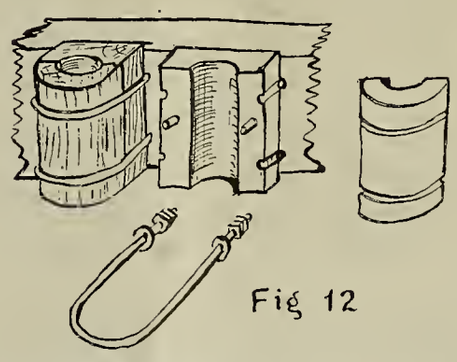


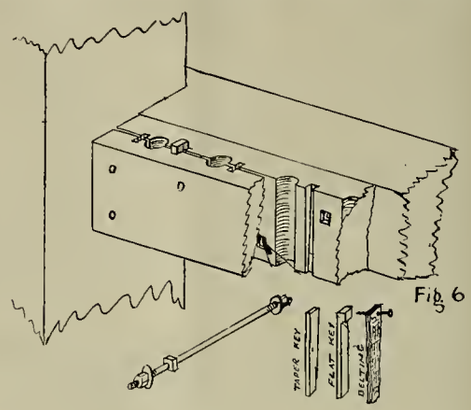


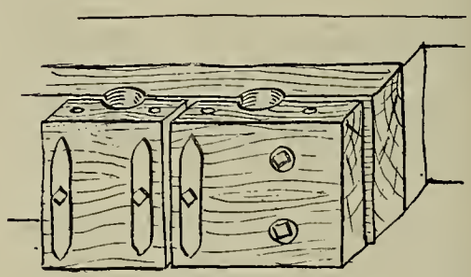


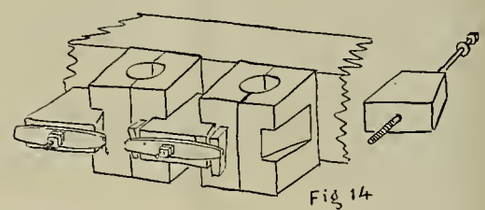


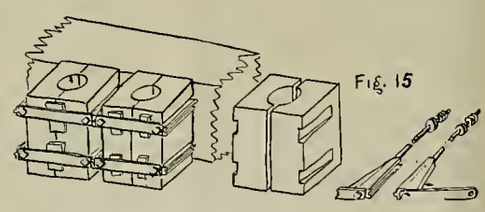












somewhat faster, it is quite a common practice to make the lower guide beam and blocks 2 inches deeper than the upper, but with sectional guides it is desirable to have as few patterns as possible, and therefore some prefer to make all of the same depth. For the same reason there are advantages in adopting some such style as Figs. 10 or 14, in which only one pattern of block is used for front and back, and for top and bottom, if these are both of the same depth.

General experience shows that the wear is less in amount and more uniform, both on stems and blocks, when the latter are made of moderately hard wood, with the grain vertical. Various woods have been used, oak, beech, pine, occasionally nut pine in California, certain varieties of eucalyptus in Australia, and maple; the latter seems to be generally preferred. Splitting is guarded against by running a ⅝ bolt, countersunk, across the grain at each end of the blocks (Figs. 9, 10, 11).

Following is a description of the several figures referred to in the text:

Figs. 1 and 2. German guides of sixteenth century for square stems, from Agricola.

Fig. 3. Guide for round stem, groove cut in main beam.

Fig. 4. Old method and Fig. 5 usual method of placing guide beams.

Fig. 6. Common solid guides, fitted with taper keys.

Fig. 7. Solid guide with bevelled top.

Figs. 8 to 12. Various types of sectionall all-wood guides.

Fig. 13. Recessed wood-frame; Sandycroft type.

Fig. 14. End-adjusting guide with wood wedges; Acme type.

Fig. 15. Fargo guide, end-adjusting, with tongued and grooved iron wedges.

The Crown King Mill, Yavapai Co., Ariz.

The Crown King mill, illustrated herewith, lately taken over by an Eastern company, with G. F. Shurtleff, manager, is at Crown King, in a section of the Bradshaw mountains, southeast of Prescott, being opened up by the Bradshaw Mountain Railroad. The rails will soon be laid to this point and development of the district will again be under way. The

The Crown King Mill, Yavapai County, Arizona.

mill has been entirely remodeled and the first work will be treatment of the old tailings dump of the Crown King mine, estimated at about 40,000 tons. The tailings dump has been tunneled and a belt elevator installed so as to handle them with economy. The tailings will be passed through a Jeffrey drier to a storage bin, and from this by plunger feeder to Dimmick classifiers and then onto Wilfley tables and Frue vanners. The concentrates will again go to a drier, then to storage bin and roaster. They then pass to magnetic separators and the zinc product is handled separately from the iron. The process has been specially adapted to the conditions there. It is expected that treatment will be commenced by July 1. The company is said to have under consideration the taking over of the Crown King mine also, and in addition has an option on the Tiger group, consisting of seven and a half claims and mill of the Tiger Gold Co. in the same vicinity.

THE next meeting of the Idaho State Mining Association will be held at Boise, Idaho, on the 19th and 20th inst.

Radium Ores in Utah.

Written for the MINING AND SCIENTIFIC PRESS by DON MAGUIRE.

Since the discovery of radium in uranium ores by the Curies of Paris, much interest has attached to uranium deposits everywhere. Some weeks ago, accompanied by an assistant, I visited the carnotite deposits near Richardson, a small hamlet in Grand county, Utah, and made an inspection of the interesting deposits which have been opened there.

Richardson is reached by wagon from Cisco, a station on the Rio Grande-Western Railroad, about 250 miles southeast of Ogden, in a region of red sandstones. Richardson is 30 miles distant from Cisco, in a direction a little west of south, and near the Grand river. Large tracts of land in the country between Cisco and Richardson have been located for oil, but without profitable result as yet.

At Richardson we found J. H. Loftus of the Welch-Loftus Rare Metals Company, who accompanied us and afforded us every opportunity to inspect the properties of the company, situated amid low hills about 3 miles to the southeast. The formation is sandstone, mostly red; but the mines occur along the crest of an anticline, which has been eroded somewhat, exposing lower strata of whitish-gray sandstone. The axis of the uplift is about east-west.

In the gray sandstone are numerous fissures, due to the flexing of the rocks along the anticline, some wide and some narrow, exposing a rich yellow mineralization. These upon being opened by mine workings are found to widen with depth, and the mineral thus exposed is carnotite (uranium oxide), the mineral from which radium is produced.

Radium once seen is never forgotten. There is no other mineral or ore just like it. There is a saying among placer miners that many things resemble gold, but that gold resembles nothing else. This is true of uranium oxide, or radium-bearing carnotite. There are many minerals bearing some resemblance to carnotite, but carnotite resembles nothing else. In color it is a bright, beautiful canary yellow, once seen never to be forgotten. Seen massive or in its frequently scaly state, the smallest fragment attracts the eye and can not be mistaken for anything else. At times its rich yellow or orange changes into a yellowish green, and this has the same appearance peculiar to itself.

At the mine known as the Rare Metals Group we found much work done, chiefly prospect holes along a distance of half a mile in length and less than 100 feet in width; but in each of these uranium oxide is present. The main shaft is about 100 feet in depth. The mineral shows the full width of the shaft to the bottom. A drift is driven to the east 50 feet in the ore. Near the mouth of this shaft there is a dump rich in coloring, and at the time of our visit about 200 sacks were piled ready for shipment. There are one or two more workings east of the main shaft in which ore shoots are prominent, and in the prospect holes to the east and west we found ore abundant where any work had been done.

A close examination of the ore piles disclosed the fact that both silver and copper are associated in this ore. Copper occurs native and as chalcocite and malachite, and, with it, silver, as black sulphurets.

Investigation over the region proved that a mineral zone extends a distance of 140 miles in length and 50 miles in width. It extends eastwardly into Montrose county, Colo., where at the silver-copper-bearing mines of Paradox valley silver-copper ores of richness are now being worked by an Eastern company, and adjacent to these mines at Paradox the ores of carnotite also occur.

At Paradox valley, in Colorado, uranium sulphide, carnotite and pitchblende, from which radium is obtained, exist in amorphous masses.

In these white sandstone reefs small pipes leading from other lenses are evidence of currents having been present in every case, and these lenses are in thickness varying from ¼ inch to 3 inches and in extent from 1 foot to 10 feet. I have been informed that some lenses have been discovered in which the yellow caruotite exists in masses 1 foot in thickness; but we did not see any such examples. In the mines opened up at Richardson very little amorphous carnotite occurs. It is wholly in a crystallized form, occurring as scale-like crystals along the minute fissures in the mineralized sandstone.

This Montrose county, Colo., and Grand county, Utah, region is the most extensive area of our country where these radium-producing ores are known.

At Richardson, Utah, the lode in which we find these ores strikes across the country slightly south of east and north of west. We followed its course to the north side of the Grand river, where in the high cliffs the mineral is exposed, and we found small inclusions of covellite, bornite and malachite associated with the orange-colored carnotite, and invariably these copper ores run high in silver. To the east and southeast similar ores occur along the strike of this lode into Castle valley and continue down into Paradox to the southeastward, where, as stated, the radium-bearing ore appears in more massive state.

There are other localities in Utah where caruotite is found, namely, near Vernal, on Ashley's Fork, Uintah county; also in the country lying east and north of the Henry mountains, in Garfield county; also at the old mines of Silver Reef and near the town of Washington, in Washington county. In every case where it is found it occurs in white or gray sandstone and usually associated with silver and copper ores. With it are found traces of organic matter showing the imprints of ferns, palm leaves, cones and of other organic remains. The carbon in such cases, it is thought, acted as a precipitant for the silver and copper.

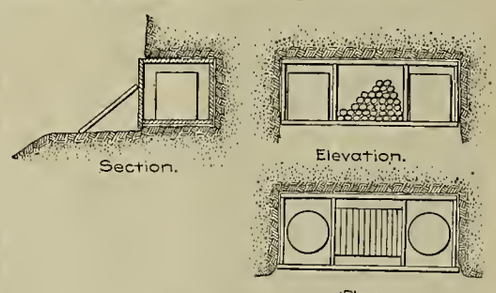
The area favorable for the production of carnotite in Utah, Colorado and Arizona is about 35,000 square miles, much of which has never been explored, as it is cut by tremendous canyons and favored with neither wood, grass nor water.

The region described is that in which the cliff dweller made his home, and he who passes through this desolate but most interesting country sees on every high plateau, in every canyon and along the narrow strips of arable land skirting the canyons the cliff dwellings of a people long since gone.

Thawing Dynamite.

The danger attending the thawing of nitro powder is becoming better understood each year and fewer accidents due to this cause are chronicled now than formerly. Still, new men are constantly coming into the mining business and a word of caution and advice on the subject is always appropriate, though the "old hands" are more prone to carelessness than the new ones. The following, written by J. H. Harper, in Engineering News is of interest:

Some four or five explosions of from one-half to two boxes of giant powder have occurred upon work under my supervision within a period of about five



Device for Thawing Powder.

years, all, very fortunately, without fatal results, though in at least two instances a very slight change in time or circumstances might have resulted in a very distressing accident.

During the past winter I noticed that J. McCrimmon, while working upon a cut a short distance east of the Mullan tunnel, on the main line of the Northern Pacific Railroad, in Montana, was using an arrangement for thawing dynamite that apparently gave entire satisfaction, and I enclose herewith sketches thereof.

Mr. McCrimmon found a pit in the ground which he utilized for the purpose, but I show it as cut into a bank, although the box might be used on level ground and covered with earth to a depth that will secure an even temperature. The box is constructed of such materials as are generally available. The cans

used were discarded powder cans, but coal oil caus answer quite as well, and almost any discarded vessel will answer.

Twice a day, or oftener, if necessary, the water is turned out and the cans are filled with boiling water. The powder is piled between the cans, as shown, or the chamber may be made large enough to receive one or more unbroken boxes of powder. Where the ground will stand, the exterior box shown is not required unless it be to assist in making the door with which the front is closed—air tight. An old blanket or tarpaulin will often serve this purpose well.

The idea is not altogether new, perhaps, as I have seen many arrangements very similar to this, but none, I think, which is more easily made, of material usually available and which is, so far as I can discover, without an element of danger that is not inherent within the powder.

A small air tight pit of this construction will, with little attention, keep a constant supply of powder in perfect condition through as severe weather as men are likely to wish to work. The Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo., furnish a powder thawer that is safe and effective.

Cyaniding Gold-Bearing Sulphurets.*

NUMBER II.

Written by S. B. Christy.

Any one may extract with a large magnet the magnetic particles of metallic iron in the center of the rusty aggregates found in vanner concentrates. An electrolytic action seems to be set up by the presence of the metallic iron in the damp ore, favoring the formation of ferrous salts.

I took a powerful magnet and ran it through the concentrates as they came off from the vanner at the Melones. I took about 5 grams of this magnetic product, mostly iron, with some sulphurets sticking to it, put it into a beaker with about a tumbler full of cyanide solution, which on the 19th of July, 1899, assayed 0.55% cyanide at 2:30 P. M.; at 4:45, a little over two hours later, it had dropped to 0.45%; at 6 o'clock it had dropped to 0.35%; and the next day, twenty-four hours later, it had dropped to .005%. That very clearly shows the destroying effect of this agent.

I took some concentrates of this same ore which had been allowed to accumulate. This was sent down to me at the University of California, and I ran them through a small magnetic separator. I got out a large amount of magnetic material, most of which was metallic iron, iron rust, etc., and I had one of my students treat that in a leaching tube for a week. No cyanide came through until after a week had passed. That is, the cyanide solution was destroyed during its continuous passage through these iron filings for over a week, and the extraction of gold was nil. That showed how important is the removal of the metallic iron from the sulphurets. Not only does the iron in a fine state of subdivision destroy the cyanide, but it absorbs oxygen from the air, which is necessary for the solution of the gold. So, it acts badly in two different ways. Before I understood that I had some very contradictory results. I ground the concentrates in an ordinary amalgamating pan, as one would do with silver ore, and on getting it fine enough, if I used cyanide enough, I got a good extraction of gold, but the destruction of cyanide was so high that, until I made the discovery of the cause of it, I did not see any way of making the extraction practicable. But I think that it can be very readily solved.

There are two principal ways by which we can crush the concentrates as finely as we wish without using any iron in contact with the ore we wish to crush. One is by using the arrastra and the other by using the flint mill, or the revolving tube mill, by which the ore is crushed by boulders of quartz or flint without coming in contact with any metallic iron. While these two methods are mechanically very primitive, they do the work satisfactorily, and I think could be improved mechanically by a little ingenuity. The arrastra I have used is not the ordinary rough arrastra, such as is built out of rough stones by the Mexicans, but one built in an iron frame by lining it with a layer of 6 inches of concrete. I crushed up some granite and made a strong concrete about 6 inches thick and lined the whole arrastra with that. Then as mullers I use blocks of basalt, or blocks of artificial stone made out of concrete, and these are dragged over the surface, and the ore is crushed to an impalpable powder. I have ground the ore for various periods of time, sometimes eight hours, some times twelve, sometimes twenty-four, and in this way I have been able to produce a product which is fiuer than you could ordinarily get a sieve fine enough to sift it through. It is much finer than 200. One hundred is not fine enough—the finer it is ground the better. It does not need to be sieved. When I wish to size it I do so by an uprising stream of water. This washes out all the slimes, and the coarse particles are reground, if necessary.

I have always found after cyaniding that the coarse sulphurets carried the value, and that the values in the fine were extracted very readily.

The arrastra is a very efficient grinding machine, although very primitive. It will do good work, particularly on sulphurets which are not hard to grind. The arrastra can be built very cheaply, made of quartz battery sand on the spot, aud if it wears out can easily be replaced by putting in a little more concrete in the worn places, so the cost need not be excessive for the grinding machinery. The cost for power is also very light, if you have water power available.

The other method of grinding is one used by paint and drug manufacturers. That is the ordinary flint mill. Constructed for these purposes it is very expensive. It is a revolving cylinder lined with porcelain liners, in which there are round pebbles of hard flint, but as constructed for our purpose, it could be easily improvised from a revolving cylinder made of iron, lined on the inside with concrete with loose quartz boulders inside, such as we get in our gravel mines, instead of the flint pebbles. In this case the discharge can be regulated by the amount of inflowing water through hollow trunnions; the right amount of water can be allowed to flow through the machine and wash out only the finer slimes. Which of the two will prove the most satisfactory depends on local conditions.

The fourth idea, then, is that iron must not be used in grinding. We must grind in some machine which will not produce iron filings.

Fifth, the solution of the gold.—This part of the operation, if properly done, is not very difficult. The gold cannot be extracted by downward filtration, for the reason that the ore is so fine it practically resists filtration. I have had a layer of slimes not more than ¾ inch thick, through which I was able with a pressure of 300 pounds to the square inch, to force through a filter about 6 inches square more than one or two drops of solution per minute. So you can readily see that it is not filterable. Some variety of agitation is necessary. You are familiar with the traditional agitator, which is a set of revolving arms contained in a cylinder, such as was formerly used to separate amalgam from the pulp from amalgamating pans. This is used in many cyaniding plants successfully, but it is troublesome, because if the machine is allowed to stop, the pulp all settles to the bottom and packs like hard cement, and is extremely difficult to get in agitation agaiu.

Another method would be a revolving barrel, the barrel containing the ore and water in suspeusion. On rotating that, it is kept in agitation very readily, and if it settles it cau be easily stirred up by rotating it. That is a practicable method, but only practicable with small quautities of ore.

The method I have used and found most satisfactory is to use a cylindrical vessel with a conical bottom—that is, a cone making an angle of about 130°, with the cylindrical sides above. Into this cone-bottomed cylinder the ore is dumped with the cyanide solution, and is stirred by mcans of compressed air. A pipe reaches to the bottom, and in this way the air is forced down to the point of the cone and rises up through the mass and produces a circulation of the whole contents. The largest sized vessel I have used is a tank 18 inches in diameter. If it is made larger than that I apprehend several air jets would be required, but with one of that size I was enabled to get good circulation with one jet. The pressure of the air is very slight. It is only cqual to the column of water that is to be lifted, only a few pounds, and where one has a water pressure it is very easy to make an air compressor out of the jet pump. You don't need to buy an expensive air compressor for the purpose. One would think that the passage of the air through the cyanide solution would cause a great loss of cyanide. And so it would if the cyanide solution were strong, but with the weak solutions I have used I have found the loss is only nominal, and if the air which is used can be caught and used over again, practically no loss of cyanide would ensue, even with strong solutions.

The use of the air as a stirring means is also advantageous, because it produces the necessary oxygeu for the solution of the gold. Under favorable circumstances, with ores which were amenable to treatment, I have extracted 99.9% of all the gold present in the sulphurets, sulphurets showing $40 or $50 in half an hour, and even in less time than that. I have taken the volume of the gold solution there and the assay value of the solution in it, and accounted for all the gold up to .1%. As a matter of fact, I find it usually necessary to allow about three hours for treatment—that is, the circulation of the pulp by means of compressed air usually lasts about three hours, and in all except the very difficult ores that suffices, and we get the gold dissolved in this way very readily. I have not found it necessary to resort to any oxidizing agents (although I have used them of all sorts, including bromo-cyanide, peroxides of sodium, of maugauese, of barium, and other chemicals), but I have found the air the most efficient and cheapest of the oxidizing agents, and I have not found anything else give much better results. I have usually used diluted cyanide solution, and I have extracted most ores with solutions that did not go higher than .1% cyanide. Once in awhile I have had to use .2%, but usually only .1%, which is much lower than was formerly supposed to be practicable with such rich ores.

The solution of the gold after you once get the sulphides in a fine state of subdivision is comparatively easy. It is the easiest thing connected with the whole process, but the next step is not so easy—and that is: The removal of the cyanide solution from the ore. That is a part of the operation which has given me the most trouble, aud will surely do so in any case. As I have stated, the fine state of subdivision of the ore is so great that filtration downwards in the ordinary way is impossible. The use of the filter press is possible in some cases, but I consider it from my experiments rathcr impracticable. If the ore is coarse enough to use the filter press, it is usually not fine enough to get the gold out. You are familiar with the filter press. It is a machine in which the ore is pumped into filter chambers, which are not more than, say, 1 inch or 2 inches wide and from 1 to 4 feet square. There are filter cloths on each side of the chamber, backed up against a grooved plate, and the solution passes through the cloth and leaves the ore behind. The solution is pumped in under pressure. Although it has been successfully used on many ores, and if we were to mix the slimes with quartz sands we might be able to use a filter press, I think on the whole it is not the best mode of treatment.

The simplest method we can possibly use is decantation. That is, instead of trying to let the material filter, we let it settle, and as the sulphurets are very heavy and the quicklime used to neutralize the acid helps to settle the stuff, it settles perfectly clear. The clear solution can be drawn off and sent to the precipitation tanks, but the ore is so fine that, let it settle as long as you please, it always holds a large amount of solution in its pores. The amount of solution left in these fine slimes varies from one-half ton of solution to a whole ton per ton dry pulp. If the ore is extremely fine, unless much time is given for settling, it will hold nearly a ton of solution. This solutiou contains gold and contains cyanide which must be removed. The most convenient method I have found to operate is to use the solution cylinder with cone bottom for the decantation processes—that is, I decant in the same vessel in which I dissolve the gold. I have this cylinder coming dowu to a conical point at the bottom. In this I have a stand-pipe reaching up above the top of the solution, and at the bottom this is ordinarily closed. On top of the stand-pipe, and outside of it, I put another piece of pipe a little larger than it for blowing air in. Ordinarily I had the stand-pipe filled with water and stopped at the bottom, so when I blow air in the air goes down on the outside of the stand-pipe and emerges at the bottom, bubbling up through the ore, circulating the pulp and dissolving the gold. When I wish to decant the solutiou, I let it settle for three or four hours, or possibly in some cases over night, and the mud all settles at the bottom. At first it lies perfectly flat at the bottom, but as the deeper part contains more precipitate, it finally settles in the form of a flat coue, flatter thau the big cone. On disconnccting my air pipe from the air compressor and producing a vacuum by air pump, I produce a siphou out of the outer and inner pipe. That is, the solution is sucked up the outer pipe and goes down the inner pipe and the solution, clear and freed from mud, flows out through the stand-pipe and runs away to the precipitating tank. I lower the air pipe gradually down, following the water as it goes down very carefully, and in this way, using a tank with a conical bottom, I can run it down to the very bottom of that mud cone and take off all the clear solution. In that way I have been able to decant off much closer thau you could possibly do in a flat-bottomed tank. Practically all the solution runs out of the cone, and I don't lose possibly more than a teaspoonful of the clear solution. It is very important to make that decantation as complete as possible. I then fill the tank up with fresh water and stir again with compressed air, lowering the pipe down gradually to get it all in suspension, and let it settle again, and repeat the process of decantation as many times as may be neccssary to draw off the cyanide solution.

Now, there is an important principle regarding this decantation which is worthy of careful study, and I shall try to explain it.

That is, the rapidity with which gold-bearing solution is extracted depends upon the proportion existing between the volume of solution drawn off each time to that left in the pulp. Suppose I have one ton of ore and ten tons of solution in the tank. That is more than necessary, but to illustrate what I mean I will suppose that. I can now draw off nine tons of water, leaving one ton of solution behind. I will call that a decantation co-efficient of one-tenth. That is, there is one-tenth of the gold-bearing solution left in the pulp, and I draw off nine tons. I decant once, and I have left in the solution one-tenth of all the gold-bearing solution there was originally. I decant again, and I have one-tenth of that, or one-tenth of one-tenth, or one one-hundredth. That is, there is one oue-hundredth of the gold solution left in the ore. A third time would give me one-thousandth. A fourth time one-ten-thousandth. And a fifth time one one-hundredth-thousandth. Now, let me call your attention to the large amount of solution that would be necessary for this ratio. The first time I would have run off nine tons, the second eighteen, the next time it would amount to twenty-seven, then thirty-six, and finally forty-five. That is, to handle one ton of ore in that way I would have to handle forty-five tons of the solution. The bulk of the solu-

*Abstract Trans. Cal. Min. Ass'n.

tion is something enormous, and the time of the decantation very great. To diminish this, suppose I go to the extreme limit and have only two tons of solution to one ton of ore. If I let that settle I draw off one ton. I have one-half left. The second time I have one-half of the half, or a quarter. The third time one eighth, the fourth time one-sixteenth, and the fifth time one-thirty-second. That is, there would be 3% of the original solution left in the ore in five decantations in this case. But here I would use the first time one, the second two, the third three, and the fifth time I would have five tons of the solution which I would have to precipitate. So you can see if I make my decantation co-efficient small, that is one-tenth, I get quick removal of the solution, but I have a large quantity of the solution to handle, and to precipitate. I have generally found that a decantation co-efficient of about one fourth is practicable. That is, I would have four tons of solution to one ton of ore. I decant off three tons each time, and that way I would bring it down to about 1½% in three decantations, and would have only nine tons of solution to precipitate per ton of ore.

(TO BE CONTINUED.)

Wet Methods of Extracting Copper at Rio Tinto, Spain.*

NUMBER II.—CONCLUDED.

Written by C. H. JONES.

Each series consists of three tanks in parallel arranged so that the liquor can be divided up and passed along as many tanks as necessary, depending on the quantity of liquor that is being run through and on the varying temperature of the liquor with different seasons, the hotter the solution, which in summer reaches 100° F., the faster the rate of precipitation. Each tank is about 320 feet long, 5.5 feet wide by 2.25 feet deep, and has a slope varying from 2 per 1000 in the first series to 11 per 1000 in the last, the reason for the increase in slope being, that as the liquor becomes impoverished in copper, the free acid present is more active in wastefully dissolving the pig iron—an action which is considerably diminished by increasing the velocity of the liquor by means of the increased slope of the tanks. The tanks themselves are made of 9x3-inch boards attached to wooden frames set in cement, the space between parallel tanks being filled in with stone and cement, constituting a wall supporting the sides of the tanks.

The Method of Removing the Cement-Copper from the Precipitating Tanks.

The accompanying engraving shows the method of removing the cement copper.

No metal is used in the construction, hard wooden pegs being employed to attach the boards to the frames. The spaces between the boards are carefully calked with oakum and pitch in order to render the tank water tight. At each end of the tank is an arrangement by which a door can be dropped in and luted so as to cut out that particular tank, and there are also wooden plugs that can be removed so that the liquor from that tank can be run off, thus allowing for the removal of the precipitated copper. A few old boards are placed on the bottom of the tanks for their protection and on these are piled up the pigs of iron which are laid across the tank at the bottom, the next layer being at right angles to the first, and so on until the tank is filled; each foot-length of the tank contains about one ton of iron. The liquor is allowed to run through the system of tanks and needs no attention except to remove the precipitated copper and to add fresh iron. The "salida" liquor containing from 15 to 20 grams of copper per cubic meter is allowed to run to waste, for the reason that about this copper content the amount of iron required to precipitate the copper equals the value of the copper recovered. Daily some of the tanks are cleaned out by being closed as described above, the liquor meanwhile passing down the other tanks of the series; the liquor is run off into settling tanks, any copper in suspension being there recovered; all of the iron is removed from the tank and piled on to the dividing wall, at the same time the copper adhering to the iron is knocked off and thrown back into the tank. The dirty looking precipitate is then transferred to the cleaning and concentrating plant, the iron is replaced in the tank and the liquor again allowed to run through it. This crude precipitate, containing about 70% copper, is thrown, a little at a time, on to a perforated copper plate placed at the head of a long launder or tank and is washed through the plate by a strong stream of water from a small nozzle. The material that does not pass through the screen consists of leaf-copper and small pieces of iron; this material is thrown into a heap and afterwards sorted over by girls who remove the pieces of iron. The precipitate that passes into the launder is repeatedly turned over against the stream of water and by this simple means a concentration is effected.

The first few yards of the launder contain a red precipitate known as "No. 1 precipitate," containing 94% copper and less than 0.3% arsenic; following this is "No. 2 precipitate," containing 92% copper and between 0.3% and 0.75% arsenic, while below is the "No. 3 precipitate;" this is in a state of very fine division and contains on an average 50% copper and 5% arsenic. This last named portion, which carries all the graphite from the pig, contains the bulk of the antimony and bismuth that is also precipitated from the liquors. Classes Nos. 1 and 2 are removed to the drying sheds and are bagged for shipment to the refinery; the No. 3 precipitate is removed, moistened with acid liquors, made into balls by hand and dried in the sun. These balls become cemented hard and can be readily transferred to the smelter, where they form part of the charge for the blast furnaces and are run down to matte to be subsequently bessemerized, thus effectively removing the arsenic, antimony and bismuth that they contain.

The reactions that take place in the cementation tanks are given in equations 5, 6 and 7.

The first reaction that occurs in the liquor running over metallic iron is the reduction of the ferric sulphate to ferrous sulphate, the final result being in accordance with the equation:

$$(5)\quad Fe_2(SO_4)_3 + Fe = 3FeSO_4.$$

This action causes the consumption of the pig iron without any corresponding yield in copper, and consequently should be avoided as far as possible by having all the iron in the ferrous state.

The second reaction is the precipitation of the metallic copper, brought about by galvanic action. The iron becomes coated with copper, and thus the iron and copper in the acid liquor constitute a galvanic couple with a considerable difference of potential. It is due to the electrolytic action that the copper and all other metals present that are electro-negative to iron will be precipitated. The ultimate action of the precipitation may be chemically expressed by the following equation:

$$(6)\quad Fe + CuSO_4 = FeSO_4 + Cu.$$

Besides the reactions above mentioned there is one which causes the liberation of hydrogen, as evidenced by the bubbles of gas that may be observed to arise in the tank liquor. This action, which causes a wasteful consumption of the iron, may be expressed as a final result by the following equation:

$$(7)\quad Fe + H_2SO_4 = FeSO_4 + H_2.$$

These three equations constitute the main reactions that take place in the precipitating tanks.

While the liquor is fairly strong in copper, the copper is mostly precipitated in a coherent form, but in the later stages as the liquor becomes impoverished it is precipitated in a powdery state—a condition which is more effective in its galvanic action with the iron, and thus unfortunately causes a larger precipitation of arsenic and other impurities than in the earlier stages. In the later stages also the "solution reaction" of iron in sulphuric acid as given in reaction No. 7 goes on to a proportionately greater extent than does the precipitation of copper, and consequently the cost of pig iron in precipitating the copper varies inversely as the quantity of copper in the liquor.

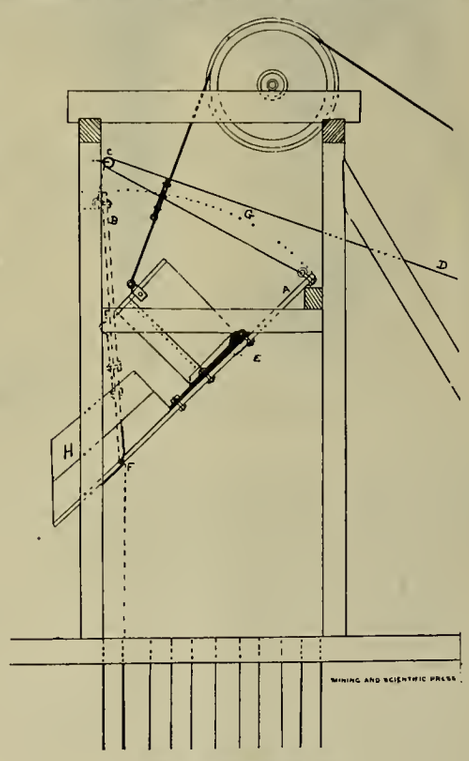
By keeping careful watch on the reduction as far as possible of the ferric iron before the liquor enters the tanks, and by giving it sufficient velocity through the tanks, a strongly acid liquor such as given above during a year's working will not consume more than 1.4 units of pig iron (containing 92% iron) to 1 unit of copper precipitated. A valuable check on the iron being consumed can easily be kept by the laboratory, by analyzing the liquors before entering and after leaving the tanks, and from these analyses the quantity of iron that is being consumed can be calculated.

This description of the methods of leaching and precipitation that are now used at Rio Tinto is offered in the hope that it will prove of interest and value, especially so in view of the fact that most of the information heretofore published pertaining to these methods has become obsolete.

*Abstract Trans. Am. Inst. Min. Engs.

An Automatic Bucket Dumping Device.

About many small mines the problems of economy are closely studied, and the inventive faculty of the superintendent is taxed to find ways and means of doing things economically. At a mine where shaft sinking only is in progress, or a small number of men



Bucket Dumping Device.

are employed underground, there are sometimes several hours when the hoisting engineer is idle, but he cannot leave his post, for at any minute the signal may come from below to "hoist," "send down tools," "send down timbers," or some other requirement, and he must be at or near his post. He has abundant time to keep the engine clean and to prepare during the day for his partner of the night shift. In such a situation it is obviously extravagant to have an additional man on top who one-half of the time will be unemployed, or if he hustle in wood from the outside pile, clean the lamps for night, level off the dump, help in the blacksmith shop, or do other odds and ends about the place, it only affords additional leisure to the engineer. There are mines, however, where one man on top attends to the entire work to be done. He is hoisting engineer, carpenter, timber-framer, blacksmith, carman, fireman and general roustabout, and sometimes adds to these duties the responsibility of superintendent. To accomplish this is only possible by the employment of mechanical devices to take the place of men. The accompanying sketch shows an arrangement whereby a man at the hoist may raise the bucket filled with rock, dump it, and send the bucket back into the mine without leaving his post at the throttle. After the bucket has gone below he goes out and trams the car to the

waste dump or ore pile, dumps it and trams it back to the shaft ready for the next load.

The sketch shows the operation of a simple contrivance for accomplishing this. A door, or apron, is made of strong planks, and fixed on a hinge, F, flush with the line of the inside of the shaft. This apron, when not covering the shaft, inclines backward, and the upper end rests against a cross piece in the head frame near B. When a bucket is hoisted it is raised to clear the dotted line, G (though in the drawing there is not sufficient room allowed by the draughtsman for this purpose). This is an important part of the arrangement, and the head frame should be sufficiently high to permit this, and at the same time permit the rock to pass from the chute into a car standing on the track. A rope, D, passes from the eyebolt at A, over the pulley, C, and to within reach of the engineer in the hoist building. At the further end, in the hoist, it passes over a second pulley and has a counter weight attached to aid in handling the door. It will be observed that the door is not absolutely vertical, but near it when in the position at B. When the bucket clears the line of passage of the top of the door, indicated by the dotted line, G, a smart jerk on the line, D, causes the door to spring outward, and passing its center of gravity it continues toward A until it rests on the cross piece at A. On the upper side of the apron a heavy piece of strap iron is secured by three stout bolts, E (shown in black). This is bent upward at the upper end, forming an obstruction on the otherwise comparatively smooth surface of the apron. The bucket is one of the straight sided kind, having a strengthening band top and bottom, with chimes 1½ inch deep on the under side. The bucket is lowered by the engineer. When it strikes the apron it slips downward a short distance, and the upper edge of the chime of the bucket engages the buckeled strap of iron, and unable to slip downward further as the cable is slacked by the engineer the bucket overturns and dumps its contents into the chute, H, whence it passes to a car which should be placed to receive the rock. The bucket is hoisted above the apron, the engineer again gives the string a vigorous pull and the door assumes its former position at B, and the bucket is again sent below.

IT seems strange that laws should be required to make the equipment of mine shafts with safety devices compulsory; but such is the case. And, worse still, in many cases the law is neglected and has become a dead letter. It is the part of wisdom for every mining company to avoid accident, not only to insure the safety of employes, but it is economy and good business to avoid the expense incident to a breaking cable, a wrecked shaft or a ruined skip or cage, which inevitably always follows a case of overwinding where no safety appliances are provided, or which fail to operate if they have been put in.

The Lone Mountain District, Near Tonopah, Nev.

Written for the MINING AND SCIENTIFIC PRESS by A. LAKES.

The region at the eastern base of the Sierras from the line of the Central Pacific Railroad at Reno, for 300 or 400 miles south, to Tonopah and Goldfield, is one that bears every evidence of great mineralization. It is essentially a volcanic region, all the rocks, with exception here and there of some outcrops of Cambrian and Silurian limestones, are volcanic. The eruptions are mostly of Tertiary age, consisting of andesite, dacite, rhyolite and diorite, with some later overflows of basalt. Volcanity seems, in Nevada, to increase as we approach the base of the Sierras, and may be connected with that great uplift. The evidences of mineralization show it to be both recent and ancient.

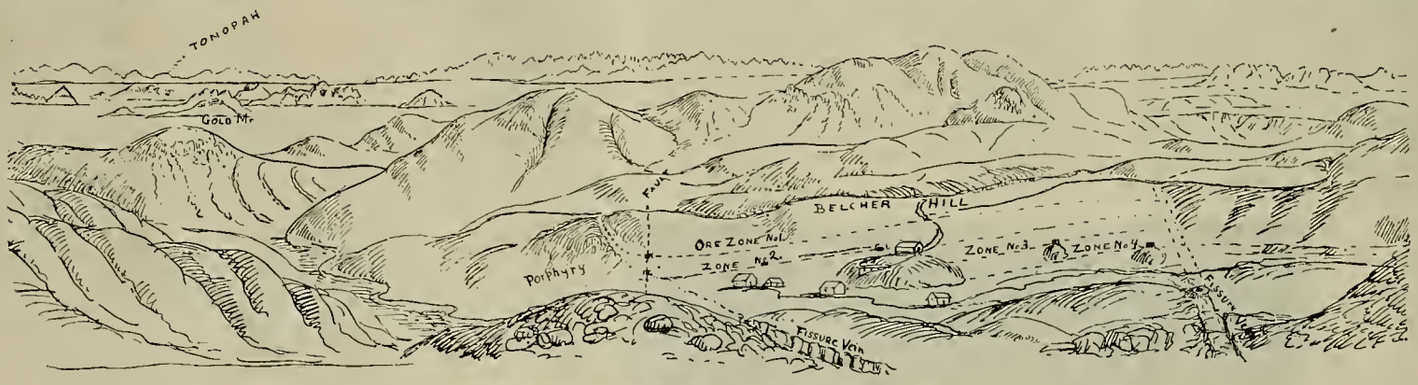
A few miles below Reno we have the Steamboat Springs issuing in puffs of steam and hot water from a series of long parallel fissures near a hill of basalt. Some of these fissures have already been filled with quartz and vein stuff, forming true veins; others are in process of filling with gelatinous silica. Here we have modern fissure veins in process of formation. A few miles further southeast we have the great Comstock fissure, filled and ore bearing, which, as the hot deeper workings show, is following down a retreating hot spring that filled the fissure with gold and silver ore in the same way as at Steamboat Springs.

South again we come to the mining district of Candelaria, where there are fissures in volcanic rocks, and still further south to Tonopah and Goldfield, with their mineralized, fissured zones in andesitic rocks. About 20 miles southwest of Tonopah, at Silver Peak, is a well-defined crater and modern lava flow, while Tonopah itself, like Cripple Creek, Colo., is located on the site of numerous volcanic vents. Tonopah has been described by J. E. Spurr and other writers, so we will not dilate on it here, but pass to one of the districts not far from it which has hitherto had less notice.

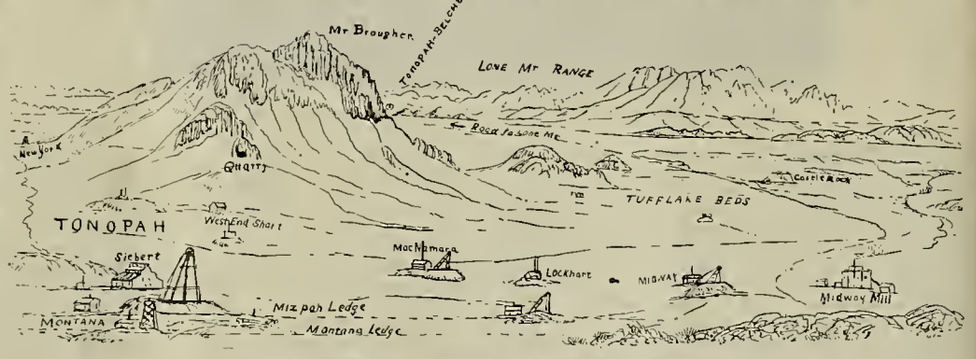
LONE MOUNTAIN.—On leaving Tonopah and going west we pass over a prairie-like region underlaid by thick beds of stratified volcanic tuff, which to an unknown depth overlies and obscures the ore-bearing andesites of Tonopah. This volcanic tuff, derived from finely comminuted material, shot up in the air from some of the volcanic vents in the vicinity, fell in showers upon the bed of a lake and was stratified by its waters. It contains occasional fossil imprints of leaves and terrestrial vegetation. Continuing west we pass occasional bluffs and tables of tuff capped with basalt. About 20 miles west of Tonopah is a group of hills around a central peak called Lone mountain. This peak is of massive granite, and against it recline, usually at steep angles, a thick series of uptilted slates, schists, quartzites and metamorphosed limestones, and marbles of Cambro-Silurian age, interpenetrated by sheets, dikes and intrusive masses of andesite and other eruptive rocks, the heat of which, doubtless, metamorphosed the sedimentary beds. The evidences of this metamorphic action are very pronounced — shales are changed into slates or schists, sandstones into quartzites, and limestones into white marble; while various minerals, characteristic of metamorphic action, appear in the rocks at contacts with the igneous dikes, such as epidote, which is particularly abundant. We have here all the acknowledged geological conditions for mineralization, nor are the precious metals wanting.

Near Lone mountain are the remains of an old arrastra showing that some primitive miners found gold and worked it. Numerous large fissure veins, striking about north and south from the peak, trav-

Loading Ore at the Tonopah-Belcher Mine, Nevada.



A Sketch of Tonopah-Belcher Mine and Vicinity, Lone Mountain, Nevada.



The Lone Mountain Range from Tonopah, Nevada.

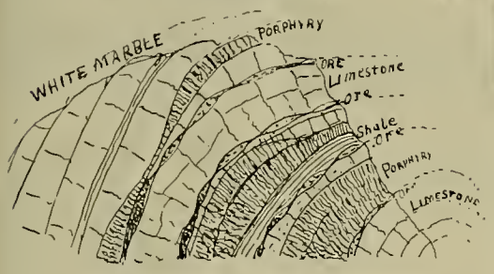
erse the volcanic rocks and the sedimentaries alike. These veins have as yet been little opened or proved, but they show on the surface unmistakable signs of mineralization.

At the Tonopah-Belcher mine, south of Lone Mountain peak, a long ridge called Belcher mountain is composed of tilted, or rather folded limestones, marbles and slates, with intercalated intrusions of

Cliff near Leadville, Colo., Showing Intrusion of Porphyry into Sedimentaries.

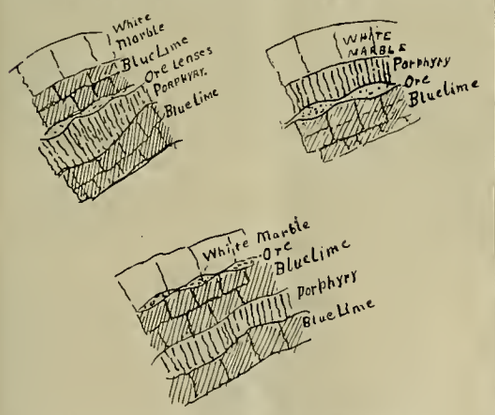
porphyry. The formations are very much like those of the Mosquito range at Leadville, Colo. In the limestones, and at their contact with the intrusive sheets, are lenticular bodies of carbonate of lead ore, carrying silver, lying more or less conformably with the stratification. The strata of the hill containing these ore bodies has been folded into an anticlinal arch which is truncated or dissected by the ravine running parallel with the hill.

Ore bodies are found outcropping and dipping into



Ideal Cross-Section of Belcher Hill, Nevada.

the hill apparently in three or four parallel zones. The degree of dip of these zones as they enter the hill varies according to the part of the fold the erosion has cut; thus at one place on the upper part of the ridge the ore zone enters the hill with a dip of not over 15°, and continues in for a few hundred feet till it becomes steep and goes down with the anticline; lower down the hill the next zone dips in at 25° or 30°, and the next below that at from 40° to 60°. All these zones will, with depth, become very steep or nearly vertical. The intrusions of eruptive rock are, as at Leadville, very irregular and hard to



Position of Various Ore Bodies in Belcher Mine.

follow or portray in a section with the present slight development of the mines. They appear as brown, lenticular masses, outcropping here and there at various levels on the face of the ridge. No one section across the face of the hill would show them all in their relative position. Sometimes they are below a certain well-defined limestone, again they are above it, sometimes they are at contact above the ore, and the ore lies between them and the limestone; at others the ore is above the porphyry and below the limestone, or again the ore may lie between a blue limestone and a white marble, and the porphyry be absent. The intrusions of porphyry appear to occur in tongues or lenses dodging about and insinuating themselves between the bedding planes of the strata.

The accompanying section of a cliff near Leadville, Colo., will exemplify the ramifications of intrusive sheets of porphyry in sedimentary strata, and in a manner very similar to that at the Belcher, to which it has a close analogy.

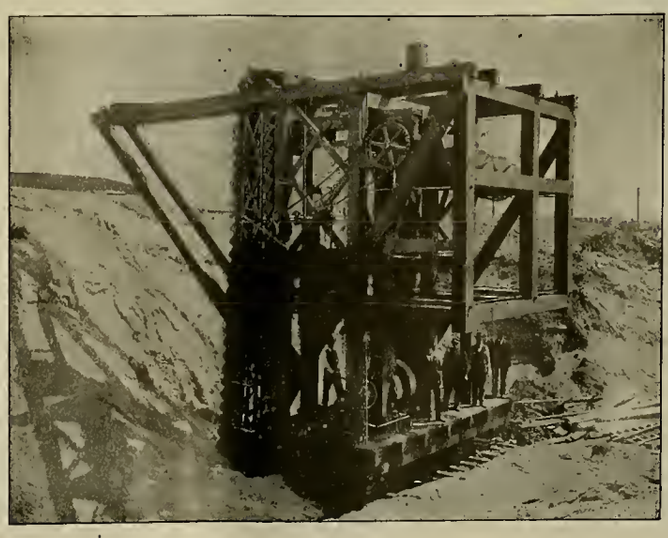
These intrusions, besides splitting open the strata, have locally faulted it. At one place a large massive intrusion of a peculiar variety of porphyry has come up and apparently deflected the strike of the limestones, bending them around at an elbow. At the sharp bend the strata have broken in a fault. The lenticular bodies of ore consist of masses of decomposed rock and iron oxide, mingled with lead carbonates, usually in the disintegrated form called at Leadville "sand carbonates." Mingled with these sand carbonates are abundant grains, kernels, nodules and small irregular bodies of galena, which are high grade in silver. The probability is that these scattered bodies of galena will increase in quantity with depth until the whole body becomes a sulphide, or a mass of silver-bearidg galena. It has been observed in other regions that these scattered nodules of galena are, near the surface, richer in grade than the galena body proves to be ultimately in depth. Whether or not the different zones of mineralization will, in depth, come together into one large body remains to be proven by deeper workings and crosscutting.

Carbonate of lead ores in large quantities are comparatively scarce nowadays, and, though low grade in silver, are much desired by the smelters to mix with their siliceous ores, such as those of Tonopah. They would be very valuable in case smelting works should be at any time erected in that camp, apart from the intrinsic value of the ores themselves with their lead and silver contents.

There are other promising mines and veins in this Lone mountain region of which no one can foretell the future. It will be observed that the Tonopah-Belcher ore deposits are entirely different in character from those found at Tonopah, as well as the rocks in which they are found. They remind one of the ore deposits of Leadville and Aspen, Colo., especially in the early days of those camps.

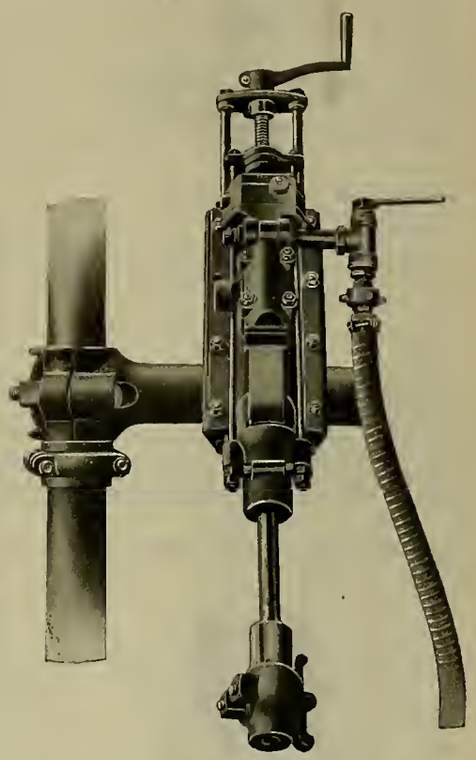
Sand and Gravel Digger.

Herewith is portrayed an automatic combined sand and gravel digger, elevator and grader, designed and constructed by the C. O. Bartlett & Snow Co., Cleveland, O. In operating the railroad track is laid along parallel with the bank to be excavated. The digging is done by heavy steel buckets, provided with special teeth, fastened to a stroug chain, all supported by a self-contained elevator leg pivoted at the head end, thus allowing the lower end to be gradually forced into the bank by means of heavy cables attached to the bottom of the elevator leg and running up over sheaves at the outer end of the projecting arm of frame, then down to a drum which is geared to the engine shaft. By this means the lower end of the elevator is to be gradually forced into the bank, digging and elevating the material up to an angle of 70°, commencing at the bottom and gradually digging its way up. The steel buckets are designed to dig the gravel, sand or other similar material and elevate it as fast as dug, discharging it at the top onto a belt conveyor, delivering it to a revolving screen on the opposite side from the elevator.



An Economical Device.

Herewith is illustrated a new "Economy" air cock attached to a "Giant" drill, the design being to obviate the loss of air due to leakage, and do away with constant leakage of air around the taper plug.



This air cock is so arranged that the pressure of the air on the bottom large end of the taper plug keeps the plug fittiug the seat, at the same time allowing it to be freely operated. To compress air is costly at best, and, it being desirable to avoid all leaks, this device is presented by its makers—the Compressed Air & Machinery Co., 24-26 First St., San Francisco, Cal.—as effectually preventing loss of air in the operation of rock drills.

The American Mining Congress.

The following preamble and resolution were passed by the board of directors of the American Mining Congress at its third meeting held in Portland, Or., March 21, 1904:

WHEREAS, Questions of great importance confront the American Mining Congress, and the correspondence and clerical work incident to carrying out the purposes of its organization have assumed proportions that justify and necessitate the acquisition and equipment of a permanent location to be used as the business headquarters of the Congress; therefore be it

Resolved, That a committee consisting of T. Ewing of California, D. Moffatt of Denver, Colo., and J. R. Leonard of Pittsburg, Pa., be, and the same is hereby appointed, with instructions to consider the following questions:

1. The most suitable and available locality for such permanent headquarters.
2. The amount of money necessary to acquire a suitable site.
3. The cost of constructing suitable structures on such site.
4. The expenditure necessary to properly equip such structures for the purposes intended.
5. The annual cost of maintaining such headquarters.

And to report recommendations thereon at the next session of the Congress in August, 1904.

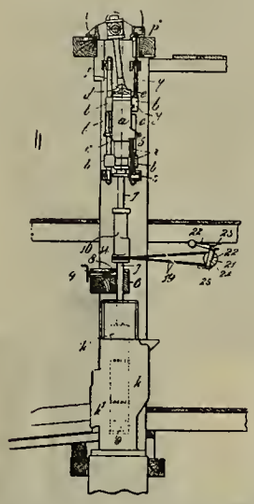
The next meeting of the American Mining Congress will be held in Portland, Or., August next, 23d to 27th, inclusive.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 29, 1904.

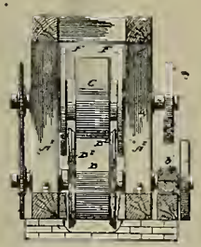
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

STAMPING APPARATUS FOR CRUSHING ORES, ETC.—No. 755,686; D. B. Morison, Hartlepool, England.



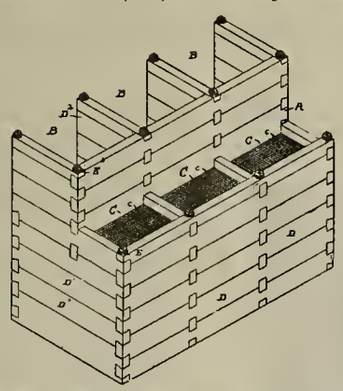
In stamping apparatus, combination with stamp stem of means for holding same in raised position comprising block of less width at bottom than at top, means for supporting block adjacent to stem but leaving it free to tilt, and means for moving block so that its wide part comes into contact with stem and for holding block in that position, but allowing it to tilt.

ORE CRUSHING MILL.—No. 755,725; E. A. Wall, Salt Lake City, Utah.



Combination with frame and lower roll mounted in fixed bearings therein, of upper driven crushing roll having free vertical movement toward and from upper side of lower roll, to crush material passing rolls, and independent driving means for rotating upper roll in opposite direction to lower roll and at same rate of speed.

JIG TANK.—No. 755,749; G. T. Cooley, Oronogo, Mo.

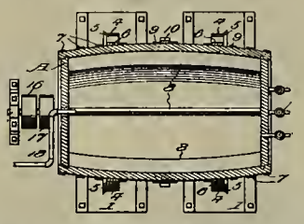


Jig tank constructed of separate side timbers, having interlocking tongues to form corner joints, tongues having one of interlocking surfaces beveled in planes of one of meeting sides and other surface beveled in planes of other meeting side, held together by draw bolts passing through tongues.

CONVERTING MATTES.—No. 755,557; R. H. Aiken, Jerome, Ariz.

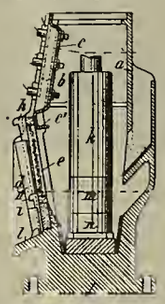
Process of converting mattes by subjecting charge of molten matte in a converter to an oxidizing blast, and meantime adding to charge, at rate approximately corresponding to rate of formation of oxide, material, proper for fluxing charge, at temperature approximately that at which slag forms from products of particular matte and fluxing materials.

APPARATUS FOR TREATING ORE.—No. 755,871; T. A. Helm, Salt Lake City, Utah.



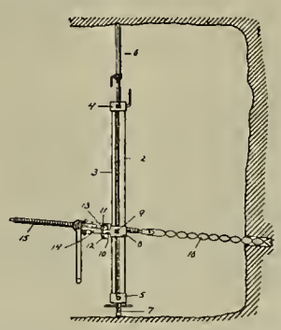
Apparatus for treating pulverized auriferous ores, comprising rotatable cylindrical tank, radially depending blades in tank extending length thereof, circular brace frame disposed between inner ends of radial blades, air pipe leading into tank, faucets to draw off liquid from tank, and means to rotate tank.

MORTAR BOX FOR STAMP MILLS.—No. 755,913; D. B. Morison, Hartlepool, England.



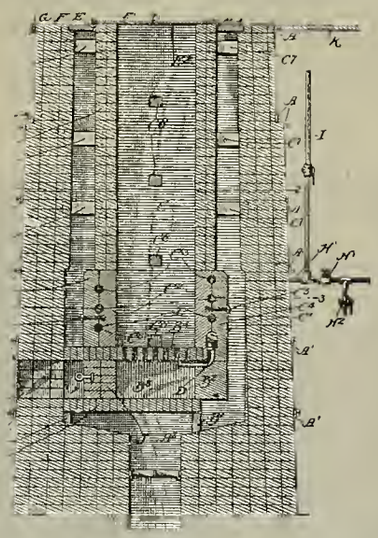
Mortar having two-part removable front, comprising lower screen section of usual design, and stiffened sheet-metal section detachably supported by box frame inside plane of screen, each section being independently removable.

COAL AND ROCK DRILLING MACHINE.—No. 756,028; L. K. Koontz, Allegheny, Pa.



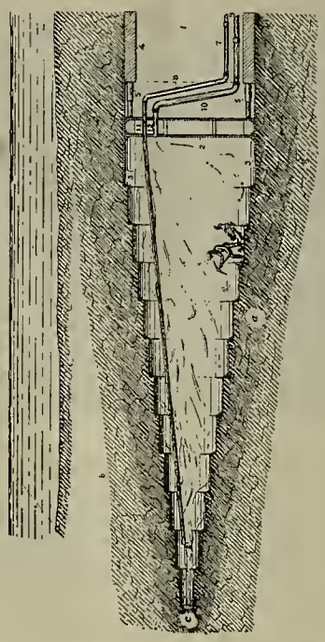
Supporting means for drilling mechanism, comprising vertically reversible post having separated uprights, and disconnected drilling mechanism sustaining devices, one on each post upright, each of devices having reversely disposed sustaining points.

METALLURGICAL APPARATUS.—No. 755,867; G. W. Gesner, New York, N. Y.



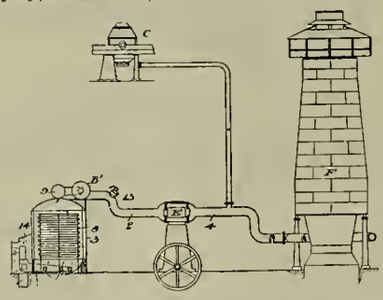
In apparatus for manufacture of alloy, or analogous use, combination of upright retort C surrounding flue and adjacent furnace arranged to discharge its products of combustion through such flue, pipe coil D partially exposed within fire brick to heat of flue, with open end of pipe discharging into retort, connection for introducing fluid to other end of pipe, chamber B^3 so material will descend by gravity from retort into chamber, provisions for opening and closing chamber, and grate B^4 of refractory material separating chamber from retort and tight floor B of refractory material separating chamber from furnace, arranged to allow descent of fine material only.

METHOD OF CONSTRUCTING TUNNELS, SHAFTS OR OTHER EXCAVATIONS.—No. 755,956; C. Sooysmith, New York, N. Y.



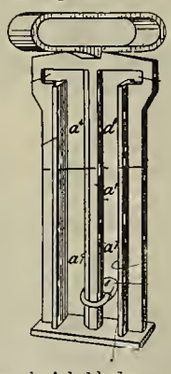
Method of tunneling which consists in constructing freezing chamber in material to be excavated, freezing surrounding material, advancing shield in rear of freezing chamber and completing tunnel lining.

METHOD OF EXTRACTING MOISTURE FROM AIR FOR BLAST FURNACES AND CONVERTERS.—No. 756,110; J. Gayley, New York, N. Y.



Method of feeding air blast to blast furnaces or converters, which consists in cooling air artificially, thereby causing its moisture to be reduced to small percentage, feeding dried air to blowing engine by initial pressure of relatively small degree sufficient to overcome in whole or in part friction of air current in apparatus, increasing its pressure at blowing engine to degree above that to which it was initially subjected and feeding dried air therefrom under compression into furnace or converter and maintaining it under compression from time it leaves the blowing engine until it enters furnace or converter.

FILE OR CARRIER FOR MINERS' PICK BLADES OR LIKE TOOLS.—No. 756,093; J. Beeton and J. Wardall, Hucknall, Torkard, England.



Carrier for miners' pick blades and other like tools consisting of body provided at one end with handle and at other end with base plate, body being formed with tenons or dovetails down and into which pick blades (having the usual recess) are adapted to slide and engage, and means for locking the blades in place.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

The Rampart Forum says hydraulic plants will be large factors in the camp hereafter and Rampart will again add to Alaska's gold output. Rhode Island creek will be worked by hydraulic. Hydraulic apparatus is being put in by the Big Minook M. Co. More creeks are being worked in Rampart district than before this winter. The Glen district is said to promise well, with good outlook for Doric, Eureka, Thanksgiving, Omega and Gold Run. The Rampart side of the slope is also making satisfactory showing, with Little Minook, Little Minook Jr., Hoosier, Slate, Ruby and Hunker creeks being worked.

The J. G. Heid group of four claims on Windfall creek (the Examiner, Call, Chronicle and Free Press) have been sold to J. H. Conrad of Juneau and London, Eng., men.

The Pacific Steel Co. of San Diego, Cal., is reported to have bought 20,000 acres of coal land in southeastern Alaska. The coal fields are 15 or 20 miles back from Controllers bay, 70 miles west of the base of Mount St. Elias. On the property are said to be ten veins of coal varying in width from 4 feet to 28 feet of both bituminous and anthracite coal. About 20 miles of railroad will have to be built, but the loads will have a down grade all the way to the bunkers on the shore. The report is not verified.

A gold strike is reported from Eagle by C. M. Johansen, United States Commissioner. The find was made on an island in the Yukon river in front of Eagle. A shaft 45 feet deep was sunk and during the last 13 feet was in pay gravel. The bars up and down the river for a considerable distance from the island have been staked.

ARIZONA.

Cochise County.

The three Mitchson claims, 2 miles east of Gleeson, have been bonded to C. R. Bostwick for $50,000. One gold ledge on the claim is said to be 2½ feet wide and assays $20 in gold. The Copper Belle group, in the same section, has resumed operations, with sixteen men at work. M. Costello and J. Gleason are operators.

The smelter of the Copper Queen mine has been blown in at Douglas. The Copper Queen smelter has five furnaces with normal capacity of 500 tons per furnace. The Copper Queen mines at Bisbee are not expected to keep them all going to their capacity, but custom work will be done. The sampler is nearing completion. There is ore on the dump awaiting treatment and there are eight cars coming in daily to supplement this. A large supply of coke is on hand.

Gila County.

The Old Dominion C. M. & S. Co. has issued its report for year ended December 31, 1903, showing the following figures, in comparison with results for 1902:

	1903.	1902.
Gross receipts	$823,138	$883,378
Cost at mines and smelter	703,324	686,177
Freight, interest, taxes, etc.	112,083	130,559
Profit from production	8,729	66,641
Construction and development	10,720	72,179

There were smelted 57,210 tons of ore, from which were produced:

	Pounds Copper.
1,835,910 pounds of pig copper, at 95.03%	1,762,996
9,075,390 pounds of matte, at 62.99%	5,716,725
Total production	7,479,721

The directors' report says construction work will start this month on a concentrating plant, capable of handling maximum capacity of 300 tons per day. The company proposes to do custom smelting as well, and from time to time, as business warrants, enlarge the plant. The company during 1903 expended $476,640 in sinking the new shaft and in improvement of the plant. The production of fine copper was 7,479,721 pounds, as compared with 7,992,550 pounds during 1902. The production would have been larger but for shutting down of mine and limiting of output by reason of the flood. Aside from deficiencies of plant, which are being remedied, the only drawback to a successful operation of the property is lack of sulphur in the ore, says the report. Since October this defect has been supplied by ores bought from the Copper Queen Con. M. Co. of Bisbee; these ores have been delivered at works at a net cost of from $1 to $3 per ton. Since water in the mine was controlled and the Copper Queen ores secured, the property has been operated at a profit. The net profits from operations during October, November and December, 1903, were $94,000 (the net profit for January, 1904, was $21,000, and for February, 1904, $25,000). When the concentrator is completed it is expected it will not be necessary to buy any large amount of ores from outside sources. The total cost of production of fine copper laid down in New York was 10.90 cents per pound, and sold at average of 11.05 cents per pound. (The cost of refining pig copper into electrolytic copper is three-fourths of a cent per pound, and matte into electrolytic copper about 2½ cents per pound.) The following operating statistics are given:

	1903.	1902.
Yield of fine copper per ton ore smelted, pounds	130.74	116.10
Per cent of fine copper in ore smelted	6.54	5.80
Cost per ton ore mined	$7.72	$5.80
Cost per ton ore smelted	$4.58	$4.27
Gross amount realized per pound fine copper	11.02c	11.05c
Cost per pound mining and smelting	9.40c	8.59c
Cost per pound handling, etc.	1.50c	1.63c
Total cost per pound	10.90c	10.22c
Cost per pound copper for construction	0.15c	0.50c
Net loss per pound copper	0.03c	*0.24c

* Profit.

The plant account is increased $476,640. Of this latter amount, which represents construction during the year, $224,239 was expended at the mining plant and $117,626 at the smelter plant. The smelter was in operation 317 days. Opening and development work totaled 6556 feet. The present average daily production of the two furnaces is 60,000 pounds of copper for month of March. The output reached 1,500,000 pounds.

W. Webstor, who has a lease on one of the Cougblan mines, near head of Pinto creek, near Globe, reports getting out ore. The ore is covelite and runs 30% in copper. He has opened a streak of this ore a foot thick.

Graham County.

The New England & C. C. Co., near Clifton, is working twenty men. The tunnel driven to connect the New England and Copper King is in 1800 feet.

A working bond has been taken on a group of Frisco river gold claims, near Clifton, by a California company with W. Davis in charge. Development work is being increased.

Sale has been made to El Paso, Tex., and Colorado men of two placer claims, the San Jose and Catalina, on Eagle river, near Morenci, for $7000. E. Elsbaugh of El Paso, Tex., is manager. The claims are 2 miles from Eagle dam. It is intended to put in a 5 H. P. engine and pump for raising water from Eagle river to a tank on the hill and to put in sluice boxes as well as dry washers.

To decrease hoisting, it is reported the ores from the first level of the West Yankee mine, near Morenci, will be carried through a tunnel from the level direct to the sorting belt of the concentrator. This would not only relieve the hoist, but help out the bins. Timberers have finished the work of carrying the West Yankee shaft down to the breaking off level of the tunnel from the Old Yankee. Room is available for installation of an electric drill. This drill will drive from the West Yankee end to meet the men drilling from the Old Yankee to the shaft of the former. The sinking crew in the West Yankee shaft at the tunnel level will be increased and the shaft carried down 250 feet farther. It is now down 450 feet, all in ore. At 450 feet it is below the level of the Old Yankee tunnel.

The Cuprite C. Co. has been incorporated at Clifton by I. N. and C. E. Stevens, F. Alsdorf and F. B. Lane, to develop seventeen claims near Metcalf. The claims are joined on east by the Stevens C. Co. and south by the Santa Rosa Co.'s holdings. Ore has been taken from surface workings which gave smelter returns of 15% copper. The ore shows gold values. The lodes can be opened by tunnels which will give depth from surface of 800 feet. The claims are convenient to wagon roads and the railroad at Metcalf.

A. Lafave, who owns four claims at Gold Hill, near Metcalf, says on the Lady Mary claim he has crosscut the lead every 20 feet for 200 feet, and the ore averages 4 feet in width, assaying $15 in gold with some lead. He will drive a tunnel in on the lead lower down and proposes later to build a mill. He states there is sufficient water in the camp for two small stamp mills, and that more can be developed.

Maricopa County.

F. Webb of Tombstone reports sale of his bismuth mine to Manager Fisher of the Saxon Co. of New York. The mine is the Medicine Chief, east of Mesa. They have opened up a vein of bismuth ore 18 inches wide.

Mohave County.

Last week the Gold Road mine, near Acme, shipped a $16,000 bar of gold bullion, the result of one week's run of the Gold Road mill. The mill is shipping $70,000 in bullion monthly, which amount will be increased before fall. The lessees are keeping the mill supplied with high-grade ore. It is said the company proposes using wet crushing and installing electric power. At present there is not sufficient water to be had for all purposes.

C. L. Wilson has a lease on the Oro Plata, near Chloride, and has started work. On the O'Dea lease ore is being obtained. No water has to be handled by the lessees for some time to come. Three-ounce gold ore is being taken out and prepared for shipment.

A. H. Dryden, superintendent of the Altata mine, near Chloride, is working men on the mine and opening up bodies of high grade copper ore, says the Mohave County Miner.——A windmill has been put on the Towne mine at Chloride, says J. Barry, owner, to free the mine of water.

Pima County.

Silver ore is reported found 3 miles from Tucson. Wire silver is shown.

Pinal County.

The Phœnix & Eastern Railroad is opening up the mining sections of Pinal county. It is in operation as far as Florence and the rails have been laid a distance of 20 miles east of Florence. It is announced by the company officials that they expect to have the line completed into Dudleyville by July 1. The management has not yet decided whether it will go eastward from Dudleyville by way of Globe or by way of Willcox.

Santa Cruz County.

At the Mowry mine, near Nogales, additional boilers are being put in to supply increased steam required by the hoisting engine.——J. Bailey of San Francisco, Cal., has bonded four copper mining claims in the Santa Rita mountains for $20,000. The properties have considerable development work, showing high-grade copper ore.

The Chicago & Patagouia C. & G. M. Co., J. T. Brickwood, manager, which is operating the Old Soldier and Young Volunteer mines on the west side of the Patagonia mountains, 10 miles from Nogales, is increasing development. The main working shaft, going down to strike the ledge at depth of 200 feet, is down 80 feet. The incline shaft going down on the ledge 300 feet away is said to be developing an ore body.

Yavapai County.

G. B. Upton, manager of the Oro Grande M. Co., operating in Yavapai county, north of Wickenburg, says the test runs with the 5-stamp mill have proven satisfactory and the company is increasing the mill to ten stamps. To have sufficient water for the ten stamps it was necessary for the company to put in a pumping station in the canyon of the Hassayampa river and run a pipe line from there to the mill. From the pumping station to the mill is 1½ mile, but the water has only to be pumped under pressure for 1600 feet, raising the water in that distance 400 feet. From this point it runs to the mill by gravity.

G. P. Harrington of the Oro Bella mine, near Crown King, reports the mill idle on account of lack of water. A pipe line is being laid from the Tiger mine to the Oro Bella and is expected to be ready next week. The water will be pumped into tanks and then run by gravity to the mill, a distance of 2 miles.

L. N. Womhacher reports making a strike in the Cactus group of mining claims which he and H. Boyer are working. The Cactus group is the south extension of the Iowa group, 2½ miles from Cherry, near Dewoy. The strike was made at a depth of 250 feet. The ore vein runs 2 feet in width, assaying $100.

C. W. Platt, at Kirkland, says the machinery for the hoist of the Illizona M. Co. is on the ground and is expected to be ready to start next week, when work will be resumed in development.

L. Hall, manager of the Alma group at Groom Creek, says work on the group is progressing. Their tunnel is in 130 feet, and 30 feet more and a raise of 60 feet will make the connection for air. He says the ground is covered to depth of 2 feet with snow.

CALIFORNIA.

Amador County.

Manager P. B. Aiken says the mill at the Climax mine, east of Jackson, has not been running lately, due to lack of wood, the storm and soft roads preventing hauling. Meanwhile he continues development work and has uncovered a 9-foot ledge of ore.

Butte County.

In Bear canyon, 1½ mile northwest of Clipper Mills, G. Woolley & Bro. have located a quartz claim said to show values in sulphurets and free gold. The lode has been developed, showing 4 feet in width between walls. It is near the Bean quartz mine.

Calaveras County.

Manager J. Evans has fourteen men at work on the '49 and the Wild Goose mines at Douglas Flat. He sunk a shaft on the Wild Goose ground to depth of 150 feet, with a sump of 15 feet. Pumps and machinery were put in to handle the water. From the bottom of the shaft drifts were run and the pay channel has been opened up in the Wild Goose ground.

At Mokelumne Hill, C. G. Nuner and E. L. Burns have bonded the Guffra and Maloney mines and will reopen and develop them. There have been several shallow shafts sunk and short tunnels run on the two ledges. On the Guffra is a 10-stamp mill and hoist.

J. M. Evans has bought a large acreage of placer ground east of Vallecita, near Murphys, and will prospect the channels this spring. The mines at Douglas Flat continue developments, and the Texas shaft is being cleaned out in order for inspection.——W. B. Lake is arranging for opening up the Cataract and Wide West mines, near Murphys. A tailrace has been dug and the derrick is ready to operate.

Water power will be added to the mill at the Hercules mine on Indian creek, near Murphys. The present power used is gasoline.

The Calaveras M. Dev. Co. has been incorporated at Oakland to operate near Sheep Ranch by J. J. Fisher and R. R. Cunningham of Sheep Ranch and J. S. and A. H. Fox and J. J. Rignoy of Oakland.

Nevada County.

C. L. Canfield, operating the Canfield gravel mine at Blue Tent, near Nevada City, has a bond on the Grizzly Hill gravel property, on the Bloomfield road, 3 miles from Columbia Hill. It is said he will place a 10-stamp mill on the Grizzly Hill.

Operations will be resumed at the Rising Sun mine in Willow valley, near Nevada City. The property is under bond to G. Kartschoke et al, and they will unwater the shaft. During the summer machinery will be put in and the mine developed.

The property of the Green Mountain M. Co. near Grass Valley, including the Green Mountain, Centennial, South Centennial, Lizard, Wasp and Summit claims, has been sold to the Sultana M. Co., which will conduct operations. The company's main offices are in San Francisco, and J. M. and J. J. O'Brien, E. Schwab, W. C. Webb, W. S. Downing, E. B. Lillis and J. Garity are directors.

J. N. Davey and J. C. Menkel of San Jose have started work on the Piper gravel claim in Washington district to continue driving the tunnel. The tunnel, in 200 feet, is expected to strike the main channel within another hundred feet.

The Mountaineer mine on Deer creek, below Nevada City, is reported improving. The face of the 400-foot level which is being driven south toward the Summit location is said to be in ore that mills $17 a ton. The machinery handles the water notwithstanding the storms. Thirty men are at work, with J. C. Campbell as superintendent. The mill is in full operation.

A variable speed induction motor, using a 60-cycle, three-phase high-tension current, has been put in at the 1400-foot level in the North Star (incline) shaft, near Grass Valley, to operate a "five-throw" pump. When run at its full capacity of 50 H. P. it will lift the water 600 feet vertically at rate of 800 gallons per minute.

Operations will be resumed at the Red Cross and Huron mines at Omega, near Washington, by Davey & Menker, of San Francisco.

Operations were resumed at the Red Cross mine, near Nevada City, last week.——The stamps of El Oro mine, near Maybert, are steadily crushing ore again.

Operations at the Brophy mine of Shady Creek, near Nevada City, will be resumed this week, says Superintendent Miller.

The Murchie mill, near Nevada City, will be enlarged, says Superintendent Maltman, and he will add four stamps.

Placer County.

The Three Stars quartz mine at Auburn has been sold to E. H. Vance of Oakland for $25,000. B. F. Hartley is superintendent.

San Bernardino County.

(Special Correspondence).—The Copper World, the Vulcan and the Excelsior mines have been bonded to San Francisco men. These properties are near the line of the Salt Lake R. R., and about 35 miles northwest from Manvel.

The Trio C. Co. is operating mines in the New York mining district, 1 mile west of Manvel. It is owned by Pasadena men. The workings consist of a shaft 165 feet in depth on the ledge, showing copper ore. It is a contact vein, between lime and porphyry. The ledge is 15 feet in width, carrying values of 10% copper. Some specimens of native copper have been taken out. A drift has been run at the 150-foot level which cuts a shoot of ore 35 feet to the west. This shoot also shows in a shaft near surface 100 feet from present workings. A plant to reduce the ore on the ground is proposed. The mine

is 1 mile from the Santa Fe R. R. and 3 miles from the Salt Lake R. R.

The Giant Ledge Co. shipped a carload of ore last week to Canon City, Colo. This mine is 9 miles from Manvel and is expected to be put on the producing list this summer.

Manvel, April 5.

San Diego County.

O. H. and J. H. Schumaher and F. Kuhn of Fullerton have a bond on the Alamitos mine, in mouth of the Oroflamme canyon, near Julian, and will start development.

J. W. Wiley and M. S. Darling, operating at Palo Verde, are developing gold prospects consisting of a group of five claims. In sinking a 100-foot shaft they struck several pockets in free gold. The group is within 5 miles of the river valley, with plenty of wood and water available.

Shasta County.

In the proceedings instituted in the United States Circuit Court at San Francisco against the Mountain C. Co., Ltd., of Keswick, to enjoin that company from destroying the growing timber on the forest reserve near Keswick hy fumes from its smelters, counsel for the Government has withdrawn the application for an injunction pending suit "without prejudice until final hearing of tbe case on its merits is had." The copper company bas agreed to pay the Government for the loss incurred.

All five furnaces at the smelter of the Mountain C. Co. at Keswick are running. It requires forty men to run each furnace —twenty on each shift. The number of men employed at the smelter is not so great as it was two or three years ago, when the open-air roasters were used and when wood was used for fuel. The substitution of electrical power for steam reduced the working force at the smelter hy seventy-five men.

Sierra County.

J. Bothwell of Downieville has a bond on tbe Papoose quartz mine in Jim Crow canyon, and will put men to work next week.

Siskiyon County.

The Chinese Co., on China creek, near Yreka, has honded its mine, witb water rights, to T. J. Nolton. The water supply Nolton intends to put on tbe Williams Point mine.

The Scott Valley hydraulic miners in the Oro Fino, Quartz Valley, Mugginsville and Pinery districts, near Etna, have been troubled by the excess of water from the heavy rain of the recent storms, hut expect to get ditches fixed up this month for operation with giants and elevators. They also expect a longer season than usual, since the additional heavy snow storms in the high mountains.

Tehama County.

H. D. Lausen and S. Guidery of Oroville have hought a dredger mining property near Red Bluff.

Trinity County.

The Poker Bar Dredging Co., near Weaverville, will start operations next week. A large number of men will he put on and a new boat built.——La Grange M. Co. is piping out of its new reservoir and if weather permits expects to have same ready for use hy May 1st, says the Trinity County Journal. The only water available at present is that which comes through the West Weaver pipe line. Repairing of other ditches is going ahead.

Tuolumne County.

A concentrator has been added to tbe mill at the Soulsby mine, at Soulsbyville. ——The mill at the Duffield mine, near Carters, will hegin crusbing rock next week.——The mill at the Starr King mine near Carters has started up after a temporary shut-down.

The John Royal mine, on Knownothing gulch, near Columhia, is increasing development work.——Drifting on the vein while crosscutting in the Old Tuolumne mine, at Wet Gulcb, is going ahead.—— The Columbia marble quarry continues to ship usual quantity of marhle.——Owing to stormy weather, mining and milling operations at the Mapes mine, on Yankee hill, near Columhia, and also at the Mountain Lily mine, have been interrupted. ——The new shaft at the Over mine, near Saw Mill Flat, has reached depth of 95 feet.——Since setting up of the heavier boiler at the Altadena mine, sinking on the vein has heen resumed.

The Providence mine and mill near Carters are in full operation with forty men at work, says Superintendent A. Scott.

The O. K. M. Co. has taken over the Annie May, the Night Star or Garner mine, O. K. 2, Cracker Jack Nos. 1, 2 and 3, Anaconda, Sugar Loaf et al. quartz mines, 6 miles northeast of Groveland, together with buildings, millsite, tools and machinery.

The mill being built on the Republic mine near Parrott's Ferry, near Columhia, is nearly completed.

Yuba County.

Debris Commissioner W. W. Waggoner says the steam shovel is working at Daguerre Point and has been making good headway, considering the rains. The earth embankment at Barrier No. 2 has been washed away. The pile driver has been recovered and placed in position to continue the experiment of pile driving.

COLORADO.

Bonlder County.

Tbe Monarch Con. G. & C. M. & M. Co., which owns 1700 acres of copper prospects on the Roaring Fork, 8 miles west of Arapahoe Peak, has bought the Pilot and Little Gyp mines at Sunshine. The company has put on men to set up additional machinery, consisting of a hoisting plant, etc., to work both mines. On the Pilot the company has a vein 7 feet wide, said to run $20 per ton in gold.

J. Yates, J. Criss and C. H. Wise of Boulder have a lease on the Herald mine, in Sugar Loaf district, and will develop it. The Herald is a gold property.——At the Nancy tunnel, at Wall Street, Manager W. Mitchell says be is putting in extensive improvements in the mill at Wall Street. They are also putting in a compressor and propose to develop the tunnel.

Chaffee County.

(Special Correspondence).—The Atlantis group of eight claims is heing prepared for spring work. Ore shipped from four of these claims is said to have run $96 per ton. There are tunnels on the claims from 250 feet to 400 feet in length. The ore carries gold, silver, lead and copper values. They are preparing to stope in the tunnels. H. Dyatt, of Leadville, is owner and expects to put in a water power plant and mill. The mines are 18 miles south of Leadville.

Granite, April 3.

The West Gold Hill M. Co. has prepared plans for a 50-ton cyanide mill to he built on West Willow creek, near Buena Vista, this season. The ore is said to carry an average value of $10 a ton, which can be recovered by the cyanide process at a cost, including mining, milling and tramming, not to exceed $2.50 per ton. The company has heen increasing work on the Sellers claim all winter and followed tbe ore 200 feet in the lime. Porphyry contact has been struck. A winze is being sunk in the floor of the drift to determine the thickness of the ore body below. It has heen crosscut for a lateral distance of 21 feet.

Clear Creek County.

The Empire Tunnel Co., owning the Tenth Legion mine, near Empire, is arranging for extensive development work. The Empire Tunnel Co. among its holdings in the Empire district has the Gold Dirt mine, also, from which shipments to the smelter have heen increased. Provided arrangements can he made with the mills, a heavier tonnage of mill dirt will be sent out. An output of thirty tons of concentrating ore can be made daily.

On the Magnet mine, near Georgetown, a whim has heen set up to hoist rock and mineral. A drift has been started west on 8 inches of ore, which mills 300 ounces in silver per ton.——Exploration is being carried on in the Mascot group, owned and operated by H. Jacoby, to open up ore reserves.——The Annetta M. Co. is sinking a winze from the tunnel level of the Griffith vein. It is down 90 feet, and has in the hottom 2 feet of lead ore, which carries an ounce in gold per ton, with silver values. In the hreast of the level going east is a body of quartz, witb 18 inches of ore, assaying $40.——Maxwell & Hood have started to drift east on the portion of the Griffith vein owned hy them.

Manager Cooper of the Capital Prize M. Co. has, after a temporary shutdown for repairs, resumed operations near Georgetown. The ledge bas been opened by a crosscut and shows bodies of iron ore impregnated with lead, with silver values and gold.——S. D. Farout has a lease and hond on the Sanora vein on Griffith mountain. He will consolidate the property with the Lafayette group and increase development during the summer. There is said to be 4 inches of ore to start on, which runs well in silver.——Drifting continues on the King William lode through a body of mineralized quartz. The work is heing done by contract under supervision of C. H. Morris. The property adjoins the Anglo-Saxon, Pickwick, Magnet, Mascot and Summit.

Custer County.

The Bassick G. M. Co. near Silver Cliff is preparing to lease twenty-six blocks of its holdings. —— After an extended idleness the Toledo mine is again in operation and mine work is in progress, with two shifts. The shaft is 200 feet deep, hut will he sunk at least 300 feet deeper. ——H. Hendershot is working the Protection and Suicile mines under lease and bond, and in development work high-grade ore has been taken out. Stringers of silver ore are being mined. The vein is 5 feet wide. A shipment of 1800 pounds to the Pueblo smelters returned 119 ounces of silver, 4% copper and 8% lead. Hendershot is running a drift on the vein. ——Preliminary work at the Valley mine is in progress by lowering the water. As soon as this is finished the company will sink and drift on the vein.

Fremont County.

E. L. Bettis, at Canon City for Eastern men, has taken over a group of claims carrying a ledge of marble, near Cotopaxi, in western part of county. The marble, it is said, is suitable for statuary.

Gilpin County.

During the month of March the shipments from Quartz hill mines, near Central City, of the Kansas-Burroughs Con. M. Co. amounted to 125 cars, or 1100 tons, most of which went to the mills and concentrators, a small percentage going to the sampling works.——Mitchell & Sons of Central City will put in a steam plant on the Gulch mine in Lake district. They bave it developed to a depth of 290 feet, hut have suspended operations on account of the slow work of hoisting from that depth with a whim hoist and horse. Tbey have shipped considerable milling ore, as well as first and second-class smelting ore. ——G. W. Mahee Sr. of Denver has started up the Newfoundland mine, on Gunnell bill, after overhauling the machinery and buildings and unwatering the incline shaft.

Gunnison County.

The Yellow Coin G. M. Co. has been incorporated by J. S. Woodruff of Denver, H. P. Woodend of Loraine, and others, to operate at Bowerman. It owns eleven claims on South Copper mountain, near the Kuenz group.

Hinsdale County.

The Golden Fleece mill, near Lake City, is in operation by Kilvert & Watkins.—— L. A. Vinton in Horseshoe hasin has resumed development of the Puzzle claim. ——Superintendent H. H. Lynde, for La Belle M. Co., is putting in 80 H. P. hoiler at La Belle tunnel.

Lake County.

(Special Correspon ence).—T. Fain is leasing on the Benton mine, on the west end of Breece hill, and reports striking ore.——Adamson & Co. are leasing on the Little Pittshurg, and are operating on shaft No. 11, which is down 90 feet.

Leadville, April 2.

(Special Correspondence).—W. S. Jones, manager of the Cloud City mine, has the shaft down 500 feet and will sink 125 feet deeper. This company has fifty acres and a lease from the city to mine under tbe streets. A hody of ore was struck in the lower level last week. The ore is iron oxide, with sand carbonates.

Leadville, April 3.

The North Moyer shaft at Leadville, put in operation in January, is taking out good grade of iron sulphides, says the Carhonate Chronicle. The output of the Moyer and North Moyer shafts is 4800 tons of zinc ores, 1000 tons of zinc-lead ore, 4000 tons of iron sulphides and considerahle copper-bearing iron ores. About 2200 tons of the zinc is milling ore. The principal portion of the zinc ore comes from the Moyer shaft which is working three levels, the lowest being 480 feet below collar of shaft. The iron and copper ores come from the North Moyer shaft, which is working about same deptb.

The Yak Tunnel Co. at Leadville is developing the Tankerstown, nortb of the tunnel. Tbe Tankerstown property is a mile from mouth of tunnel. A raise has heen driven 100 feet and a hody of low-grade sulphide ore opened from which shipments have heen made. Tbe ore carries silver, gold, lead, iron and zinc. The Yak Co. is also taking out ore from the Silver Cord mine.

The present daily output of Leadville district is over 2500 tons of all classes of ore. The producers in the older territory are doing well, as are a number of suh-districts, which are sending daily shipments. This output is steadily growing. South Evans, Big Evans, Fryer, Carbonate, Breece and Rock hills, Iowa and California gulches, all near the city, and St. Kevin, Half Moon, Twin Lakes, Sugar Loaf and other outlying sections are adding to the daily production.

The Midas M. Co., which controls the Colorado and Penrose ground at Leadville, has remodeled and retimbered the latter shaft. They are ready to get pipes and machinery in place, so that sinking can resume hy May 1. The pumping plant of four boilers and one main pump will cost about $27,000. The pump will have capacity of 1500 gallons per minute, and raise the water 1200 feet.

At the Golden Curry mine, near Leadville, G. Nestor & Co. report a find made in a tunnel run in 500 feet, and the ore shows sulphides averaging $25 a ton. In the hreast of the tunnel a body of ore has been opened up, wbich shows average assays of seven ounces silver. Additional work is planned for the summer, including the sinking of a shaft, which is going down to cut the ore in the tunnel.——A lease has been granted on the Gertrude, near the Curry.——Ore is being mined by J. McNeece on his Fortune mine, while the lease on another part of the ground is being worked by T. Raney.——Some shipments of fair grade ore have been made from the Reindeer during past two months, but principal attention is being given to development and prospecting work. This is the shaft sunk on Rock hill.

T. Goodwin, manager of the New Monarch group at Leadville, and the Ohio & Colorado - Salida smelter, says that at both Salida and Leadville they have plans under consideration for improvements. The deepening of the Monarch shaft from 700 to 2000 feet will be put through and the plants of machinery on the ground will he put in place as soon as the weatber permits. As Manager Goodwin wants to handle the low grade as well as the higher grade material as the product is mined, the company proposes build ing a concentrating mill at the Monarcb ground. The strike in the Cleveland shaft is a hody of sulphide ore. The first work on the Monarch shaft will be retimbering tbe 700 feet tbat bave already been sunk, after which the plant of machinery will be put in place and the shaft sunk to 2000 feet or deeper. The Salida smelter, says Goodwin, is running full force. The capacity of the plant will be increased. The Ohio & Colorado Co. also has under consideration the building of its own refinery.

Mineral County.

The general mining outlook of Creede district is reported showing improvement over corresponding period of last year. All the mines are increasing output. The Humphreys company is producing 10,000 tons of ore per month, 6000 tons of which are concentrated hy tbe Humphreys mill, into 1000 tons of lead and zinc concentrates.——The United Mines, whicb is the principal property operated by this company, continues to show improvement, as development progresses, especially in the north end, says Manager G. Davis. ——Tbe Nelson tunnel has resumed work, driving the tunnel north through tbe White Star Co.'s ground, which is under lease to the Little Kanawha Leasing Co., controlled by A. E. Humphreys et al. This contains bodies of low-grade lead and zinc ores similar to that of the United Mines.

Park County.

(Special Correspondence).—H. Dyatt, of Leadville, is operating on the Peerless-Maude and adjoining properties. He is shipping ore that averages 40% lead. Part of the ore is concentrated 2 and 2½ tons into 1 and the high-grade smelting ore is shipped direct to the smelter. Plans are under way for working the group on larger scale. A mill is proposed.

B. S. Schlessinger, manager of the Last Chance mine and mill, expects to increase the output of his mine the coming summer. His mill is handling ore from the Peerless-Maude mine.

Doran, April 3.

Pitkin County.

(Special Correspondence).—Fire in the Smuggler mine still hampers progress underground. They are mining about 10,000 tons per month, which goes through the concentrating mills, and the concentrates are shipped to the smelters. They are running one of their mills twelve hours and the other twenty-four hours per day. Ore is concentrated 6 to 7 tons into 1. They are shipping 200 tons of ore each month in addition to the concentrates. The company employs 200 men. It is thought that 2 feet of bituminous shale on the hanging wall between the harder shale and the vein, which contains oil, is burning and causing the trouhle in the mine.

Shipments from all sources amount to about 12,000 tons per month from the district. The base of the ores of the camp is lime and the smelters pay for lime. The railroads have made graduated rates according to the value of the ore. Little prospectiug is heing done in the district, owing to the fact that the camp produces nothing hut silver, and at the present price of silver it will not pay to prospect for the same.

The Smuggler Co. has a lease on the Mollie Gibson and Della S. mines, which they are working.

Aspen, April 4.

San Juan County.

The Highland Mary tunnel, near Silverton, is in 5300 feet. Near the face of the tunnel is a raise of 400 feet, which connects with other workings including two drifts, one running north and one south from point of intersection. Gray copper carrying silver values is heing hroken from the

north drift. The concentrating mill of the Gold T. & R. Co., which owns the group, is in operation.

San Miguel County.

The Butterfly-Terrible G. M. Co., at Ophir Loop, is increasing operations on its group of mines. For lack of water, only twenty-five of the thirty stamps in the milling plant are dropping. The mill is handling 100 tons of ore daily. Manager J. F. Keating says during the fifteen days of March the amalgam and concentrate product obtained more than paid cost of operating the property for entire month—about $6000. In the mine, stoping has begun on the block of ground between the first and third levels, which is between 750 and 800 feet in length by 320 feet in height. The vein ranges from 1 to 8 feet in width. A tunnel will be started this summer lower down the mountain which will tap the vein between 500 and 600 feet deeper than the third level. It will be necessary to drive it 3000 feet before cutting the vein.

Summit County.

W. Lennox, M. Evans, et al. have incorporated the Lincoln G. M. Co. to operate the Goldrick (Clark-Riethmann) group in French gulch, near Breckenridge.——The West Side (Engle) mill is running steadily on Gold Dust-Puzzle ore, and concentrates are being turned out. Several four-horse teams are hauling ore from the mine to the mill. The Puzzle Leasing Co. is operator.

Work on the Admiral mine, below Wheeler, is progressing. The Admiral Co. is building a dam below the old site and is preparing for increased hydraulic operations this season.

Teller County.

The treatment rates on ores from Cripple Creek district have been reduced by the American R. & S. Co. and the United States R. & R. Co., and the Telluride mill at Colorado City. The rates being offered by these plants are as follows:

Treatment and freight on one half ounce gold ore	$5.50
Treatment and freight on one-half to one ounce	6.00
Treatment and freight on one to one and one-half ounces	6.50
Treatment and freight on one and one-half to two ounces	7.00
Treatment and freight on two to three ounces	8.00
Treatment and freight on three to five ounces	9.00

All values over five ounces $6 for treatment with freight charges added.

To show the extent of the cut the previous scale is given:

Treatment and freight on one-half ounce	$ 7.50
Treatment and freight on one-half to three-fourths ounce	8.25
Treatment and freight on one ounce	9.00
Treatment and freight on one and one-fourth ounces	9.25
Treatment and freight on one and one-half ounces	10.50
Treatment and freight on one and three-fourths ounces	11.25
Treatment and freight on two ounces	12.00
Treatment and freight on three ounces	12.75
Treatment and freight on five ounces	13.50

Negotiations are under way for building a cyanide mill on the ground of the Isabella G. M. Co. at Cripple Creek. They propose to buy the dumps at the several mines on Isabella territory.

J. H. Featherstone has a lease on the entire workings of the Dillon mine on Battle mountain, near Victor, which adjoins the Portland mine. He is working from the third level up. Lessee Featherstone has subleased the fourth and fifth levels to Gorman & Co., who have opened a streak of ore from which they made first shipment this week. The sixth level it subleased to the Victor Leasing Co. The seventh and eighth levels are subleased to Moore & Co. The latter is making preparations to do a large amount of development work. They are building an ore house with capacity of 100 tons.

The ten lessees on the Doctor-Jack Pot holdings at Cripple Creek shipped out during March twenty-five broad-gauge cars of ore, with average values of $35 in gold per ton. All of the ground of the Doctor-Jack Pot Con. M. Co. is being operated by lessees.——Superintendent E. G. Taylor of the C., K. & N. mine, on the western slope of Beacon hill, says the mine produced during March 860 tons of ore, giving average values of $65 gold per ton. Taylor, who has charge of the Old Gold, adjoining the C., K. & N. on the south, as lessee, says the Old Gold output 1700 tons of average value of $35 per ton.

The Vindicator M. Co. at Independence shipped out during the month of March 1200 tons of ore, giving an average return of $50 gold per ton. The ore is being mined from above the tenth and below the sixth levels. The management is making no attempt to get below the tenth level, which is flooded with water.

M. Burke, who struck ore on the Henry Adney claim on west slope of Beacon hill, Cripple Creek, is cutting a station at depth of 416 feet. When this work is done and additional machinery set up shipments will be started. The ore house capable of handling 100 tons of ore per day is completed. The shaft house is also finished. A 10x12 hoist with engine and 80 H. P. boiler is going in. Burke holds bond and lease for $35,000.

The Old Gold M. Co. is putting in a plant of machinery and an air compressor preparatory to working a property on Beacon hill, Cripple Creek, on company account. Lessee Taylor & Co., who was operating under lease, made good tonnage of ore, returning values of $60 per ton. The ore was being broken in a drift 180 feet southwest of shaft at depth of 390 feet from surface. His lease expired April 1.

The water in the shaft of the Mary McKinney mine at Cripple Creek is receding at rate of 2 feet a week, due entirely to El Paso drainage tunnel. By May 1 the company will have drained all the water from the sixth level. The company is receiving large number of applications for leases, but at present not many are being granted.

IDAHO.

Ada County.

G. A. Tuttle, manager of the Copper Mountain M. & M. Co., operating at Copper City, 8 miles from Eureka, reports the new boat for the Snake river will be running by May 1. His company, in which Spokane, Wash., men are interested, will start shipping as soon as the boat runs. They are working fifteen men and will increase the number. The smelter at Eureka will start up this summer. The Copper Mountain ore will be shipped there. The mine is near the river, so that a tramway will be put in to load the ore on the boats. They will also put in hoist and electric drills this summer. The Electrolytic mine, which adjoins, is working a few men.——A deal is pending for the sale of the Yellow Boy mine, owned by Smith & Woodrum of Lewiston, Idaho, to Eastern men for $60,000.

Shoshone County.

The Little North Fork C. M. & M. Co., Ltd., is increasing development of its copper mine, near the Little North Fork. The drift is being run to catch the ore shoot that was cut above. This is in 425 feet and is expected to reach the shoot within 100 feet farther. The owners are P. Anderson, J. Brandon, B. Teckham, Matchette & Mason and G. W. Harris of Wardner.

The Hecla M. Co., operating the silver-lead mine near Mace, is shipping its ores to the Salida smelter in Colorado, where they are fluxed with local siliceous ores. The Bunker Hill & Sullivan is out of the smelting company's control. The Cœur d'Alene Dev. Co., which formerly supplied considerable tonnage from the Crown Point group, near Wardner, is practically closed, and is only getting out a little ore under lease. The American S. & R. Co., says the Spokesman-Review, is holding the Federal group under long time contracts, and is getting the output of the Last Chance at Wardner, the Mammoth and the Standard at Mace and the Tiger-Poorman at Burke, together with the ore the Tiger-Poorman at Burke sends out. It is also getting the tonnage from the Morning mine at Mullan. This year is improving for the Cœur d'Alenes. The output is large and the price of lead up, while the labor question is quiet. In addition the railways are reducing rates for transportation of ores to the smelters. Another cut was announced last week to Leadville, Colo., over the Northern Pacific on ore or concentrates from Mullan, Morning, Wallace, Sunset, Manchester, Gem, Frisco, Mace, Hecla, Burke, Osborn and Wardner. A rate of $7 is offered for ore worth not more than $60 a ton, $9 for ore not over $65 and $11 a ton for ore worth less than $100 a ton. To Denver and Pueblo, Colo., the same grades of ore have rates of $8, $10 and $12, respectively. The minimum carload will be 30,000 pounds.

According to reports of the employment office of the Mineowners' Association, 75% of the 2000 miners engaged through that agency in the Cœur d'Alenes are native-born Americans, while all the foreign-born element employed have declared their intention of becoming citizens of the United States. Before a man is able to obtain a position through the employment agency, it is necessary for him to submit satisfactory proof to those in charge that he has declared his intention of becoming a citizen. In the mines of the association above Wallace, 1100 men are employed, and of this number 26% are Missourians. These 300 miners are nearly all working in the Standard, Mammoth, Hecla and Tiger-Poorman mines. Formerly there were some employed at the Mullan and Wardner mines, but few, if any, now. Of the foreign-born, Swedes constitute 10%. They are principally at the Morning mine at Mullan. Finlanders compose about 5% of the total number, and are mostly in employ of the Morning Co. These two comprise one-half of employes at the Mullan property. Among the remainder there is a mingling of nationalities scattered in the different mines. Coruishmen form a large portion of the employes in the Bunker Hill & Sullivan mine at Wardner.

A final settlement of the 16 to 1 mining case has been made and operations resumed. The 16 to 1 mine is in Nine Mile section, near Wallace. On account of the heavy snow in that section, the work of opening up the mine will not be started until May.

MISSOURI.

Jasper County.

The Ozark Zinc Oxide Co. at Joplin is enlarging its plant for the second time. The capacity will be increased by one-third when the new furnaces are ready for operation. Last year the capacity was doubled. A building of brick and sheet iron is being put up for the additional machinery. The product of the plant (zinc white) is used in manufacture of paint. The company is smelting carbonate ores from Mexico, New Mexico and other Western points, as well as all the carbonate output of Arkansas.

MONTANA.

Beaverhead County.

At the Ajax mine, near Dillon, Superintendent Noyes has thirty men at the mine and mill. A mill, with ten 1050-pound stamps, has been put up and is handling twenty tons of ore per ten hours, which constitutes a shift. It is equipped with two tables which save a ton of concentrates per day, which, when shipped, net $25 per ton.

Cascade County.

Four feet of high-grade gold ore is reported found in the mine of the Crevasse Mountain M. Co., at Crevasse, by W. G. Conrad of Great Falls, part owner. The number of men at work will be increased.

Choteau County.

At Havre the Blackfeet Oil Land & Development Co. has been organized by J. S. Almas, L. K. Devlin, J. W. Huse, E. V. Hauser, M. Clark and W. C. Broadwater. The company will develop oil lands, of which it has 3000 acres, on Two Medicines creek.

Fergus County.

At Great Falls F. Longstaff, O. P. Perry, D. L. Williams, J. R. Mettler, O. F. Wadsworth, W. Ellis, J. A. Ferguson and J. Burns have organized to develop a group on Sage creek, near the Cascade county line.

The Little Hazel M. Co. is driving a tunnel 700 feet on the Little Hazel group in Conklin gulch, near Lewistown, for tapping a vein of silver-gold-copper ore exposed in a discovery shaft above. C. Edwards of Gilt Edge is foreman. The vein on the Little Hazel shows 20 inches of ore, carrying shipping values. The tunnel is in 175 feet.——C. Stephens of Cone Butte is driving a tunnel on the Alma and Alder. He has a 7-foot vein of ore that carries gold values of $7 per ton. The tunnel is in 110 feet.

Jefferson County.

The Cataract C. M. Co. is working full-handed at its Bullion, Crystal, High Ore and Grey Eagle mines, near Basin, until the smelter is running.——The Pennsylvania-Montana M. Co., operating the Hattie Ferguson mine, has put on more men and is shipping two cars of ore per week to east Helena.

The Red Bird M. Co. has put machinery on the mine it has under hond in High Ore gulch, near Basin. It is preparing to increase development and is shipping ore.——The number of men at the Hiawatha has been increased and a tunnel is being run on the west side of the hill to tap the lead and to facilitate the working of the mine, as it will make the haul easier, grade and distance being reduced, says Manager Dowling.

Work will be resumed on the Boulder-Comstock mine, near Basin, the company intending to put in more machinery and thoroughly develop the ground, sinking the shaft several hundred feet deeper.——The Basin Reduction Co. has started work on the slum dams below Basin, and, on the completion of these, operations will be started on the proposed enlargement of the concentrator to 2500 tons a day, the present capacity being 1500.

Park County.

H. B. Edwards, manager of the Ethel May G. M. Co. of London, Eng., which owns mines in Emigrant gulch, near Livingston, says he is preparing to put in twelve stamps having quadruple discharge mortars. Other machinery for use in the mill includes a Blake crusher, with capacity of 150 tons per day, and six Frue vanners.

The trouble between the Kimberley-Montana G. M. Co., operating the Bear Gulch and other mines at Jardine, and its employes has been adjusted.

Powell County.

G. J. Kirby, president of the Montana United M. Co., at Emery, says Superintendent Cohh is putting in a sawmill outfit for the mines.

Silver Bow County.

A strike is said to have been made in the Combination mine, in Meaderville, near Butte, last week. Development work has progressed to the 700-foot level and the find was made at that depth. Samples assayed 31% copper and 100 ounces in silver. Considerable water has been struck and the extent of the discovery cannot be ascertained until the mine is pumped out.

Teton County.

The St. Mary's Lake L. Oil Co. of Great Falls has been incorporated by I. Myers, C. M. Webster and R. Cooper of Great Falls to develop oil lands in northern Montana.

NEVADA.

Esmeralda County.

The Red Top M. Co. has been organized at Tonopah to operate a group of claims in Goldfield district. The officers are C. D. Taylor, F. M. Ish, R. L. Colborn, J. B. Menardi and G. B. McClelland. Colborn reports that a new lead has been found on the Vindicator group and preparations are being made to sink on it.

The Blair interests at Silver Peak are preparing for an increase of development work in the mines of that estate. The mill has been put in order. The mine is equipped with a 30-stamp mill and a leaching plant.

Lincoln County.

B. Macready, with Los Angeles, Cal., men, has a bond on the Forney & Hilbish group comprising five claims south of the Spokane group of the Southern Nevada M. Co., near Searchlight. He has put men on surface work prior to beginning development. Macready has also bought the Barney Reily mine. The claim is a fraction between the Santa Fe and the Miess group.

J. McArthur and F. A. Ray have a bond on the Confidence mine in the Summit Springs section, near Searchlight. Development work was begun last week.

The Nevada Keystone M. Co. will leave Sandy and move its mill to the mine near Sandy, says the Searchlight. The water supply will be pumped to the mine from Goodsprings. It is also reported the company intends making other improvements. The company will build at a point on the Salt Lake Railroad route, 12 miles from its mines, an electric plant with capacity sufficient to furnish light at the mines and power for operation of mining and reduction machinery. When the plant is set up the company will amalgamate forty tons of ore per day and cyanide fifty tons. Present operations are confined to milling high-grade ore (over $30 per ton).

Lyon County.

The North Rapidan mine at Como, near Dayton, is being prepared for a season of development work. The mill has started up.

Nye County.

J. C. Gladden and J. R. Walker of Salt Lake City, Utah, have bonded a group of seven claims 8 miles northeast of Crow Springs, near Tonopah. The ledge is said to show an 18-inch streak of silver-lead ore carrying shipping values.

Storey County.

Superintendent J. R. Ryan has arranged the pumping system at Con. Cal. & Virginia combination shaft at Virginia City, so that two Reidler pumps do the work formerly performed by three. This leaves one Reidler always ready for use in case of break-down, says the Territorial Enterprise. Two Reidlers and No. 2 elevator hold the water below the 2350-foot level.

Washoe County.

A 3-stamp mill will be put in at the Ninth Crossing mine, in Rainbow district, by C. F. Kolster and J. Urban of Reno. Work will be started this month and development underground will at the same time be increased.

A strike is reported in the Desert King mine, 4 miles from Reno, showing ore running $100 a ton in a 4-foot vein. The ore shows values in chlorides, free gold and wire silver. In character it is a breccia.

White Pine County.

J. B. Fleming of Salt Lake City, Utah, of the White Pine C. Co., operating at Ely, says the mine will be equipped with reduction works.

NEW MEXICO.

Grant County.

Machinery for the International mill is on the ground at Malone and is being placed.——The Owen Bros. have a lease and bond on the Bellum claims at Santa Rita.

The Con. M. Co. has bought the Chi-

cago mill at Gold Hill and it will be moved to the mines of the company near Lordsburg.

The Shamrock smelter at Pinos Altos was again blown in last week by Manager B. Johnson of the Burro Mountain smelter, who has the Shamrock smelter also. The copper matte from the Pinos Altos plant will be used for fluxing purposes in the Burro Mountain plant, as it contains iron and sulphur, carrying copper with gold and silver values. A flow of water has been obtained in Dead Man's gulch, half a mile below the Burro Mountain smelter, at a depth of 20 feet. This gives the company a flow of 1200 gallons a day, which is sufficient with the condensers that have been put in. However, several more wells will be sunk.

Rio Arriba County.

Tres Piedras reports say a strike has been made in Bromide camp on the 300-foot level of the Tampa mine. Only one shift is being worked. The vein is 12 feet wide and it is expected a mill will be built, says F. Bolton of the company.

Sierra County.

A deposit of platinum ore (sperrylite) is reported found 3 miles from Hillsboro. The ore is said to carry 3% of platinum. A vanadium deposit exists in three mines which have been opened up in several places, said to have given returns of 12% venadic-pentoxide. The properties are owned by W. Buchanan, J. H. Bigelow and S. J. Macy. It is proposed to increase work. —— Fourteen men have been put to work on the Empire mine, near Hillsboro, by the Empire G. M. & M. Co. The 200-foot station will be reached this month. The Empire has 2 feet of ore that runs $30 a ton in gold. —— The Bigelow G. & C. M. Co., operating near Hillsboro, will connect its two shafts, 400 feet apart, by running a drift each way on the 180-foot level.

Socorro County.

E. Craig is preparing for resumption at the Last Chance mine and mill at Mogollon. The mill is being overhauled and will be increased in capacity.——A deal is said to be pending for the holdings of the Helen M. Co. at Graham and the Confidence mine at Mogollon by English parties.

OREGON.

Baker County.

J. Mikel says he is arranging to open up the Nine Strike mine in Cracker Creek district, near Sumpter.

The I. X. L. mine, near Greenhorn, is preparing to sink from 200 to 300 feet deeper the coming season. The capacity of the mill will be doubled and other important improvements made, says G. A. Carter of Greenhorn, consulting engineer.

A. B. Patterson, superintendent and manager of the Octo G. M. Co., owning the Octo mine 6 miles west of Baker City, says arrangements have been made for increase of development work, which will be started this week, preparatory to resumption of milling operations. He also says he will start work on the Crown Point mine, near the Octo.

T. Kennerly of the Gold Coin mine, in the Greenhorn mountains, near Greenhorn, says he will resume work on that ground this spring. F. C. Ganter is superintendent.

The strike at the Eureka & Excelsior mine of the Mountain View M. Co. at Bourne has been settled and the men have returned to work.

The Tempest mine, Sumpter, will have a 100-ton smelter, says M. Blanchard of Portland, manager of the smelter company.

Douglas County.

C. C. Matthews, superintendent of the Oregon Securities Co. at Bohemia, says he is putting in additional machinery. The 30-stamp mill is expected to be ready for operation this month.

A body of ore has been opened in the Riverside group, near Bohemia, in the lower tunnel. The breast of the drift shows ore 7 feet wide. This tunnel is in 340 feet, and they have been drifting in the ore body for 200 feet. It is under the management of F. J. Hard.

Grant County.

P. A. Brady, superintendent of the Belcher and Red Lion mines near Granite, says arrangements are being made to put in milling machinery at both these mines, and operations will be started as soon as weather permits.

At the Badger mine, 1½ mile from Galena, near Susanville, owned by the Badger M. Co., work is progressing. The ore carries gold and silver. It has depth of 750 feet. Ore is sacked as it comes from the mine and is hauled by teams 40 miles to the Sumpter Valley railroad and shipped from there to the smelter. The company has a mill with which the low-grade ore is treated and the concentrates are shipped.——Spaulding, Stevenson & Simpson have put in a Huntington mill of thirty tons capacity to work a dump of tailings. There are several thousand tons of this, which is said to assay $8.

Jackson County.

The Golden Standard mine of Gold Hill district, owned by Kubli Bros. of Jacksonville, and which has been closed down, is being overhauled and made ready to resume operations.

Josephine County.

The Ada quartz mine of Foots Creek district, near Grants Pass, has been bonded by Manager Woodrow of the New York General Electric Co., and will put men to work next week, says the Telegram. He will continue development of the Ada and shape it for a stamp mill and plant. The mine is opened by tunnel and shaft to depth of 200 feet. A tunnel has been started on a deeper level and has been driven 80 feet. This tunnel will be completed. The ledge is 3 feet in width.

The Bagley Improvement Co. is doing work on Wards creek, east of Grants Pass, building reservoirs and constructing ditches, and will provide water in quantity for both placer mining and irrigation. The company's holdings cover an area of 1000 acres along Wards creek of both farm lands and placer ground. The gravel is said to lay from 8 to 10 feet in depth, and carries average values of 20 cents a yard.

The Van Dorn & Hedrick hydraulic placer mine, on Rogue river, below Grants Pass, is being overhauled. Larger ditches are being built and heavier piping laid.

The Golden Eagle mine at Provolt is in full operation and they are running a tunnel 150 feet to tap the ledge in the shaft, 60 feet in depth. The ledge in the shaft is 3 feet in width. The company which has this mine honded is superintended by J. Whitehead of Gold Hill.——The Sharp Bros. placer mine in Powells creek is worked steadily by pipe and rock hoists. ——A bond is being negotiated for on the Little Pocket quartz mine across the river, 1 mile from Provolt, owned by E. Hannum and A. Cook. It is idle at present.——On Missouri Flat the Gilkins M. Co. is placer mining on the Carris farm.

Lane County.

The 40-stamp mill for the Lucky Boy mine at Blue River is nearing completion, says L. Zimmerman, president of the company.

SOUTH DAKOTA.

Lawrence County.

The Columbus Con. M. Co. has closed its cyanide plant in Blacktail gulch, near Deadwood, and is shipping ore to the Hidden Fortune plant. The latter mill will he supplied with ore from both the Columbus Con. and the Hidden Fortune. F. E. Steele is in charge of the plant. The change was necessitated by condition of the wagon roads between Columbus Con. mine and mill, and also because the Columbus Con. cyanide plant was too small, says the Review.

The Dakota cyanide plant in Deadwood is dropping twenty-five stamps steadily. For several weeks the company has been bothered by heavy snow and consequent railroad blockades, which have interfered with ore supply from the mines. The mill requires three carloads a day.

Work has started by the Horseshoe M. Co., near Terry, on a flume to bring water from a spring on the southeast slope of Terry peak to its cyanide plant. When completed it is expected the spring for a time at least will supply all the water required to run the mill and do away with the expense of pumping from the Mogul shaft. Regular shipments of ore are being made by the Horseshoe M. Co. from the Mark Twain and Ben Hur mines to outside smelters for reduction.

Pennington County.

At Keystone M. Crocker is putting in a sinking pump in the J. R. mine shaft and work in the shaft will be resumed. —— F. Hebert has a carload of ore on the dump of the Clara Belle mine, which he will ship to Denver, Colo., for treatment. —— The Sunbeam company has stopped work in the mine temporarily and is only keeping the water out of the shaft. Prospecting work in the mine will be resumed with a diamond drill.——A. D. Arundel is doing development work on the 150-foot level of the Lena shaft. He is running a crosscut from the shaft south. At 40 feet a body of ore was broken into.

The Aberdeen G. M. Co. has been working steadily during the past winter on its mines near Hill City. An inclined shaft has been put down 110 feet with a whim. This company has four of the claims off the J. R. group. The principal work by the Aberdeen company is being done on the Surprise lode, from which the former owners of the J. R. took out ore. P. Daly is manager.

UTAH.

Beaver County.

Water supply for the Horn Silver concentrator at Frisco having been obtained, the plant is again in operation with thirty men on the payroll. The water supply as yet limits the crushers and tables to a feed of 140 tons daily. Manager Farnsworth says he has not resorted to the development of water by drill for the reason that the mine at depth of 1600 feet is practically dry. He has 100 men underground and continues extraction of copper ore.

The Majestic C. M. & S. Co., with mines near Milford, is in the hands of two receivers. R. R. Tanner has charge of the company's affairs in Utah and H. Altman in Colorado.

It is reported the stockholders of the Majestic C. Co. have voted to consolidate their holdings near Milford with those of the Monarch M. Co.

Grand County.

Ore is being hauled from the uranium mines near Richardson to the railroad, whence it is shipped to Niagara, N. Y., says the Times of Moab.

Juab County.

Shipments for month of March are largest in history of Tintic district, says the Tintic Miner. It required 617 railroad cars of forty tons capacity, the total exceeding 25,000 tons, or an approximate net value of $250,000. This tonnage was divided as follows:

	Cars of Ore.
Ajax	20
Bullion-Beck	27
Carisa	12
Centennial-Eureka	205
Dragon Iron Mine	36
Gemini	105
Grand Central	73
Lower Mammoth	32
Mammoth	44
Tetro	16
Uncle Sam	14
Yankee	11
Six others, a total of	16
Total	601

CONCENTRATES.	Cars.
May Day	2
Uncle Sam Con	4
Total	6

Superintendent Earls says he has reached the 700-foot level, with the winze in the south part of Bullion-Beck ground adjoining the Centennial-Eureka at Eureka, and will run a drift into the ore shoot, which was opened in the Moultoon tunnel. The 700-foot level in the Beck corresponds with the 1100-foot level of the Centennial. Lessees in the old workings shipped twenty-seven cars during the month.

The Mammoth mill, near Eureka, is being put into condition for work, says the Tintic Miner. Manager McIntyre will not longer await a favorable contract with the smelters for his low-grade product. Operations will be under way next week.

Work will be resumed on the King William mine at Tintic, near Eureka, this month, says C. H. Blanchard, the owner.——Operations have been resumed at the Eutonia M. Co.'s ground in West Tintic, near Eureka.

Piute County.

The Richfield M. & M. Co. has been incorporated at Richfield to operate in the Gold Mountain mining district, near Marysvale. The officers are H. W. Ramlose, J. Wilson and W. Ogden.

Salt Lake County.

Manager D. MacVichie, of the Bingham Con. C. Co., operating at Bingham, is considering adding lead furnaces to its smelter.

J. W. Langley has an option on the Gypsy Blair mine in the Big Cottonwood district, near Alta, for $50,000. The Gypsy Blair adjoins the Kennebec M. Co. ground, in which Geo. H. Robinson is interested. Its side lines are within 4000 feet of the Columbus Con.

On the Castro group of mines at Bingham development will begin under the Van Patten option next week, says the Tribune, the intention being to extend the tunnel begun by the owner, N. Castro, to the main ledge. From the main fissure mined by Castro copper ore has been produced. The owner has retained the placer ground.

Sevier County.

O. Larson, superintendent of the Log Cabin group of mines, near Richfield, reports developments showing $5 gold ore in sufficient quantity to justify putting up a mill. Since the exploration of a cross fissure by which the main ledge was intersected at the 500-foot station was begun, said the superintendent, it has swung around until it is running parallel with the latter. He says the value can be extracted by cyanidation. The general offices of the company, including the Gold Dev. M. Co., have been removed to Richfield, with Assistant Manager M. F. Murray in charge.

Summit County.

The new tailing plant of the Daly-West mine at Park City is nearing completion.

Tooele County.

On account of the heavy flow of water in the Honerine drain tunnel at Stockton work has been suspended in the adit. In the meantime the water in the workings of the various mines is rapidly being lowered. Until the volume of water recedes so that men can work readily, nothing will be done toward driving the tunnel ahead to the objective point.

WASHINGTON.

Ferry County.

D. F. Anderson of Rosalia, president of the Belcher M. Co., reports a railroad will be built this summer from foot of Curlew lake, near Republic, 6 miles up Lambert creek, to Belcher camp. As soon as it is built the Belcher will start shipping. It is expected work will start on the railroad by May 1 and be completed within forty days. The road is to connect with either the Hot Air line or the Great Northern. At the Belcher they are preparing to put in a tramway and electric drills this summer. They have 2500 feet of tunnels on the property and are in shape, says President Anderson, to start shipping 500 tons of ore a day as soon as the road is opened. The Portland mine has machinery on it and will also be ready to ship.

Skagit County.

The Canadian-American M. Co. of Belleville, N. O. Hughey president, proposes to put in additional machinery as soon as weather permits. The mine will be placed on a shipping basis of fifty tons per day.

Snohomish County.

(Special Correspondence). — Geo. S. Binckley of San Francisco, Cal., chief engineer of the Puyallup river power development of the Columbia Improvement Co., expects to have this plant completed by June 15. The exciters have been in use for some time, and the first main unit of the four, of 6000 H. P., was started April 2.

Electron, April 4.

Stevens County.

The Copper King mine, owned by the Chewelah Copper King M. Co., 6 miles northeast of Chewelah, is developed by 3500 feet of tunnel, shaft and drifts. The main tunnel is 1300 feet long and has opened three shoots of ore 4 feet wide, 13 feet and 25 feet. The ore is of copper with varying gold values, and carries a percentage of iron. Three cars of ore on the dump will be shipped as soon as the roads are in condition to haul to the railroad. Men are working this group under Superintendent D. F. Strobeck, who says he will take out and ship a car of ore per day.——The Jay Gould mine, owned by the Hertzell-Jay Gould M. Co., T. T. Hertzell president and manager, is also in operation. It is 3 miles east of Chewelah, with a good wagon road. The Jay Gould is a silver-lead claim, carrying values in copper and gold. The ledge is 25 feet wide, between walls of granite and serpentine. This is developed by 200 feet of shafts, levels and crosscuts. The main shaft is 180 feet deep, and follows the ledge. The mine is equipped with a 50 H. P. boiler, 30 H. P. hoist, steam pump and steam drill. It also has two reserve engines of 10 and 25 H. P.——The Nellie S. M. & M. Co., 1¾ mile east of Chewelah, is doing development work, says H. H. Baker, president.——The Eagle mine, the first producer of this camp, is idle.—— The Alice M. Co. has acquired, through a bond, the Echo and Juno claims, 1 mile east of Chewelah. These claims are near the Nellie S.

The six furnaces of the smelter at Northport were blown out last week, says Manager E. I. Wilson and men are at work putting up a sampler and crusher, the machinery for which is at hand. It is also stated that the smelter with its present facilities and the present condition of its furnaces is unable to get certain custom ores containing fluxing properties necessary to smelt Le Roi ores to best advantage. These ores have been promised if necessary repairs are made. Smelting will resume next week.

Whatcom County.

T. P. Saunders, president of the Great Excelsior mine in Mount Baker district, east of Whatcom, says the capacity of Mount Baker mill will be doubled and other mines will put in machinery. Besides the smaller properties that will put in plants, the Great Excelsior, which has twenty stamps dropping, will add eighty more. The B. B. & I. R. Railway is building to the camp.

WYOMING.

Carbon County.

The Ferris-Heggarty mine, near Dillon, has resumed its output of ore and 100 more men were put on last week, says the Dillon Doublejack. The number will be further increased. Considerable ore that has been broken down during the winter is in the bins and will supply the tram for a time.

Laramie County.

Heavier machinery is being put in at the iron mines of the Colorado Fuel &

Iron Co. of Pueblo, Colo., at Sunrise. The weight of the compressor is 102,200 pounds. A large number of drills will be set to work and the number of men increased. The demand for this ore is said to be the call of the Moffat road and the Colorado & Southern for rails. The flywheel of the compressor weighs 20,000 pounds and is 16 feet in diameter. It will furnish power for thirty drills. The present complement of drills in the mine is eight. For another of the company's mines it is expected a 60-drill compressor will be put in.

FOREIGN.

AFRICA.

Rhodesia.

The total gold output of companies making returns to the Rhodesian Chamber of Mines at Bulawayo for month of February is reported at 18,673 ounces (Matabeleland, 15,481 ounces; Mashonaland, 3192 ounces)—a decrease of 686 ounces as compared with the previous month and an increase of 1583 ounces as compared with the corresponding period of 1903. The silver output for January was 3521 ounces and for February, 3461 ounces.

AUSTRALIA.

Western Australia.

At Bayley's mines at Coolgardie the diamond drilling contract has been finished, proving the continuation of the new reef at 600-foot level and at 250-foot level Price shaft. They have started sinking winzes, preparatory to mining and milling. In winze from 800-foot level of Price shaft, reef averages 3 feet in width, assaying 60 pennyweights of gold. The reef has been opened up in the 1000, 900 and 800-foot levels of Price shaft.

The Great Fingall Con. at Kalgoorlie reports the first twenty of the new stamps started dropping March 15.

The Lake View Consols mine at Kalgoorlie reports February returns at 8403 tons of ore treated, yielding 4206 ounces fine gold. Costs—ore extraction, 13s 3d per ton; ore reduction, 13s 5d per ton; total working expenses, (including general expenses) £1 6s 8d per ton, or total of £11,204. Expenditure on machinery and plant, £407; expenditure on mine development, £2220.

At Kalgoorlie Bowick, Moroing & Co. have taken over the White Feather Main Reef mine, and J. Pollard is manager. Since 1895, when the Reef was first prospected, its main ore body has been followed to a vertical depth of 850 feet. The official records show that up to Feb. 1, 1904, the mine has yielded 79,550 ounces of gold from 90,489 tons crushed.

The Kalgurli mine, at Kalgoorlie, is preparing to put in additional milling power. It is proposed to increase the treatment capacity of the plant to permit of 7500 tons of ore being handled monthly.

BRITISH COLUMBIA.

Boundary District.

With the Granby and the Mother Lode mines shipping their usual quota to the smelters, Boundary miners have this year to April 1 sent out over 200,000 tons of ore with value estimated at $1,000,000.

Cassiar District.

In Atlin division mining work is increasing. C. B. Gaddis, manager of the Spruce Creek Power Co., which owns 1360 acres of claims on the Spruce near Atlin, says his company will put in a $150,000 hydraulic plant. The Pine Creek Power Co., owning 1000 acres of gold-bearing ground on Pine, will increase development work this year. F. T. Blunck of Iowa and L. H. Griffith of Seattle, Wash., are part owners in the Pine Creek Co.——The British-American Dredging Co. will operate two dredgers in Atlin the coming summer. T. Schwitzer is manager of the company, which is owned by Philadelphia, Pa., men.

The Switzer-Robinson M. Co. has been organized to operate the Blue Canyon and Deniston group of leases on Upper Spruce and Upper McKee creeks, near Atlin. The lower end of Blue canyon was prospected last year by a traction driller, with Superintendent Richards in charge. This year the driller will continue prospecting above the canyon. There are twenty-two leases, and the ground is said to be suitable for dredging.

East Kootenay District.

The Imperial Coal & Coke Co. has increased its holdings of land near Michel.

Nelson District.

M. S. Logan of Nelson, managing director of the Juno, on Morning mountain, near Nelson, says it is proposed to build reduction works, consisting of a stamp mill and other equipment. The Juno is above the Venus-Athabasca group. A drift was run on the continuation of the Venus lead, tapping the main Juno lead at depth of 300 feet. By sinking and raising a connection was made with the surface. Crosscuts are said to show 8 feet of milling ore. To continue development a lease was secured on the No. 2 tunnel of the Venus mine and a raise is being run to connect with the upper workings on the Juno ore body. Arrangements have been made for a supply of air from the Athabasca compressor, which is also furnishing air for the Venus mine. Machine drills will then be put in the Juno.

Rossland District.

Arrangements are closed for building a railroad siding a mile long around the base of Columbia mountain, near Rossland, when snow goes off. It will afford transportation facilities for the Iron Colt, Mascot and Kootenay mines. They have low-grade iron ores. All three have teamed their produce over a wagon road, and the reduction of $1 per ton in the cost of laying down the ores at smelters over a railroad line throughout, it is expected, will be inducement for operation of all three.——An electrically operated pump is being put in at the Spitzee mine, where the present pumping apparatus has been operated from the compressor plant. The mine will operate another machine drill and increase its working number to twenty-five men. The main drift on the 200-foot level shows the ore and the crosscuts open a shoot averaging 8 feet in width and carrying $12 in values. This spring the main shaft will be continued to the 350-foot point.

Slocan District.

The Black Warrior mine, near Sandon, will be worked this season.——The Arlington M. Co., at Slocan, will build a mill this summer.——The owners of the Horseshoe mine, at Trout Lake, are busy sacking high-grade ore for shipment.——The Queen-Dominion M. Co. has put men to work on the Queen Bess mine, near Sandon.

Vancouver Island.

The Crofton smelter is getting twenty tons of ore daily from the Richard III mine, on Mount Sicker. Preparations are being made at the Yreka C. Co. mine, on Quatsino Sound, for increased shipments to the smelter. Breen & Bollingor, who own the smelter, have contracted for 100,000 tons of ore, and a steamer will be put on the run between Crofton and Quatsino to transport the ore.

West Kootenay District.

The clean-up at the Oyster-Criterion mill at Camborne for month of March is reported at $5200 by B. Crilly, assistant manager of the Great Northern M., Ltd. The mill crushed 1000 tons, giving value of $5.20 per ton in gold saved on the plates, besides the concentrates. Bullion was shipped to the United States Assay office at Helena, Mont. For the first month's run the gold bullion assayed $14.73 an ounce, and has since shown increase. The south drift on the Oyster claim is running in a payshoot.

The Silver Cup and Nettie L. mines, near Trout Lake, will resume operations by May 1.

The tunnel on the Swede group at Poplar is in 100 feet and will be extended another 150 feet before it cuts the vein.——The Motropolitan G. & S. M. Co. intends putting in an aerial tram at the Triune mine, near Ferguson. —— The Marie-Marilla M. Co. intends resuming work on the Pedro and Minnie F. claims in the Lardeau as soon as supplies can be taken in.

Development work will be started on the Old Gold, Mountain Lion and Primrose mines near Lardeau as soon as the trails are passable.——The tunnel on the Home Run mine is in 60 feet and nearing the ledge. Several stringers have been cut.

A. F. Rosenberger, manager of the Gold Finch M. Co., with beadquarters at Nelson, has work under way. The property was formerly owned by the Northwestern Dev. Co. and had considerable development work. The ore carries free gold. A mill was also built.

The Metropolitan G. & S. M. Co., R. H. Battey of Minneapolis, Minn., president and manager, will reopen and increase work on its mines near Ferguson this month. Manager Battey will superintend operations and will remain during the season. A double-rope aerial tram from the Tribune mine to the base of the mountain near Ten Mile will be built.

CANADA.

Nova Scotia.

A company of Canadian and American men has been formed to operate the submarine coal area extending beneath the ocean on the eastern side of Cape Breton, writes W. R. Holloway, U. S. Consul-General at Halifax. These areas, it is claimed, comprise 27 square miles and the seams have a total thickness of 31 feet. In 1860 a colliery was established at South Head with small capital, and 7000 tons were mined; while the workings extended below the sea level, the mine was dry and the coal of good quality.

ENGLAND.

Cornwall.

The copper mining industry is decreasing in importance in Great Britain, writes H. Fox, U. S. consul at Falmouth. Forty years ago the production of copper ore and copper precipitate amounted to 210,000 tons annually, whereas in 1902 the production was 6112 tons. Cornwall is the main source in the United Kingdom of the supply of this ore. Tin mining, which is also mainly confined to Cornwall, has also decreased. Cornish tin ore occurs both in the granite and in the adjoining slate. Nearly one-fourth of the output in 1902 was raised from the Dolcoath mine, which yielded 1828 tons. The Cornish granite trade is being affected by competition of Norwegian granite to such an extent that some English firms have acquired and are working quarries in Norway.

MEXICO.

A government report shows that there are 9000 mining properties paying taxes in Mexico at present, says the Mexican Investor, and the following official statement is given on mineral production of Mexico for the fiscal year 1902–3:

Silver	$ 82,300,000
Gold	32,500,000
Copper and copper ores	19,600,000
Lead and lead ores	5,670,000
Antimony and antimony ores	1,139,000
Asphalt and coal	35,000
Marbles	150,000
Other minerals	200,000
Total production, 1902–3	$141,594,000
The mineral production in the fiscal year 1901–2 was	$113,057,000

These figures are in Mexican silver and do not include about $3,000,000 of gold and silver consumed in the Republic.

Chihuahua.

T. H. McConnoll is building a reduction plant at Guadalupe y Calvo for the Rosario mine. The equipment includes tanks for cyanide process.

The Pan American M. & S. Co. is operating the Quebradillas mine, near Parral, with J. W. Pender as manager. The company is also operating the Grenadena mine, near Santa Barbara, and the Iguana mine, near Parral. At the Iguana underground work is temporarily suspended, pending putting in of beavier pumps.

The Adela mill at Santa Barbara has been sold to B. Peterson and J. F. Johnston, who are oporating a group near there carrying gold ores.

The Gorham Mfg. Co. of New York is again operating the Cerro Colorado mine at Parral and is shipping 1500 tons of ore monthly, says the Enterprise. The reduction plant is idle. H. A. Ladd is superintendent.

B. Davis of Chihuahua, manager of the San Pedro mines and the Corralitos L. & C. Co. in northern Chihuahua, says the principal work at those mines under way is sinking a new shaft, and that a pumping plant will be put in next month.

C. Barbier, who, with F. Ramirez, has a lease on La Reina mine at Cusihuiriachic, has started up the Burns mill at that place. The mill has capacity of forty tons per day.——It is reported the Helena M. Co. will resume operations on its mines at Cusihuiriacbic. The company is owned hy same men as are in the Calera mine, near Minaca, and the Chihuahua M. Co. and El Potosi M. Co. at Santa Eulalia. The Helena Co.'s mines have been idle for several years and the workings are more or less filled with water.

The Buena Ventura M. Co., with bead office in Washington, D. C., and branch office in Denver, Colo., has been incorporated and has taken over the lease and hond on the Buena Ventura mine and the fractions San Jose and Guadalupe, aggregating 8½ pertenencias, 3 miles from Parral and 2000 feet from Alvarado's Palmilla mine. The principal values are silver and gold. The officers are L. M. Goddard of Denver, Colo., J. W. Pender of Parral (manager), J. Liveze, R. S. Donaldson and S. C. Warner. The price is stated at $125,000 gold. They are starting development work by sinking a two-compartment shaft and will put in a hoisting plant. The shaft will be sunk 400 feet. Tho ores are said to run thirty ounces in silver and $4 gold.

The Santo Domingo placer mines, 85 miles east from Chihuahua, on the Conchos river, have been sold to the Mexican Gold Fields Co. These placers cover 3000 acres. The gold is distributed through 35 feet in depth of alluvial deposits down to an auriferous "caliche" (false bedrock). This has heen tested by 150 boles down to this hedrock. The placers are on both sides of the Conchos river where there are fully 10,000 inches of water flowing the year around, says the Enterprise. The Mexican G. F. Co. will put in machinery for extracting the values. It is intended to use hydraulic, steam shovels, and dredging methods. The mines are 42 miles from Las Trancas, the present eastern terminus of the Kansas City, Mexico & Orient Railroad, and grading, which is going on, is approaching the property. E. A. Horner of Leadville, Colo., is president and manager, with G. H. Hoverland and P. P. Harris of Chicago, Ill., treasurer and secretary, respectively.

At Sierra Almoloya, between Jimenoz and Parral, the Almoloya M. Co., N. O. Bagge of Los Angeles, Cal., principal owner, and D. W. Sbanks, manager, will put up a central electric power plant for the operation of its mines with capacity of 150 H. P. It will be built at Dorado station, on Parral branch of Mexican Central and 5 miles from tho mines.

Sampling works are being built for P. Alvarado, owner of the Palmilla mine at Parral. Thoy are being put up adjoining Alvarado's electric power plant beside the Parral & Durango Railroad.

The Compania Minera de Naica is preparing to put up hoisting machinery, ore bins and chutes to handle a larger output from its mines at Naica, 16 miles from Conchos station, on the Mexican Central, says Superintendent J. Garrett. The company has its railroad to Conchos station completed.

It is reported the Companie Mexicaine Sud-Orientale, a Belgian corporation, of which L. Pellegrini at Chihuahua is consulting engineer, has an option on La Central, Bustillos and Juarez mines of M. Ramirez in Santa Eulalia camp. The three mines aggregate 196 pertenencias.

P. H. Hefron and J. W. Piper of Washington, D. C., are putting up a 2-stamp quartz mill at the r 2nd of April mine, west of the Dolores mine, west of Chihuahua. Work on the mines is progressing.

Sinaloa.

G. L. Sheldon of Cboix, manager of Las Tajos Dev. Co., a Pittsburg, Pa., company, operating mines at Cboix and at Morelos, Chihuahua, reports work progressing at both properties. He says a Milwaukee, Wis., company is preparing to exploit placer deposits, one of 20 miles in extent along the Cboix river and another of 50 miles along El Fuerte river. This company has put in six gasoline engines and other machinery for pumping water up to the mesa. Las Tajos Dev. Co. has been developing Las Tajos copper mines at Choix and since last November has done over 800 feet of work. On the Morelos mine, which is silver-lead, 600 feet of work bave been done in same time. Tbo putting in operation of the Orient road from Topolobampo to El Fuerte has been of assistance to mining in and about El Fuerte and Choix.

Sonora.

B. F. Graham of Bisbee, Ariz., president of the Tigre M. Co., says a reduction plant (possibly lixiviation process) will be put in at tho company's mines. He says the erection of a reduction plant will make considerable saving in cost of operation, owing to the fact tbat the mine is several miles from the railroad and hauling in wagons is expensive.

J. Douglas of the Greene Con. C. Co. at Cananea, says they have reduced the cost of concentrating from $1.50 to 82 cents per ton, and expect to get it down to 70 cents per ton. The cost of treatment and concentrating (four into one) is $4.40 per ton. Results for last month showed that 3.1% copper ore gave a profit even under present conditions with the concentrator not working. At the present price of copper, 2% ore has a value of $5 per ton. That the Greene is not a shallow mine is shown by the fact that from the croppings the Veta Grande has been opened to 1160 feet and on the Capote 1222 feet, says Douglas. The sbaft is started from the bed of the gulch and the workings are down 800 feet.

The Sonora M. & M. Co. has closed a deal with the Mexican Exploration Co. taking over forty-two portenencias of mining property together with 6000 acres of timber land, with water supply, near Tubutama, in Altar district. It is 40 miles from tide water and is on the line of the proposed railroad to Point Lobos.

Near the Copete mine, near Copete, the Sultana group, owned by J. L. Giroux of Los Angeles, Cal., is being worked. In the principal workings the shaft has reached a depth of 1050 feet, in ore all the way, and is said to have developed in the lower levels an ore body 30 feet between walls, carrying copper, silver, gold and lead values. In the Columbia, an adjacent mine in the Sultana group, an incline is down 337 feet in ore carrying 15% copper.——Adjoining the Sultana, on south side of the Cerro del Oro, is the Colorado group, owned by C. S. Mills et al. There are 3000 feet of development work and gold ore has been blocked out ready for stoping and reduction. Connected with the property is a small mill at Carbonera, which Manager Mills proposes starting this month. As soon as an adequate water supply can be secured the mill will be moved up to the mine, 5 miles away, and be enlarged.

Personal.

R. M. BRERETON is examining mines in Tonopah, Nev.

JNO. Y. MCKANE of Tonopah Nev., is in San Francisco, Cal.

W. C. CALDER of Sumpter, Or., is in the East on mining business.

DR. W. J. MURPHY has returned to Manvel, Cal., from Los Angeles, Cal.

J. H. MCNICHOLAS, of Portland, Or., is in Cleveland, O., on mining business.

O. P. POSEY of Los Angeles, Cal., is in San Francisco, Cal., on mining business.

J. E. KING of Mokelumne Hill, Cal., is in San Francisco, Cal., on mining business.

C. J. BANDMANN, of San Francisco, Cal., is examining mines at Tonopah, Nev.

CHAS. P. RICHARDSON has returned to Newsome, Idaho county, Idaho, from Chicago.

J. C. STRONG of Butte, Mont., interested in Montana mines, is in San Francisco, Cal.

B. F. HARTLEY is superintendent of the Three Stars mine at Auburn, Placer county, Cal.

E. A. THIES succeeds his father, Adolf Thies, as general manager of the Haile, S. C., G. M. Co.

J. C. SULLIVAN is superintendent of the Raymond-Illinois groups near Eureka, Juab county, Utah.

S. G. KNOTT has resigned as manager of the Nancy Tunnel at Wall Street, Boulder county, Colo.

N. A. WALLINGER is assayer at the North Star mine near Fort Steele, B. C., vice N. T. Kingshury.

NORMAN A. ROOT is now connected with the firm of Harron, Rickard & McCone, San Francisco, Cal.

N. HARPER has retired as manager of the White Feather Main Reef mine at Kalgoorlie, Western Australia.

H. W. LOTSHAN of Puehlo, Colo., has returned there from Portland, Or., where he has heen on mining business.

R. J. COLEMAN of Denver, Colo., part owner of the Lluvia de Oro mine in Chihuahua, Mexico, is at the mine.

T. S. WOOD has returned to Leadville, Colo., from Santa Barbara, Cal., where he has been during the winter.

IVAN DE LASHMUTT goes from Butte, Mont., as professor of metallurgy at the University of Arizona, Tucson, Ariz.

F. H. FLOOD of San Francisco has gone to Curlew, Wash., to superintend the mill and cyanide plant of the Bodie M. Co.

E. L. HOLLINGSHEAD, manager of the Weyant M. Co., of Pollock, Idaho, is in San Francisco, Cal., on mining business.

W. J. ADAMS, mining engineer, has returned to San Francisco, Cal., from an examination of mines in Mariposa county, Cal.

PRESIDENT J. E. BAMBERGER of tbe Daly West M. Co., of Park City, Utah, is in the East, after a trip to Los Angeles, Cal.

FERD. RUTTMAN has resigned the superintendency of the Vacas-San Marcos M. & M. Co., and returned to New York City.

W. BALL has resigned as superintendent of the Lower Mammoth M. Co. at Tintic, near Eureka, Utah, and is in Lehi, Utah.

S. L. BUTLER has returned to Salt Lake City, Utah, from Mexico, where he has heen looking after his mining interests.

J. H. HAMMOND, general manager of the Guggenheim Exploration Co., is inspecting the mines of his company in Mexico.

A. F. ROSENBERGER is manager of tbe Gold Finch M. Co., operating at Camborne, B. C., with headquarters at Nelson, B. C.

R. M. CAMERON, owning mining interests in Plumas county, Cal., returned to Quincy, Cal., last week from a trip to Nampa, Idaho.

S. B. EDWARDS, State Mining Inspector, with headquarters in Gunnison, Colo., is examining mining property at Leadville, Colo.

T. S. VAN FLEET, of the Gold Bug mine, near Sumpter, Or., has gone to New York, N. Y., and Boston, Mass., on mining business.

L. V. SWIGCETT, of Portland, Or., of the Golconda Extension mine, in eastern Oregon, is on a mining business trip to Philadelphia, Pa.

W. H. MCCORD, mining engineer for El Cuho M. & M. Co. at El Cubo, Guanajuato, Mexico, is in San Francisco, Cal., on mining business.

J. FITZGERALD has resigned as manager of the P. and O. mine, at Querida, Custer county, Colo., and has gone to Colorado Springs, Colo.

O. D. COLVIN, Seattle manager of the American Steel & Wire Co., will become the manager of the Snoqualmie Falls & White River Power Co.

D. H. PEERY and C. K. MCCORNICK of Salt Lake City, Utah, have returned there from a trip of several weeks to California on mining business.

E. M. RAY, till recently at Parral, Chihuahua, Mexico, is manager of the Pinos Altos mines of W. P. Dunham & Co. at Pinos Altos, Chihuahua, Mexico.

J. MCLELLAN has resigned as assayer for the Calumet & British Columbia G. M., Ltd., at the Eva mine, at Camhorne, B. C., and has gone to Montana.

J. P. WEYANT, of Toledo, Ohio, secretary of the Weyant M. Co., operating in Seven Devils district, Idaho, is in San Francisco, Cal., on mining business.

C. E. EDDY of Salt Lake City, Utah, interested in the Lost Packer mines at Loon Creek, Idaho, is examining mines at Goldfield and other Nevada camps.

PRESIDENT J. A. BISHOP of the Walcott G. M. Co. has succeeded J. Fitzgerald as manager of the P. and O. mine, at Querida, Custer Co., Colo., near the Bassick mine.

S. H. PITKIN, first vice-president of the Wellman-Seaver-Morgan Co. of Cleveland and Akron, Ohio, returned this week from a business visit to San Francisco, Cal.

WM. L. SAUNDERS succeeds the late Wm. R. Grace as president of the Ingersoll-Sergeant Drill Co. of New York. Mr. Saunders was vice-president of the company since 1897.

ASSISTANT MANAGER M. F. MURRAY of the Log Cabin mines, near Richfield, Utah, is in charge of the general offices of tbe company, which have been moved to Richfield, Utah.

W. MITCHELL, superintendent of the Nancy Tunnel at Wall Street, Boulder county, Colo., has been appointed manager of the same company, vice S. G. Knott, resigned.

S. I. HALLETT, of Aspen, Colo., has resigned as consulting engineer on the Smuggler mine, to take effect May 1st, when he expects to make a prospecting trip through Idaho.

F. E. STEELE, recently mill superintendent of the Columbus Con. M. Co., near Deadwood, S. D., has charge of the Hidden Fortune plant in same section, vice W. A. Kelly, resigned.

T. GOODWIN, manager of the New Monarch group of mines at Leadville, Colo., and the Ohio & Colorado smelter at Salida, Colo., returned to Leadville last week from a business trip East.

EDW. DOERR, general manager of the Mexico Guggenheim Exploration Co., has resigned. It is reported in Denver that hereafter the Mexican general offices will be abolished and the business transacted from the Denver office, with A. Chester Beatty in charge.

F. D. BROWN has resigned as manager of the Basin Gulch placer property and the American Jim Co., and will he succeeded by J. Sorenson as manager of tbe Basin Gulch workings, and C. Wipf, who will have charge of the American Jim, near Phillipsburg, Mont.

J. POLLARD, formerly at the South Eureka mine, Sutter Creek, Cal., and lately mine superintendent of the Lake View Consols mine, at Kalgoorlie, Western Australia, is superintendent of tbe White Feather Main Reef mine at Kalgoorlie.

Commercial Paragraphs.

THE National Metal Co. bas absorhed the firm of P. G. Roeder & Co., Mexico City, Mexico.

B. C. RIBLET has a contract for an aerial rope tramway at the Alice mine, Creston, B. C.

THE Fulton Iron Works of San Francisco, Cal., is building a 200-ton smelter for the Empire Smelting Co.

THE New York office of the Colorado Iron Works is now in the Engineering Building, 114-16-18 Liberty street. S. W. Traylor is the New York manager.

BEAUDRY & CO. of Bostou, Mass., builders of the Beaudry champion power hammer, announce the removal of their offices to the new Oliver Building, 141 Milk street, corner of Oliver.

F. L. SMIDTH & CO., engineers and manufacturers of modern grinding machinery, with offices at 80 William St., New York City, will move to larger and more convenient quarters in the Taylor Building, 39-41 Cortlandt St., New York, on May 1.

THE Canadian Westinghouse Co., Ltd., of Hamilton, Canada, have engaged C. C. Starr, formerly with the firm of John Starr, Son & Co., as their representative in the maritime provinces, with headquarters at 134 Granville street, Halifax, Nova Scotia.

Trade Treatises.

The Latham Machinery Co., 195 South Canal street, Chicago, devotes its most recent catalogue to illustrated description of its Monitor duplex punching machines.

"Chrome Steel Stamp Mill Parts" is a brochure from the Chrome Steel Works, Chrome, N. J., G. W. Myers, Hayward Bldg., San Francisco, Cal., Pacific coast representative. Hydraulic forged shoes and dies, tappets, bossheads and Canda cams are illustrated and some testimonials annexed.

Catalogue No. 4 from the Thew Automatic Shovel Co., Lorain, Ohio, gives a sectional view and detailed notice of the Thew single truck shovel, with halftones of its different types, as designed for railroad, mining and contract work. The Thew shovel for handling ores is also given considerahle illustrated prominence. Dipper dredgers and special conditions pertaining thereto form the concluding part of this booklet, which will be sent anywhere on request.

"Wire Rope Tramways," from the Hallidie-Painter Tramway Co., 46 Fremont street, San Francisco, Cal., is the latest trade issue of illustrated information concerning this form of telpherage, embracing automatic aerial wire rope tramways; the double-rope, single-rope, two-bucket, one-bucket and special systems; hoisting and conveying cableways and surface trams. The excavating system, which combines the aerial tramway system with excavating, grading and conveying material, is also exemplified.

Dividends.

Bunker Hill & Sullivan M. & C. Co., Idaho, $45,000; paid April 4.

Latest Market Reports.

SAN FRANCISCO, April 8, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅛d (standard ounce, 925 fine); New York, har silver, 54⅝c, refined (1000 fine); San Francisco, 54⅝c; Mexican dollars, 43½ San Francisco, 43½c New York.

COPPER. — New York: Standard, $13.25; Lake, 1 to 3 casks, $13.50; Electrolytic, 1 to 3 casks, $13.12½; Casting, 1 to 3 casks, $13.12½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £58 12s 6d spot per ton.

The copper market the past week has shown increasing strength and prices have made a material advance. There appears to be a general opinion that copper is going still higher, but that it will go ahove 14 cents is not probable, unless a heavy l uying movement commences. Any attempt in this direction, bowever, is always met hy a firm market and higher prices, which promptly cbecks huying, unless the consumers are satisfied that the producers are not turning out the metal in excess of the demand, in which case all buyers seek to secure contracts at as low figures as possihle before the inevitable raise in price.

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, har 5¾c; pig, $4.85. London: £12 6s 3d ℔ long ton.

SPELTER.—New York, $5.30; St. Louis, $5.00; London, £22 5s ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.35 @ 28.65; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 31c; less, 32c; bar tin, ℔ lb., 32½@35c. London, £127 6s 6d spot.

PLATINUM. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $45.50@46.50, large lots; London, £8 5s 0d; San Francisco, local, $43@44 ℔ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.85 @14.35; gray forge, $12.60; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$15 50@16 00
Foundry Northern 1	14 25@14 50
Northern 2	13 75@14 00
Northern 3	13 25@13 50
Southern 1	14 00@14 35
Southern 2	13 50@13 85
Southern 3	13 00@13 35
Forge	12 50@12 60
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 45@ 1 50
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 41@ 2 46
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	13 00@13 50
No. 1 cast, net ton	12 00@12 50
Iron rails	17 00@17 50
Car wheels	14 50@15 00
Cast borings	4 50@ 5 00
Turnings	8 50@ 9 00

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the hasic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wiro, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ hbl.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, hhls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumherland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in hulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, hoiled, hbl., 49c; cs., 54c; raw, hbl., 47c; cs., 52c; Lucol oil boiled, bhl., 44c; cs., 49c; raw, hhl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron hbls., 19c; wooden hhls., 21½c; cs., 25c; Mineral

Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., hhl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bhls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., $1.00.

BISMUTH.—Subnitrate, ℔ lb., $2.00.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—$2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 75c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING MARCH 29, 1904.

755,837.—EDUCATIONAL DEVICE — E. W. Barker, Oakland, Cal.

756,096.—HAND TRUCK — E. J. Bryan, Riverside, Cal.

756,195.—HARROW—E. H. Cheever, Oceanside, Cal.

755,845.—TIME SWITCH—Cherry & Radke, S. F.

755,628.—AWL—J. L. Davidson, Los Angeles, Cal.

756,161.—ATOMIZER—J. P. Farmer, Portland, Or.

756,102.—FOLDING BED—H. Faschinn, S. F.

755,758.—GAGE—C. W. Foust, Los Angeles, Cal.

755,809.—STRING CUTTER — Hanaao & Rodennver, S. F.

755,659.—WATER HEATER—J. F. Hathaway, S. F.

755,660.—FIRE ESCAPE—W. G. Horton, S. F.

755,880.—OIL BURNER—A. Johasoa, S. F.

756,116.—OIL BURNER — W. S. Keagin, Tucson, Ariz.

755,899.—ELECTRIC RAILWAY — T. Mahoney, S. F.

755,691.—TELEPHONE—McKinsey & Nelson, Susanville, Cal.

755,923.—LATCH—T. O'Shaughaessy, San Jose, Cal.

755,924.—WRENCH — T. O'Shaughnessy, San Jose, Cal.

755,932.—CULTIVATOR—M. Pruya, Florin, Cal.

755,937.—FRUIT GRADER—Richardson & Kimball, Los Angeles, Cal.

755,799.—POWER TRANSMISSION—M. L. Schlueter, Oakland, Cal.

756,148.—WIRE SPLICER—L. W. Simpson, Betteravia, Cal.

755,951.—TREATING ORES—J. Smith, S. F.

755,717.—OIL BURNER—A. J. Smithson, Portland, Or.

756,187.—SAW SET — O. E. Stickler, Olympia, Wash.

755,965.—GAS BURNER—H. Symonds, Long Beach, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

POWER TRANSMITTING APPARATUS.—No. 755,799. March 29, 1904. M. L. Schlueter, Oakland, Cal. This invention relates to an apparatus which is designed for the production and transmission of power; it consists of a plurality of trains of gearing arranged in pairs, each pair operating alternately upon a main power shaft, to which an approximately continuous motion is given by the plurality of devices acting thereon. Intermediate between the gears and the main shaft are pawl and ratchet mechanisms, which operate alternately as power is communicated in each pair.

ELECTRIC RAILWAY SYSTEM. — No. 755,899. March 29, 1904. T. Mahoney, San Francisco, Cal. This invention relates to improvement in means for operating electric railways of the type employing a sectional trolley rail having its sections normally out of circuit with the main and adapted to be energized momentarily and successively by the passing car. Its object is to simplify construction, reduce cost, afford perfect insulation, and particularly to overcome the difficulty heretofore experienced in many of the magnetically operated switch systems in cutting in the current when the car is traveling at a high rate of speed.

OIL BURNER.—No. 755,880. March 29, 1904. August Johnson, San Francisco, Cal. This invention relates to certain improvements in oil or hydrocarbon burners. It consists in a means for supplying air and regulating the supply and means for distributing the oil and air to the burner, and other parts of construction.

CULTIVATOR.—No. 755,932. March 29, 1904. M. Pruya, Florin, Cal. One-half assigned to R. M. Jones, Florin, Cal. This invention relates to improvements in devices for cultivating the earth, and is especially applicable to that class of cultivators known as the "A-cultivator," having sides diverging from the front, where they are united, and provided with cultivating teeth. The improvement consists in the employment of reversed or convergent bars hinged to the rear ends of the divergent ones and means by which the rear ends of said bars are drawn toward or separated from each other.

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Dredger for Sale.

A clam-shell dredger used only six weeks and in first-class condition. Hatch steel bucket, capacity 2 cubic yards level full; boiler 48 in. x 16 ft., return tubular; main engines are 12x18; spud engines are 8x12, solid bed plates; two large friction hoisting drums; three friction drums for handling spuds; machine set up with frictions, clutches, traveling spud, two main spuds, hoisting and spud chains, capstan, feed pump and every part complete in every detail and ready to run; weight of all iron work and machinery 493¼ tons. Machine cost $19,500; will be sold at less than 25% of cost price.

Also: Two 3-ft. Pelton wheels, $50 each.

Two 6-ft. new Pelton wheels, double nozzles, cost $600 each, price $125 each.

Three Woodbury Concentrators, only used three weeks, price $90 each.

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1000 ft. 8 in. Riveted Flanged Pipe, made for heavy head of water. Has never been used and will sell 25% less than new pipe.
1—125 H. P. 220 volts Commercial Motor.
1—40 H. P. 220 volts Northern Motor.
1—1 H. P 220 volts 4 ampere Northern Motor.
2—1 H. P. Sturtevant Blowers, direct connected with 1 H. P. Northern Motor.
1 Ingersoll-Sergeant 20x36 single stage Compressor.
1—1¼ Boggs-Clark Centrifugal Pump mounted on sub-base for motor connections.
2000 ft. 12 in. Wrought Iron Pipe.
570 ft. 10 in. Sheet Iron Pipe with flanges.

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AIR COMPRESSORS.

20x20¼x24 Ingersoll-Sergeant straight line steam driven air compressor, with unloading device and pressure tank.
12x12 Snyder-Hughes, duplex, belt driven.
8x6x8 Clayton, steam driven, duplex.
8x8 single, belt driven, Clayton.
7x7 single, belt driven, Clayton.
12x12x14 steam driven.
24x12x24 Ring.
20x20x24 Eastern.
10x10x10 Laidlaw, Dunn & Gordon.

HOISTING MACHINERY.

M. C. Bullock hoist, consisting of Webster, Camp & Lane drum, 5 ft. dia. x 9 ft. face, or we can make two drums, one 5 ft. face and the other 4 ft. face—direct connected to 18x24 Atlas slide valve engine, with double brake stands and all equipment.
10x14 double cylinder, single drum Marinette hoisting engine, with drum 5 ft. dia. x 4½ ft. face, complete with brake and driving stands.
12x16 double cylinder, single drum Marinette hoisting engine, with drum 5 ft. dia. x 4½ ft. face.
8x12x14 McEwen tandem compound engine and 35 k. w. 110 volt C. & C. generator direct connected.
30x16 Fraser & Chalmers Corliss engine in excellent condition, all complete, ready for immediate shipment.
22x48 Wheelock Corliss engine.
25x10x24 Gordon duplex steam pump.
Bullock "Champion" diamond prospecting core drill, with 800 ft. of rods and complete equipment. Will sell at a bargain.
3—60x16 horizontal tubular boilers, triple butt strap riveted.
2—No. 4 Cameron mine pumps.
2—No. 7 Cameron mine pumps.
3—50 H. P. Erie City "Economizer" boilers.
160 H. P. locomotive fire-box boiler.

WIRE ROPE.

We have in stock a quantity of fine second-hand wire rope, six strands 19 wires to the strand, which has not seen excessive service and which is in first-class condition for further use: 65,000 ft. 1¼ in. 12c ℔ ft.; 42,000 ft. 1⅛ in. 11c ℔ ft.; 13,060 ft. 1⅛ in. 14c ℔ ft.; 1½ in. 13c ℔ ft.; 2 in. 18c ℔ ft.; 2¼ in. 24c ℔ ft.

In addition to the above we have all sizes of cable ranging from ⅜ in. up. OUR CATALOGUE NO. 360 IS A BOOK OF VALUABLE INFORMATION, and quotes low prices on many items for which you have daily use. Send us inquiries for your wants.

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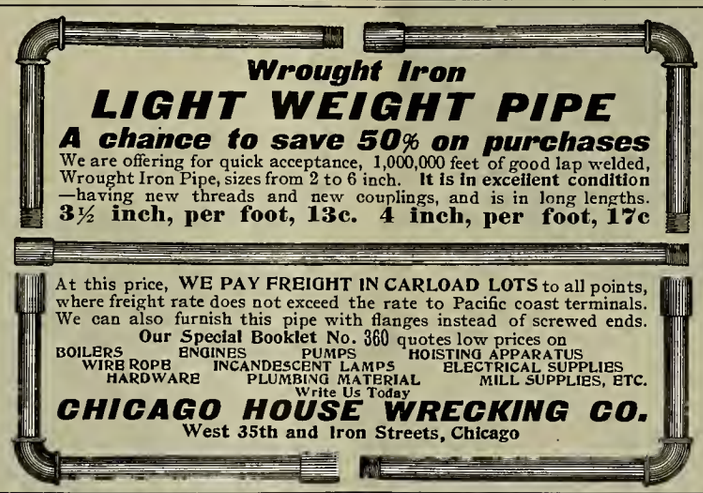
West 35th and Iron Sts., CHICAGO.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We are offering for quick acceptance, 1,000,000 feet of good lap welded, Wrought Iron Pipe, sizes from 2 to 6 inch. It is in excellent condition —having new threads and new couplings, and is in long lengths.
3½ inch, per foot, 13c. 4 inch, per foot, 17c
At this price, WE PAY FREIGHT IN CARLOAD LOTS to all points, where freight rate does not exceed the rate to Pacific coast terminals. We can also furnish this pipe with flanges instead of screwed ends.
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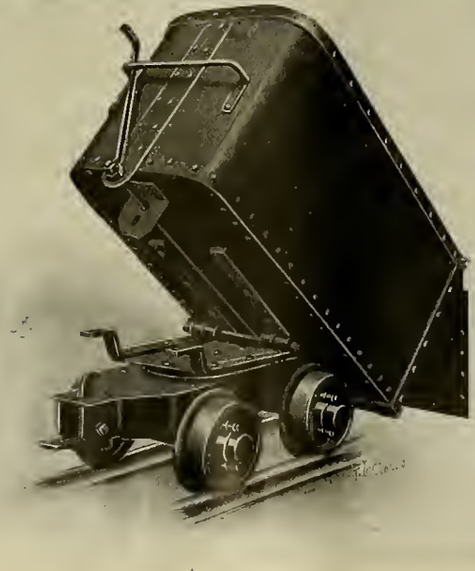

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8 Standard 16-ft. Wilfley Tables.
6 Double Deck 12 ft. Wilfley Tables.
6 Single Deck 12 ft. Wilfley Tables.
2 Metal Top Bartlett Tables.
1 Rubber Top Bartlett Table.
6—6 ft. Frue Vanners.
8 Gilpin County Concentrators.

ROLLS.

1 Set 16x36 Colorado Iron Works.
2 Sets 14x30 Fraser & Chalmers.
3 Sets 10x30 Fraser & Chalmers High Speed
1 Set 6x42 Colorado Iron Works High Speed
1 Set 6x30 Colorado Iron Works High Speed
1 Set 14x27 Colorado Iron Works High Speed
1 Set 14x27 F. M. Davis.
2 Sets 14x27 Jackson.
2 Sets 12x24 Jackson.
1 Set 12x20 Jackson.
1 Set 12x12 F. M. Davis, Geared.
4 No. 2 Engelhach Sample Grinders.
1 No. 1 Engelhach Sample Grinders.

CRUSHERS.

1 No. 3 Gates.
2—11x15 Dodge.
2—9x15 Blake.
1—8x12 Dodge.
1—5x15 Forster.
2—7x11 Dodge.
3—7x10 Blake.
1—4x7 Blake.
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10-Stamp Mill, 850 lb. stamps, high mortars.
10-Stamp Mill, 750 lb. stamps, low mortars.
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3 Large Ball Pulverizers.
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2—30-in. Disintegrators and Pulverizers.
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2—No. 5 Baker Rotary Pressure Blowers.
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2—No. 7 Connersville Blowers.
3—No. 50½ Buffalo Blowers.
1—No. 0 Buffalo Blower.
2—No. 10 Sturtevant Exhausters.
1—No. 0 Buffalo Exhauster.
1—No. 6 Root Exhauster.

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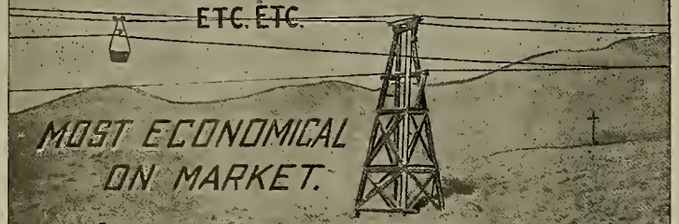

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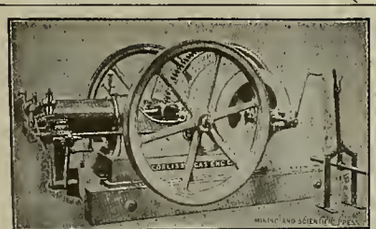

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MINING AND SCIENTIFIC PRESS.

Whole No. 2282.—VOLUME LXXXVIII. Number 16. SAN FRANCISCO, CAL., SATURDAY, APRIL 16, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Gold and Copper Con. M. & M. Co.'s Plant, Three Miles From Walker, Yavapai Co., Ariz. (See Page 271.)

Rigby Chlorination Works, Mayer, Yavapai Co., Ariz. (See Page 271.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, APRIL 16, 1904.

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SELDOM through the years does this journal cite the statements of its correspondents or readers, but the general manager of one of the largest enterprises in Mexico makes a brief statement so precisely in line with the province of the MINING AND SCIENTIFIC PRESS that it is quoted. He says: "While I have not time to read many technical papers, must say that two articles in the issue of March 26th are worth to me several years' subscription." The additional statement that he finds the advertising columns to be a complete directory for his purchases, is also of value. He does the buying and his purchases are in the hundreds of thousands annually. He is a type of the man who appreciates his MINING AND SCIENTIFIC PRESS and is found everywhere. He buys and reads it because it is of value to him. He respects its utterances and looks upon an advertisement in its columns as being in good company and worthy of cousideration in placing contracts for machinery or supplies.

WHAT a nomad the mining engineer is! In Colorado to-day, in Idaho next month, thence to California, or, mayhap, Central America or South Africa. An important part of one man's work in the business office of this journal is changing the addresses of mining engineers who, in some capacity of their work, are rambliug the earth over. It is not unusual in the office where these lines are written for three or four to meet, who, since their last meeting, "had traversed foreign lands aud crossed earth's central line." Probably no profession furnishes more migratory characteristics. And thus these business pilgrims acquire a breadth of experience, a knowledge of men and things, a mental endowment of diverse knowledge that stands them in good stead the world over, and tends to mitigate the unavoidable inconveniences attendant upon this thing of forever "moving on."

Circulation and Advertising.

The Engineering News of New York, a reputable and truthful weekly contemporary, makes a statement in its issue of Feb. 11th that is notable and suggestive, namely, that while its subscription price is $5 per annum, the cost of producing each copy is about 30 cents. So it appears that it gets less than 10 cents from the subscriber for what costs it three times that amount to produce each week. To do this with 1000 subscribers would yearly briug in $5000 at a cost to the publishers of $15,000. With say 9000 subscribers, if they all paid, the Engineering News would receive therefrom $45,000 per year, while according to its figures it would have cost $135,000 to so serve its patrons with their weekly issue—entailing a deficit through the year of $90,000. Our Eastern contemporary thus forcibly illustrates the fact that the subscriber to a technical journal of high class and recognized ability gets it for considerably less than it costs, for about one-fourth what he would have to pay were it not for the other important factor in the publishing business—the advertiser. It is the advertisers in the Engineering News that enable its publishers to furnish its readers for $5 what it costs them $15 to produce. This is relatively true of several other publications. In the issue of Sept. 5, 1903, this journal commented on the same fact concerning itself. In that article it was stated that: "Such a publication as the MINING AND SCIENTIFIC PRESS could uot be placed in the hands of its readers at a cost to them of less than 6 cents per issue were it not for the advertising patronage, and it is equally manifest that in buying from those who so advertise herein the reader really beuefits himself iu more ways than one, for beside the consciousuess that he is dealing with reputable firms, it is to be borne in mind that it is those firms who make it possible for him to get such a journal for $3 per year; for, as stated, without the income received from advertising, this journal could not be issued for any such amount and continue to maintain its high standard of technical excellence. Of course, the advertiser doesn't place his advertisement iu this paper for philanthropic reasons, or just because he wants to have our readers regularly supplied with even so good a publication; he advertises for the profit its wide circulation brings him; for in no other way can he get so great a hearing at so small a cost, he being assured profitable publicity. But it is manifest from the above that it is of mutual interest to buy from firms who advertise. If what they have wasn't good they wouldn't or couldn't advertise it in the MINING AND SCIENTIFIC PRESS."

How mutually interdependent those things are is illustrated by the further fact that in the matter of paper, postage, press work, etc., the more copies of a journal that are printed the more it costs to get out that issue, and yet if the journal has not a great and increasing circulation it can not be a profitable medium for the advertiser. Hence our New York engiueering contemporary and similar high-class journals must maintain and augment their circulation, however costly that may be, or suffer a loss of advertising patronage that would be fatal to continuity of the high standard set.

This leads to a further line of thought: Manifestly, as the value to the reader depends upon the character of the material furnished, and as that costs the publisher considerably more than he gets from the reader, and as this deficit and a fair profit must be made up by advertisiug receipts, it is essential that there be no waste circulation; it is requisite that the subscribers be of a class who are intelligent and of purchasing capacity. The kind of readers that have to be bought with "premiums" and coaxed to buy the paper by offers of something else with it are not the kind who are sought by advertisers. Nor are they sought by a publication that manifestly depends for the contiuuity of its successful life on its ability to create and secure profitable business for its advertisers, and that spends sufficient to furnish the kind of matter that is wanted by practical men who look to such a journal as a valuable element in their daily lives.

Giving and Getting Credit.

Among the results of general prosperity has been the general cheapeuing of credit, so that the maker and dealer of mining machinery and supplies has under stress of competition been accorded credit to an uusual degree. Time was when a miue operator wantiug a stamp mill or a complete hoisting plant had to put up a good round sum in advance and give satisfactory guarantee that the rest of the purchase price would be forthcoming upon completion. That rule still largely obtains, and even now the complaint is sometimes made by an unbusinesslike miner that the maker and vender of machiuery docsn't want to share the smallest part of the risk, but must be given assurance of payment in full before the work is begun. But, waiving the obvious answer to that complaint, it is manifest that the old rigidity along those lines is fast softeuing and that credit is considered as expediting and extending business, one ready argument being, "if I don't do it my competitor will." The credit system in that or any department of business is liable to misuse. It is to be constantly borne in mind that a sale of merchandise is theoretically an exchange of goods for money, and to be a spot transaction. The buyer, when not paying cash or its equivalent, stands in the attitude of a borrower. The agreed value of the machinery he gets is a loan by the seller to him. There is no real difference between loaning a man $10,000 cash for six months and letting him have $10,000 worth of machinery with the expectation of getting the mouey for it in six months, except that if a manufacturer loaned the $10,000 he would have to have a note, and interest specified, and good endorsemeut or collateral security for its payment; while in the case of the transfer of goods he ofttimes has to "take his chances." It would be a good rule to observe not to credit a man for merchandise to whom you would not loan money.

It would be better all around if the losses entailed by abuse of the credit system could be minimized, for were it not for such loss the manufacturer and veuder could supply his machinery cheaper, and the mining industry would in the main be benefited. It is not suggested that credit be abolished, for individual requirements and the stress of competition would not admit of such a thing even if it were desirable, but it is suggested that there should be a clear idea of the worth, value and importance of credit; that credit is in danger of being made so cheap aud so easily obtained as to be held in light esteem. Of course every seller of mining machiuery, or of auything else, aims at the maximum of sales with the minimum of loss, but he will do well to remember that he has his own credit to keep up, and that it were better to lose a probable customer and possible profit than to lose the profit and the cost of the merchandise and the customer too. A lot of doubtful accounts are poor assets, and credit, like any other good thing, may be so abused as to wreak irreparable injury on him who gets it and him who grants it.

As requisite as to know how to make good machinery is knowledge of whom to trust. There is no one more honest than the miner; no one more desirous to pay every cent of every obligation he has assumed, but that man is often his best friend who kindly declines to permit him to place himself in a position of debt from which he may find it difficult to emerge. Credit is of use and cannot be eliminated from business transactions, but in the final crux credit is but auother name for confidence, and he who gets and he who gives will agree that it should not be made too cheap nor too common.

CONTINUAL progress and improvement is the constant aim of the up-to-date engineer. In this issuc is one of the latest developments in the manner of layiug out transition curves for railways. To present the subject logically, the author has shown the manner in which his results are derived. The busy surveyor has little time for digging through abstruse mathematical discussions, yet by going to the end of the article examples and methods of using the accompanying tablcs will be found, and will enable the surveyor to apply an accurate and rapid method of computing this important form of curve for all cases likely to occur. The article, although severely techuical, is deemed of sufficient importauce to warrant detailed reproductiou, as a matter of permanent record and reference in years to comc,

CONCENTRATES.

A 16-CANDLE POWER incandescent lamp would roquiro about 65 watts per hour.

✣✣✣✣

CHRYSOPRASE is a variety of chalcodony, tho apple-green color being due to nickel oxido.

✣✣✣✣

THE quicksilver flasks used by the Almaden, Spain, mine are furnished by a Spanish firm at 6.10 pesetas per flask. A poseta is 19½ cents U. S. gold.

✣✣✣✣

IN the California oil districts it is estimated that about 20% of the sand is oil, and that 80% of the oil contained in tho sand is susceptible of recovery.

✣✣✣✣

WHEN air is compressed to one-fourth its volume without loss of heat it has a pressure of eighty-nine pounds per square inch, or sixty pounds without heat, isothermal.

✣✣✣✣

"FOSSICKING" is an Australian mining term applied to crevice and bedrock placer mining: also to working out pillars of abandoned claims, and to the working over of old dumps for gold.

✣✣✣✣

SAND may be all right, as averred, for scouring scale out of a boiler, but unless the fact is strongly proven there will be considerable justifiable unbelief. The remedy would seem to be worse than the disease.

✣✣✣✣

EXHIBITORS at the St. Louis Exposition will have to pay $10 per horse power per month for power, the charge in each case to be based on the motor capacity installed by the exhibitor, and irrespective of the amount used.

✣✣✣✣

THROUGH an 8-inch pipe, 8000 feet long, the intake and discharge ends of the pipe being submerged, there being a head of 160 feet, there will flow, theoretically, 967 gallons water per minute—in practice about 800 gallons per minute.

✣✣✣✣

REMINGTONITE is a hydrous carbonate of cobalt, occurring in rose-colored incrustations, soft and earthy. It was first discovered in a copper mine near Finkshurg, Carroll Co., Md., and was recently reported found in the Standard mine, Baker Co., Or.

✣✣✣✣

PHOSPHORITE is a concretionary and partly scaly variety of the mineral, apatito, which occurs notably at Estremadura, Spain. Apatite is of two kinds—fluor-apatite and chlor-apatite—being a phosphate of calcium with either fluorine or chlorine.

✣✣✣✣

ANSWERS to a number of questions are necessarily deferred, it being impossible to so far get accurate and authoritative detail in reference thereto. It is desired that in all cases of inquiry the data accompanying inquiries be in detail and as complete as possible.

✣✣✣✣

THE ordinary steel tape used by engineers is graduated under a tension or pull of ten pounds. Hence a difference of ten pounds in the pull exerted upon the tape (or a difference of 31½° F.) would produce a variation of ¼ inch per 100 feet of length in the measuring line.

✣✣✣✣

MALLEABLE cast iron is all right for pipe fittings or railway supplies, but is not fitted for heavy engineering, mining or structural work. Malleable coke iron is the principal material used in its manufacture. It may be produced in the cupola, reverberatory furnace or open hearth.

✣✣✣✣

RUTILE is not a metal, but a mineral—titanium dioxide ($Ti O_2$). It is reddish-brown to red in color; streak pale brown; transparent to opaque: hardness is 6 and specific gravity to 4.2. Rutile crystallizes in the tetragonal system, and sometimes contains iron. It is used in manufacture of certain qualities of steel, also for coloring porcelain.

✣✣✣✣

IT is not practicable to give precise data on the relative values of different fuels, but figures furnished by one who has made the subject one of special study show that for 1 cent coal at $12 per ton would furnish 23,000 units; wood at $10 per cord, 27,000 units; oil at 12 cents per gallon, 12,000 units; coke at $10 per ton, 24,000 units; gas at $1 per 1000 cubic feet, 6500 units.

✣✣✣✣

A STRAIGHT sale of the company's property would be disposing of it for cash or its equivalent, and after paying all outstanding obligations a division of the net receipts among the stockholders, pro rata. Where the company disposes of its properties for stock in another company, the stock not being convertible into cash, it would be more an absorption than a "sale."

✣✣✣✣

PRODUCER GAS is formed by passing steam and air through a thick bed of coal. In this way all the coal is consumed, the greater part of the carbon being converted into carbon monoxide. There is no resultant coke, nothing but ash. Sulphate of ammonia is produced as a by-product. A ton of coal that would yield 10,000 cubic feet illuminating gas will give 140,000 cubic feet producer gas.

SPERRYLITE is an arsenide of platinum ($Pt As_2$) and is not known to contain radium or vanadium. It is the only known native compound of platinum, and its specific gravity is 10.6. Vanadinite is a double chloride and vanadate of lead—(Pb Cl). $(Ph_4 (VO_4)_3$. Endlichito is a variety of vanadinite in which a portion of the vanadium has been replaced by arsenic. Vanadium is not an essential constituent of the uranium minerals, carnotite and uraninite, which are radio-active; and so far as known, vanadium minerals do not contain radium.

✣✣✣✣

IN the blast furnace manganese oxido acts very much the same as iron, but makes the slag more liquid and more readily fusible. When manganese is in abundance it is the practice to make a slag containing little base. In some districts slags containing large amounts of manganese run high in lead and silver; in other districts similar slags run low in lead and silver. This difference probably represents the variation in practice of the smelter managers. Where oxidized copper ores are to be smelted, it is desirable to employ as little barren flux as possible.

✣✣✣✣

RUBBER CONCENTRATOR BELTS should not be allowed to remain in packing boxes. If extra belts are kept on hand in the mill or storeroom, they should be hung on a roller or a frame of some sort, and turned occasionally, as rubber, when not in use, tends to become hard and brittle (particularly along lines of folds). Where a mill is hung up for any length of time provision should be made to set the machines in motion occasionally, so as to move the belts. In such cases, also, the belts should not be kept as taut as when working.

✣✣✣✣

ORE BODIES are rarely of the same age as the rocks in which they occur, and in some instances there is a great difference. Ores found in the Silurian rocks, such as those of the Cambrian, in South Dakota, were evidently formed not earlier than the close of the Cretaceous. Ore bodies contemporaneous with the rocks in which they are found are of restricted occurrence and include certain gold-bearing conglomerates, beds of bog iron ore, calcium borate, gypsum, rock salt, etc. Some deposits of magnetite and chromic iron, the result of magmatic segregation, may also be included in this class.

✣✣✣✣

OPAL is amorphous silica. Only those varieties showing iridescent colors—the fire opal—are valuable. Some opals lose their brilliant colors on exposure to the light. The cause of the brilliant play of colors is a subject of discussion. Some authorities believe them to be due to included cavities; others think them due to their curved lamellæ, whose refractive powers differ from the remainder of the stone. These are supposed to have originally existed in parallel position, but have since been subjected to strains due to movement of the inclosing rocks; these planes have been bent and broken, producing the color effect so much prized.

✣✣✣✣

WHEN drilling with machine drill 45 to 50 feet of holes per machine on a shift is considered good work in hard ground. In the same ground men should make with hand hammers about 7 to 8 feet per man. Drilling with machines is always cheaper than by hand, except in those countries where labor is very cheap. There occasionally the labor, though inefficient, is cheaper than machine work. Machine drilling costs from 12 to 25 cents per foot according to rate of wages, cost of power, character of the rock, and to no small extent on the treatment the machine receives at the hands of the runners and chuck tenders.

✣✣✣✣

MANY big mining companies now have a geologist on their staff, the same as a consulting engineer or a manager, and his employment is an economical matter, for he can save the company his salary over and over again. Before the beginning of development work it is his business to have the geological conditions carefully considered, and the success of the enterprise often hinges on the thoroughness and accuracy of his work. It is but one of the phases of mining and scientific progress that is eliminating the gamble from mine work and making the result as certain and definite as any business undertaking can be so made.

✣✣✣✣

WHERE gold adheres to the bottom of an iron retort, the gold may be recovered by breaking out the portion to which the gold clings and treating the pieces in nitro-hydrochloric acid (aqua regia), made of two parts hydrochloric and one part nitric acid. When the whole has been taken into solution the iron may be thrown down as a flocculent precipitate in the form of ferrous-hydrate. The solution is then filtered and the gold precipitated from the filtrate by addition of ferrous sulphate, made by dissolving iron sulphate in water. The gold is thrown down in the form of a dark brownish-purple powder. This is caught on the filter or evaporated to dryness, mixed with borax and melted in a crucible in the usual manner.

✣✣✣✣

GOLD is often found in loose alluvial, or wash, where there are no rounded pebbles or rocks present. This is particularly the case in desert regions, where the rocks disintegrate rapidly, producing a mass of loose material, mostly angular, and this is washed down by the infrequent but heavy rains occurring in such regions, and the finer material is blown about by the winds, the gold from neighboring veins or rocks being buried in the debris. The gold is also usually angular, or little worn. The dry washers are familiar with this class of gold deposit. A number of instances of the occurrence of gold under these conditions are known, where the lodes or veins from which the gold came have never been discovered. There are examples of this kind in Kern, Riverside and San Diego counties, California.

✣✣✣✣

SPHALERITE is sulphide of zinc. It is also called black jack, blende, zinchlende, mock lead, jack, etc. The name sphalerite is from the Greek, meaning treacherous. No other ore possesses such a variety of color, luster and physical appearance. In color it may be black, various shades of brown, honey-yellow, grayish, green, red or white. Its luster is vitreous to adamantine. The streak varies with the color, being usually lighter than the mineral. It is transparent to translucent and opaque. It often resembles galena closely, though containing no lead, often auriferous and argentiferous. The reddish brown or red varieties are called "ruby blende." It is coarsely crystalline to fine granular, also cryptocrystalline—that is, showing a distinct crystalline structure, but which can not be resolved into individual crystals. All varieties except the black kinds have a resinous luster. It resembles some garnet, but is softer and heavier; when treated with hydro-chloric acid, evolves hydrogen sulphide.

✣✣✣✣

MEXICAN MINERS usually work their mines in an erratic manner, but although their methods are considered primitive, they have accomplished some great engineering feats in the conduct of the mining business. Among those is the shaft of the Valenciana mine, on the Veta Madre (mother vein), which is eight-sided, 30 feet in diameter and 1320 feet deep. The first 400 feet are walled with solid masonry. Below that the wall rocks are firm and hard and require neither timber nor other support. The hoisting engines are grouped about the shaft opposite its several sides, and the cages run from top to bottom being held in position by steel cables, which, reaching from top to bottom, answer the purpose of guides. The Rayas mine shaft, on the same lode, is even larger than that above described. One advantage of these large shafts is good ventilation, which would be further improved if the shafts were partitioned into two or more tight compartments, one of them being carried higher than the others. These shafts are in the State of Guanajuato.

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THE Federal statutes clearly require that a mining claim shall be plainly marked on the ground after discovery has been made. The monuments marking the boundaries must be plain and so distributed that any person may trace the outlines of the claim on the surface without difficulty. Monuments may be set at any time after discovery prior to an intervening right, but it is to the interest of the locator to promptly define his boundaries as quickly as convenient—that is, as soon as he can possibly determine the strike of the vein or lode along the surface, and for his own protection to do this thoroughly and without unnecessary loss of time. A. may make a discovery, sink a shaft and perform $1000 worth of work. He may set up a discovery post or monument and clearly state the number of feet he claims in either direction; but if he neglects to place his monuments at the corners and center-end lines, as required by law, so that all may easily determine the exact position and boundaries of the claim, and B. locates a claim near A. encroaching upon A.'s claim, B.'s claim, if properly made (complying strictly with the law) will hold as against A.'s, who has failed to make a proper and valid location.

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IN the Rand, South African, gold mines, in breaking the rock in the stopes underground, machine drills are always used. In the case of narrow reefs the values can be better maintained by using hand labor. These narrow reefs are stoped by means of machine drills, also, which lower the grade of the ore to be sent to the mill through the increase of the amount of waste which must be broken down by this means. Efforts to supplant native labor in stoping on these narrow reefs have been tried by the use of small machine drills, light in construction, drilling a hole about the same as that accomplished by hand labor, but these have not been satisfactory. Regarding the use of machine drills underground, the white labor there is the greatest opponent to the most economical working or handling of more than two machine drills under the direction of one skilled white man with the assistance of unskilled white or native helpers. As regards shovelling the rock broken in the stopes to the levels to be trammed away, efforts are being made to supplant hand labor by mechanical appliances. In long stopes, small gravity tram lines have been put in to reduce the number of shovellers necessary to handle the rock broken. The tramming underground has been carried on by natives, as the mines had been laid out with that intention. The drives as they follow the sinuosities of the reefs are tortuous, and better adapted to tramming by hand than by mechanical means. Plans have been formulated in the equipment of new deep-level mines to install mechanical haulage on certain main levels, but even in these cases it will not entirely do away with hand tramming, as more or less of it will have to be done on intermediate levels. From the time the rock is delivered to the ore bins at the bottom of the shaft until deposited on the dumps, it is practically handled automatically in all the mines, and improvements are being effected, as, for instance, the emptying of the cyanide tanks by mechanical devices, electrical furnaces for heating drills underground, and the use of mechanical drill sharpeners.

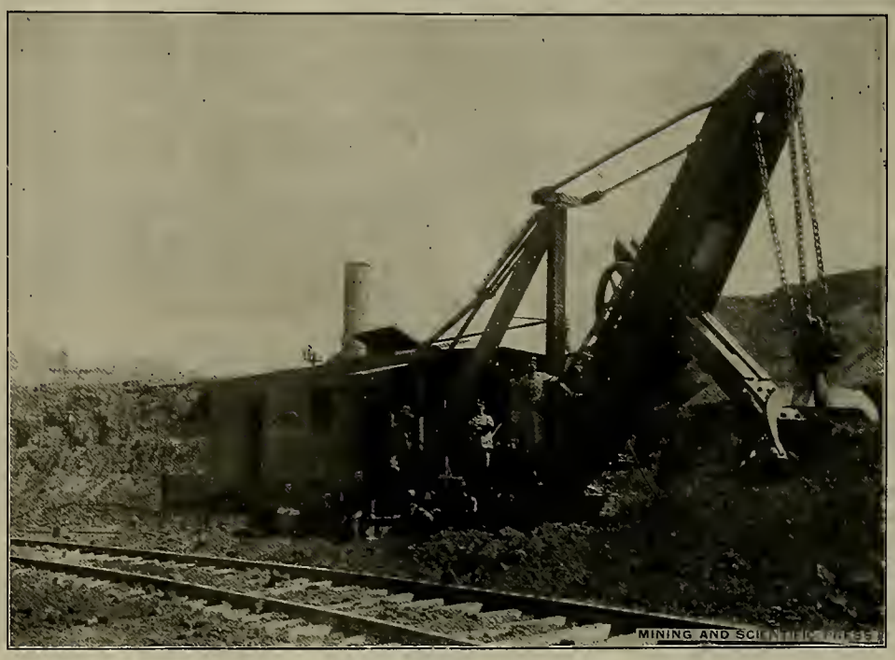
Mining Methods in the Mesabi Iron District, Minnesota.

Written for the MINING AND SCIENTIFIC PRESS by KIRBY THOMAS.

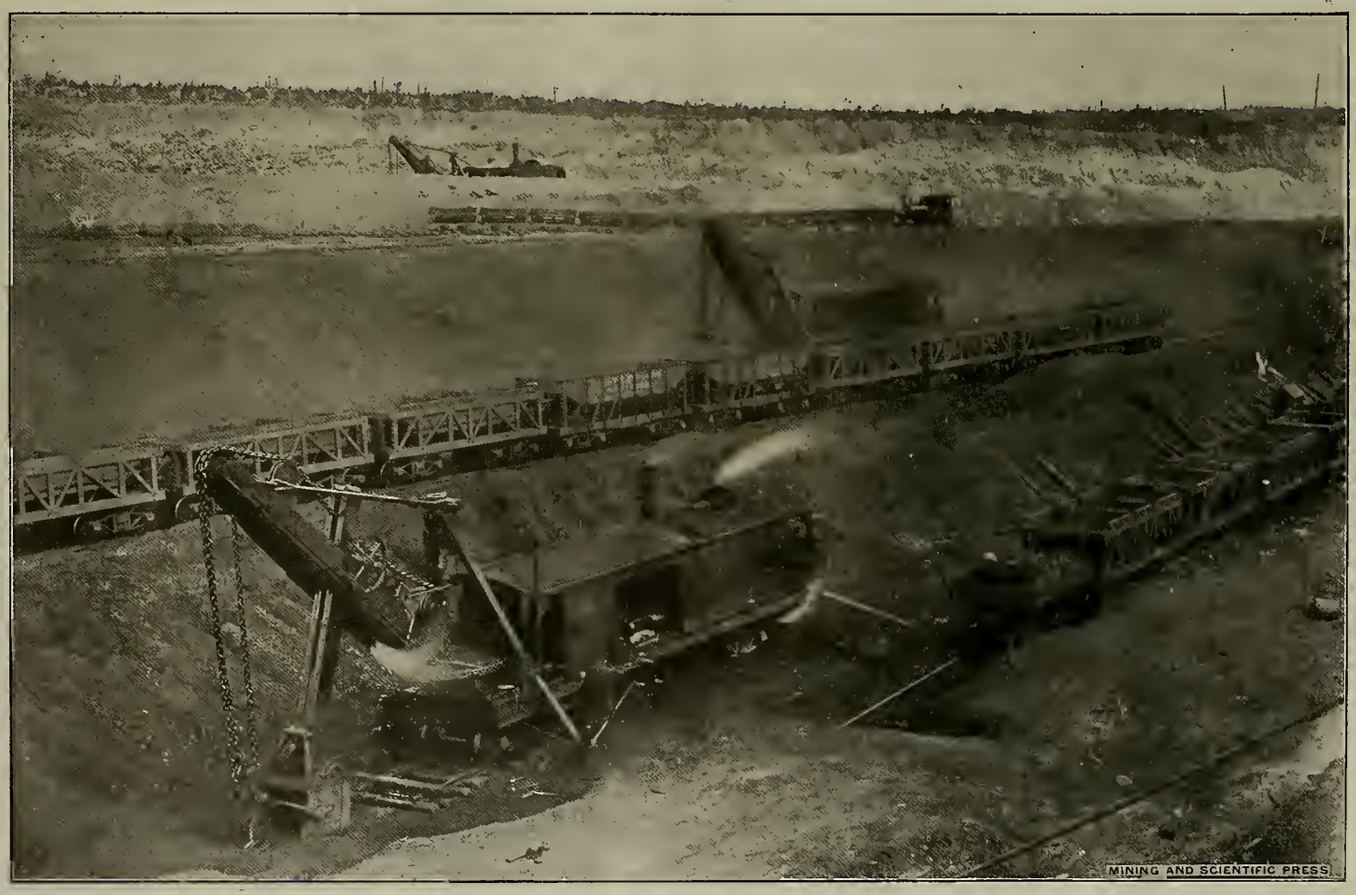
The Mesabi iron district in Minnesota has become widely known by reason of the practice of mining the ore with steam shovels from open cuts or pits. However, in recent years the Mesabi district has developed underground mining to some extent, and the open-cut methods have been modified and improved. In 1902 about 47% of the Mesabi output was from open-cut mines, the rest being mined underground chiefly by "caving" and "slicing" methods and "milling." The tendency in 1903 was to still further increase the proportion of mines operating by the open-cut methods.

The Mesabi ore is soft aud it lies in shallow troughs of large horizontal extension. The covering ordinarily is a mantle of drift material—gravel and boulders—varying in thickuess from nothing to 60 feet or more. Very recently much ore has been found under taconite layers, ofteu of considerable thickness. Taconite is the local name for the iron-bearing formation or siliceous sedimeutary rock from which the iron oxide was concentrated. In nearly all cases the ore is so friable that it easily breaks into fine material with only loosening by a black powder blast, so that it can be removed by the ordinary steam shovel.

The steam shovel mining is distinctive of the Mesabi district and was introduced there at the time of the opening of the district ten years ago. The usual rule is to mine by open cut with the steam shovel where the overburden of gravel is not more than 50 or 60 feet thick. Other considerations beside the thickness of the overlying drift enter into the selection of methods on the different properties. The size and shape of the deposit, space and facility for trackage and available dumping grounds are all determining factors. Opeu-cut mining, because of the large advance outlay for the stripping, requires more capital at the start. The theoretical rule that a foot in depth of gravel could profitably be removed for each foot in depth of ore underneath is little considered in practice.



Steam Shovel at Mahoning Mine, Hibbing, Minn.



Steam Shovels at Work in the Hibbing Mine, Mesabi Range, Minn.

THE "STRIPPING" PROCESS.—The "stripping," as the work of removing the overburden of drift is called, is usually done by contract. Several large firms are engaged exclusively in this work. The contracts are generally by the cubic yard and often extend over two or three years. At this figure the cost of removing the gravel 25 feet deep on an acre would be about $16,000; contract prices vary from 30 cents to 50 cents per cubic yard. As the contracts sometimes cover forty acres or more, the magnitude of this work can be understood.

The material to be removed varies from glacial till to coarse gravel and boulders weighing several tons. The gravel is frequently hard and is then loosened by blasting with black powder. The steam shovel is set on a portable track alongside the standard gauge track for the dumping cars. These dumping cars have an automatic side-tip dumping arrangement. They hold about 3 to 3½ cubic yards. Little "dinky" engines draw them to the dump in trains of five or six, or more if the haul is long. Iu twenty hours (two shifts) a 65-ton steam shovel will remove 2000 cubic yards. The dipper holds about 2 to 2½ cubic yards and is worked against a face usually 20 feet high. The steam shovels used on the Mesabi for stripping and for mining the ore are built specially strong and have many improvements calculated to adapt them to the special work. The haul to the dump is usually short—not more than 1000 to 2000 feet. A common practice is to strip enough ore for the mining to be started and then to strip contemporaneous with the mining. In the case of the Mahoning, however, the whole tract of forty acres was stripped before a ton of ore was taken out.

The cost sheets of operating a steam shovel are herewith given as obtained from one of the large operators. These figures apply likewise to the steam shovel working in ore, except as to the expense on the dump. The steam shovel in ore will handle nearly one-third more cubic yards than in gravel. The cost items are as follows:

WAGES PAID FOR STEAM-SHOVEL LABOR, MESABI RANGE, JUNE 30, 1903.

Brakemen, per hour	22½c
Common labor, per hour	18½c
Cranemen, per hour	32½c
Drillers, per day	$2 00
Dump bosses, per day	$2 00 to $2 25
Firemen, for 12 hours	$2 25
Head blasters, per day	$2 25 to $2 50
Laborers, per hour	18½c
Locomotive engineers, per hour	30c
Locomotive firemen, for 12 hours	$2 25
Mining captains, per month	$100 00
Pitmen, per hour	20c
Shift bosses, per day	$2 50
Shovel runner, per hour	42½c
Track foremen, per day	$2 25 to $2 50
Trackmen, per hour	18½c
Coal, per ton	$4 00.

FORCE NECESSARY FOR OPERATION OF STEAM SHOVEL.

	Per Day.
(On Shovel.)	
One shovel runner	$4 25
One craneman	3 25
One fireman	2 25
Four laborers (pitmen)	8 00
One to two track cleaners	2 70
(On Locomotive.)	
One engineer	$3 00
One fireman	2 25
One brakeman	1 85
(Drilling and Blasting.)	
One head driller	$2 50
Four drillers	8 00
(On Dump.)	
One dump boss	$2 25
Four or five laborers	9 25

Coal used by steam shovel per ten hours, 2½ to 3½ tons.

The ore forms a hard floor beneath the gravel. This floor is scrapped with graders and by hand and sometimes a layer of lean ore or taconite is removed from parts of it. This ore surface is comparatively level. Sometimes it is undulating and in some cases irregular. The work of cleaning up the floor is expensive. Generally the ore at the top face is good grade and ready to mine.

Mining the Ore.—In mining the ore practically the same methods are used as in removing the overburden, except that the ore is loaded into railroad cars by the steam shovel. The removal of the ore is in all cases done by mining companies and not by contract. The railroad furnishes the cars and the rest of the equipment is owned by the operator. The railroad takes the cars at the approach to the mine. The cars used heretofore were of 25-ton capacity and were built of wood on the plan of a box truss. Within the last year steel cars alone have been supplied for additional equipment. These have a capacity of fifty tons each. They are built of pressed steel, with air brakes and automatic dump. Many wooden cars are still used.

Each steam shovel will load seventy-five cars of ore of 25-ton capacity in ten hours. The shovel works on a face about 25 feet high. The ore is loosened by blasting, as with the gravel. The open cuts are from 75 to 150 feet deep. In no case is it necessary to use any cables or auxiliary engines to haul the loaded cars to the main track.

The system of tracks in the different mines varies considerably. The Mahoning mine has one approach and the tracks are laid on the plan of a spiral, with the lowest track in the center. The Mountain Iron mine is laid out as converging series of crescents, each outward crescent working on a higher ore bench. The Fayal, Biwabik and the Oliver use only one approach with a brauching track.

The steam shovel in common use weighs sixty-five tons. More recently steam shovels weighing 110 tons each have been in use at the Stevenson.

The contact of the ore and taconite is often irregular and horses of lean ore occur in the main mass. These necessitate some work with hand shovels, but the amount of ore handled other than by the steam shovel in any of these open-cut mines is an inappreciable percentage.

The "Milling" System.—The "milling" system of mining is used for about 7% of the Mesabi output. The ore is stripped, as in the open-cut mining, but, instead of loading direct into railroad cars, a shaft is suuk usually in the wall rock and drifts run out into the ore at a base level. From these drifts raises are cut in the ore to the surface. The ore is then broken down through the raises, by blasting and with picks, into chutes, from which it is loaded into tram cars. These tram cars are hauled to the shaft by mule power or electricity, and from which the ore is hoisted as in other underground mining. At the Fayal a steam shovel was used to dump the ore into the "mills," as the raises are called. The cuts herewith show the "milling" pits of the Fayal when the work started and later when the pits had been merged into a cavernous hole.

The percentage of the output of the Mesabi by the caving and slicing systems is nearly equal to that by the open-cut mining. This method consists in commencing at the top of the ore and working out each cut or slice, dropping the surface as the work goes on. This plan of caving the surface is used, because of the soft character of the roof, which is in most cases only gravel. A shaft is sunk as in the "milling" system, and from the base level a drift is run into the ore. Sub-levels are then driven at distances of from 12 to 20 feet and from these upraises run to the top of the ore. The ore is taken out in slices just wide enough to carry the roof while working. The ore is shoveled and tumbled into the raises, at the bottom of which are chutes which load direct to the tram cars. As each slice is taken out, the soil and rock above are allowed to cave in, and this packs sufficiently to hold up laterally with a little temporary timbering and lagging. This is repeated until the whole top of the ore body has been drawn into the raises, when the same steps are gone througb for the next sub-level. The floors of the slices are covered with boards, so as to keep the dirt from mixing with the ore and to aid in forming a roof for the next slice below. This floor under the dirt follows the ore down with each slice. This system, with some modifications, is used in all of the underground mines of the Mesabi, except at the Adams, where an adaptation of the square-set timbering plan is used in a portion of the mine. The caving and slicing system is satisfactory aud economical. Nearly all of the ore is saved. The ore itself is generally loose, so that very little blastiug is required; yet it stands up very well in the drifts and sub-levels with a moderate amount of timbering.

In the underground mines the miners workiug on company account get $2 a day. The contract miners make as high as $6 and $8 a day. The contract system in geueral use on the older ranges is coming to be more favored on the Mesabi.

In none of the Mesabi mines is the water a serious problem. The open-pit mines drain the ore bodies by drainage tunnels and pump the drainage from a central pump. In several of the large mines absolutely no pumping is needed. The Penobscot mine, in the Hibbing district, now closed down as a reserve for the steel corporation, encountered a subterranean water course which required some heavier pumps. It was found that pumping from the Penobscot drained the surrounding properties dry.

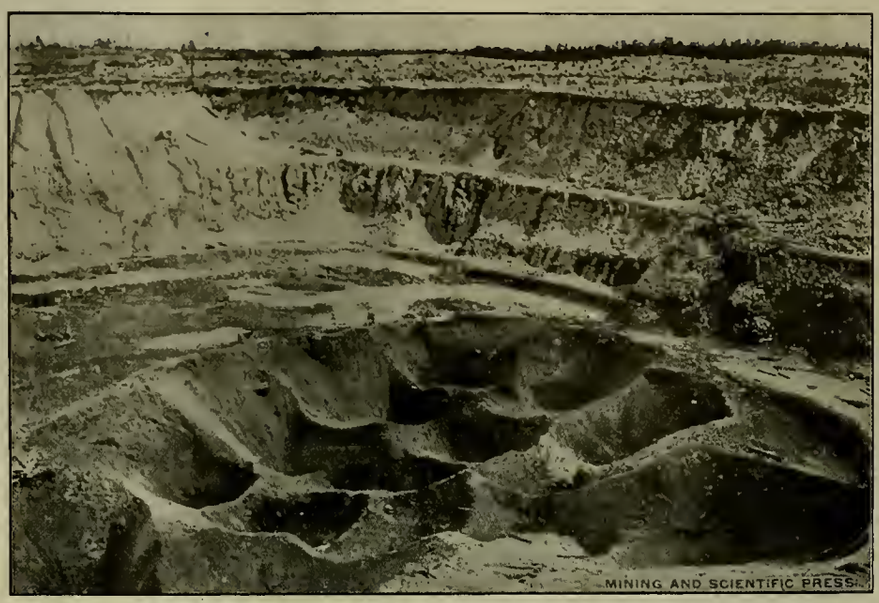
The ventilation problem is practically eliminated on the Mesabi, as the mines are comparatively shallow and usually have several openings to the surface.

A table of the depths of the Mesabi mines in 1902 shows only three over 200 feet, namely: Auburn, 218 feet; Adams, 207 feet; Spruce, 211 feet. There are five others over 150 feet deep.

On several of the shafts steel head frames have been erected, but the steel frame is not favored because of the short life of the Mesabi mines. At the present time only one mine has electrical underground haulage—the Adams. This electrical haulage is much favored aud its use is likely to be extended. In all of the mines the usual self-dumping skip is used and the ore is dumped into bins in the summer season and loaded direct into the railroad cars. In the wiuter the ore goes into stock piles, from which it is loaded into cars in the summer by the steam shovel.

Grades of Ore.—The ore in the mines does not grade regularly and it is necessary to sample closely. At the mines samples are taken in advance of the steam shovel and from the cars. Usually a determination for iron and silica can be giveu in an hour. The phosphorus takes longer. Generally the mine is sampled ahead of the work by drill holes and pits. Each mine has its own grades, which are carefully maiutaiued, as they form a basis of contracts for ore deliveries and in some cases for royalties. The under-grade ore is kept separate, if it is necessary to move it at all, or, in some cases, mixed with high grades to meet contract conditions. The grades are guaranteed, and accurate records of the grades are kept from the mine to the furnace. The texture of the ore is an element to be considered. A porous texture is desirable. The Biwabik is the only ore that is crushed. The Fayal ore is lumpy.

Probably the Mesabi mining is the cheapest in the world. This is due to the methods, particularly the open-cut mining with the steam shovel and somewhat to the large scale on which operations are conducted. In 1902 13,734,920 tons of ore were mined on the Mesabi. Last year the output was 12,820,964 tons. There were nine mines ou the Mesabi in 1903 that



Open Cut of the Fayal Mine, Showing Commencement of Mill Hole System.

Open Cut of the Fayal Mine, Mesabi Range, Minnesota, Showing Advanced Stage of Work.

shipped more than 500,000 tons. Five shipped more than 1,000,000 tons. The largest shipper last year was the Fayal, a combined open-pit and uuderground mine, putting out 1,460,815 tons. This same mine produced 1,919,172 tons in 1902. Ore was taken by rail to the lake and by water to Cleveland, where it sold for $2.75 to $3 a ton for the Bessemer grade and $2.35 to $2.65 for the non-Bessemer grades. The rail haul to the lake is uniformly 80 cents a ton. The average lake freight to Cleveland in 1902 was 75 cents. The operator pays to the fee owner royalties from 25 cents to 35 cents a ton, with frequently large bonuses for the lease. Heuce the necessity of cheap methods to make profits for the miniug compauies.

The Gold Dredging Industry.*

Written by F. W. Griffin, M. E.

Gold dredging has in fact reached the dignity of an industry. Eight years ago dredging for gold in this country was practically unknown. To-day thousands of acres of dredging land have been proved and millious of cubic yards of gold-bearing gravel are being dug each month. During this comparatively short time the development of the gold dredge has gone ahead with rapid strides until now the dredge has reached a state of perfection that has lifted dredging from an experimental basis to the plane of sound business.

The underlying reason for the general success of gold dredging is that by the use of sound expert judgment the value of a property can be ascertained to a practical certainty before any money is spent otber than that for prospecting. Whether or uot a piece of ground is suitable for dredging is determined by physical conditions. To begin with, the deposit must be the result of a great flow of heavy gravel where the drainage area has been large and the "feeders" good. The present creeks or streams which cut through a gravel deposit do not necessarily bear any relatiou to the original deposit. It must be practically flat lying, and the values must be disseminated over a wide area. You caunot dredge narrow, torrential portions of streams where large boulders abound. Where the bedrock is hard and the values are on that bedrock, the gold recovery of the dredge is materially reduced.

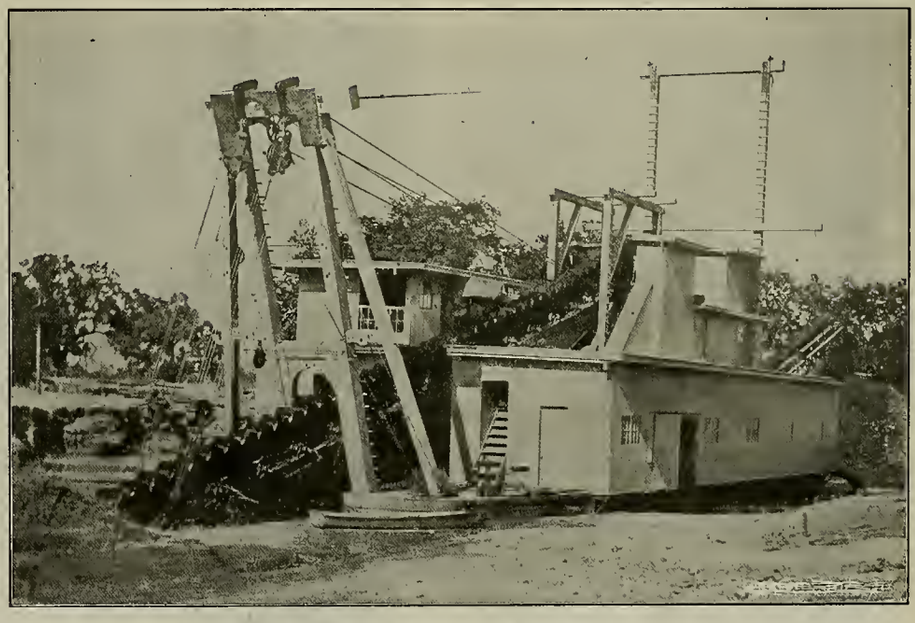
A piece of ground which fulfills the above conditions will bear investigation. Great care must be taken in prospecting, uot only in the work itself, but also in placing the holes, and particularly in drawing conclusions from the results obtained. Prospect work is generally done with a drilling machine which sinks a hole 6 inches in diameter. The test by drill is fully as accurate as the test by shaft, so far as the values obtained from the gravel prospected is concerned, but careful expert judgment must be used to reach an approximately accurate conclusion from the result of either drill or shaft. The reason for this is that oue hole to ten acres is considered close prospecting. Therefore, if ten holes are sunk on a 100-acre tract and if the total of these ten holes is divided by ten and this result is taken for the true average value of the property, it will surely be misleading. The more holes you sink the nearer you come to the true value of a property. My deduction from a great number of cases in actual practice is that a dredge will produce from 60% to 70% of the arithmetical average value shown by drill holes when the holes are placed approximately one to each ten acres of ground. This does not mean that the dredge will save more tban 70% of the values, but it does mean that the average value obtained from computing prospecting results is erroneous by 30%. If a property shows an average value of 20 cents per cubic yard, then a dredging property has been proved. This is true ouly when the drilling has been carefully done aud proper allowances have been made—further, the property must be located in an accessible place, where power is cheap. The two factors of transportation and power must not be overlooked, and where they are high the average value of the property must be proportionately high.

One of the best features of gold dredging is that the entire investment can be closely figured. The price of the property and the cost of the dredge and equipment are knowu quautities. The cost per yard of handling a defiuite quantity of gravel per month can be accurately estimated. Therefore, the commercial value of a dredging property can be accurately measured.

Almost without exception dredging is carried on, not in the rivers, but on the benches contiguous thereto. In most cases a pit is dug inland and the hull of the dredge is floated in it. Very little water is required to float the dredge and to operate it, as the water which is pumped for washing purposes comes back to the pit. The amount of water is determined by seepage and the cleanness of the gravel dug.

The dredge of the present day is the endless chain elevator type. An endless chain of buckets is carried on rollers resting on a steel ladder. The upper end of this ladder is hinged on a gantry frame about 20 feet above the deck of the dredge. The lower end of the ladder is suspended by cables, which pass over sheaves to a drum on a wiuch, so that the ladder may be raised or lowered to feed the buckets. The buckets pass over tumblers at the upper and lower ends of the ladder. The power to drive the bucket liue is applied at the upper tumbler through gears. The material as excavated by the buckets is dumped into a hopper and from this hopper is fed to revolving or shaking screens. Water uuder pressure is forced from spray pipes over the screens onto the traveling gravel. The gold-bearing material passes through the screens into a distributor, which feeds this material and water to tables provided with riffles. These tables in turn discharge into side or tail sluices, which deposit the fine tailings well behind the dredge. The coarse tailings, after being washed on the screens, pass from the screens to a conveyor, which carries these tailings 30 to 50 feet behind the dredge and stacks them 20 to 30 feet high.

A Large Dredge in Course of Construction.



Dredge Cutting Away the Surface Debris.

There are four distinct functions which a dredge must perform:

First.—Dig large definite quantities of gravel per month.

Second.—Screen aud wash all the gravel the buckets can dig.

Third.—Save the gold.

Fourth.—Dispose of the tailings.

The digging end of the machine was developed first. The size and strength of all the machiuery had to be increased to withstand the varied, changing, immense strains put upou it in digging gravel. Actual working experience has been the key to the problem which had to be met. What this experience has taught may be illustrated by the statement that the weight of the buckets alone have been increased from 500 to 1200 pounds each. Machinery on the dredge as a whole has been increased from 150,000 pounds to nearly 500,000 pounds in the larger machines, while the capacity of the dredges has been increased from 20,000 to 75,000 cubic yards per month.

It takes power to miue gravel. It takes more horse power to dig tight gravel than it does to dig loose gravel. To dig large quantities of gravel you must have large quantities of power. This question of horse power behind the bucket line is the determining oue for size of shafting and strength of digging machinery. As a fundamental proposition, the machinery must be designed to withstand a maximum pull which can be exerted by the driving machinery. If a 100 H. P. motor is driving the buckets, the strain must be figured, not to withstand the normal pull of this motor, but the greatly increased pull as the motor slows down to the stalling point. To this figure add the strain resultiug from the surging of the dredge when digging tight gravel.

Variable speed motors have been generally introduced to give better control of the machinery and to regulate the speed of the bucket chain.

In the close-counected bucket type the number of buckets dumped per minute range from eighteen to twenty-eight. In the bucket and link type the average is about twelve to fourteen.

The rated horse power of the 45,000 yard dredge is about 155; that of the 75,000-yard machine is 230. The actual average horse power used is about 100 for the small dredge and 150 for the larger dredge.

The "wear and tear" on dredging machinery is great, but the evil of wearing out one pound of material and "scrapping" nine out of every ten pounds has been corrected. The wearing parts are lined largely with manganese steel, and these wearing parts have been made readily and easily replaceable.

While the digging end of the dredge was being developed the screening end was not carr.ed on so rapidly. The dredges were digging more gravel than they could wash and screen. However, this defect has been overcome by increasing the screening area and adding more water under high pressure. The screening end as well as the digging end of a dredge

*Trans. Cal. Min. Assn.

must be designed to suit the conditions under which the dredge is to operate, the amount of material to be handled and the character of that material. In some gravel a revolving screen is better than flat shaking screens, and in other cases a combination of the two is best.

The third function of the dredge—that is, saving the gold—is made comparatively easy. In the first place, the coarse material has been removed by the screens and the finer gold-bearing sands are distributed evenly over a series of tables where the supply of water can be regulated. Immediately under the screen, where the fine material drops in thin streams, is the best place to save the gold. In general practice 85% of the clean-up is made under the screens, and the percentage of loss on a dredge is remarkably small. The gold-saving riffled area on a dredge is practically 1200 square feet.

The fourth function of distribution of tailings varies in complication with the varying conditions of the ground worked.

The distance from the water level to bedrock and the height of the bank above bedrock are determining features. Storage capacity for both fine and coarse material must be had. The main points in the distribution are to get the conveyor long enough to stack the coarse material to a height sufficiently great and far enough behind the dredge so that they will not run back. The fine tailings must be led off the dredge at an elevation which will insure storage room. Where an unusually great amount of sand is encountered, it is necessary to use a sand pump to take a portion of the fine material from the tail sluices and discharge it well over the top of the coarse tailing piles.

To be successful a dredge must be kept running as near twenty-four hours a day as possible, for when a dredge stops the producing part of a plant stops, while the expenses continue. Good judgment in the management of a dredge will minimize the time lost. Duplicates of the essential parts of the dredge should be kept on hand. All wearing parts should be provided for before hand, so that when a break occurs it can be mended with the least possible delay. Care in this regard is more necessary in the dredge than in the mill, for in the mill you can hang up one battery for repairs or renewals while the others are working; but with the dredge the most trivial accident will stop the whole plant until repaired. Still, the dredge of to-day is practically on the same footing as the mill, and the loss of time due to mechanical causes is no greater in the dredge than in the mill.

At the present time well managed dredges are making a monthly average of from 80% to 90% of the possible running time. All stops of whatsoever nature are counted, including lost time for clean-up, power shut-downs and matters outside of the actual stoppages, due to mechanical causes, on the dredge. It is the usual practice to clean up twice a month. The time lost on this account is about four or five hours per clean-up. But this time is not all dead loss, as it can be used to advantage in general repairs.

The question of size and capacity of the dredge is one on which opinion differs, but at present all efforts are bent toward increasing the capacity of the dredge. The dredge of a monthly capacity of 40,000 to 45,000 yards is more easily kept in repair, for all the parts are comparatively light. Still, the labor cost, which is one-third of the actual expense of operating a dredge, is the same in a dredge of 40,000 yards capacity as it is in a dredge of 70,000 yards capacity. The increase in power is less in proportion than the increase in number of yards handled, and, therefore, the large dredge reduces the cost per cubic yard of handling the material. The cost of repairs does not increase out of proportion. Therefore, the larger dredge is unquestionably the greater net producer. However, there is an economical limit to the capacity of a dredge. As I stated, there are three factors beside digging a great amount of material, namely, washing thoroughly, saving the values and storing the tailings. It is also true that the first cost of a dredge increases out of proportion when the size of the dredge passes a certain limit; further, the parts of the dredge are so much heavier that the difficulty of making repairs increases and the time lost from this will be greater. The expense of maintenance will also increase.

At the present time I believe that in the dredge of 70,000 to 80,000 cubic yards per month the economical limit is reached. Still the tendency is to larger capacities, and it is not at all impossible that within a short time dredges of 100,000 cubic yards capacity will be the most economical.

The average cost of handling ground with a small machine of 40,000 cubic yards capacity is, approximately, 6¼ cents per cubic yard, segregated as follows:

	Cents.
Labor	2.1
Power	2.00
Dredge supplies	0.34
Taxes and insurance	0.18
Maintenance and repairs	1.20
Sundries	0.43
Total	6.25

In the 70,000-yard machine this cost per yard is less than 5 cents.

It is useless to predict what the future has in store for gold dredging, so rapidly has the industry developed within the last two years. The improvement is steady and the field is constantly increasing. Ground is being handled to-day that two years ago was placed out of the possibility of dredges. Not only can harder, coarser deposits be handled, but the depth to which the machines can attain is constantly increasing. Under ordinary conditions a bank 20 feet above water level can be handled. One year ago the greatest depth reached was 45 feet below the water level. There are now in the course of construction on the Yuba river, near Marysville, two dredges which will dig 60 feet below the water level. Through this development, thousands of acres of ground have been added to the dredging field which a year ago were deemed outside the economical limits. As the development of the industry continues, I feel certain that tremendous areas of low-grade ground will be rendered available for profitable dredging. Instead of the field of gold dredging becoming smaller, it is growing larger and larger each year. I remember a year or two ago it was generally considered that the Oroville district was practically the only field for larger dredging operations. To-day the proved successful dredging field extends from Alaska to Mexico. In Central America, South America and Africa have dredging operations been started. In fact, in all countries where placer mining has been successfully carried on the dredge is sure to follow.

Gold dredges are operating successfully in the United States—in Oregon, Idaho, Montana, Colorado and New Mexico. In California gold dredging has been carried to its highest development. At Oroville there are twenty-six dredges operating. There are from 5000 to 6000 acres of dredging land proved and developed. A conservative estimate of the value of these Oroville properties is $4,500,000. None of the stock in the companies is for sale. On the American river, near Folsom, a good dredging field has been proved. It has not been as fully developed as Oroville, but the dredging acreage is about as great as that of Oroville. There are four dredges near Folsom, and lately new life has been infused into the camp. Plans have been made to equip the properties with dredges as rapidly as possible. Two large dredges are now nearing completion and a third is under way, and soon the Folsom district will attain the prominence of Oroville.

The Yuba field promises a brilliant future, with an acreage of 3000 to 4000. On Bear river, near Wheatland, there is a field of over 1000 acres, and new machines are being built to work it. On the Calaveras, at Jenny Lind, a large dredge has just been completed and a fine return on the investment seems assured. In Siskiyou and Trinity counties dredges are being successfully worked and soon these fields will be extensively exploited.

Generally speaking, a gold dredge will work to a depth of 60 feet below water level. It will handle a bank 20 feet above the water line. It will handle 75,000 cubic yards per month, at an expense of 5 cents per cubic yard. There is no chance of labor troubles, as two men operate a shift.

Dredging for gold has become a mechanical and a commercial proposition; as an investment it is one of the safest in the business world. It will become more and more attractive as the industry develops, and the returns demanded by capital so invested will not be greater than in ordinary commercial enterprises. Gold dredging is a real industry. Best of all, there has not been any promotion or inflation of dredging stock in California. There have been no "wild cat" schemes. The industry is young, but it is clean and strong and healthy, and bids fair to grow to great proportions.

Cyaniding Gold-Bearing Sulphurets.*

NUMBER III.

Written by S. B. Christy.

Now, this is the difficulty of the decantation process—you cannot get complete removal of your solution. There is no way to do it except to handle a large quantity of solution. The less solution I leave in my pulp the quicker I get a removal of the gold-bearing solution, and in the most favorable circumstances I had left at least one-half ton of the solution, or 50% of water, in my resulting tailings. I looked for some method of overcoming this difficulty. The filter process being not practicable, it occurred to me I might use a centrifugal machine to remove the water from the pulp. We made several forms of centrifugal machines in the mining laboratory of the University, and I made a number of experiments with this method, and I found it entirely practicable to remove the amount of water down to about 12%. The best results I got was 11%. That is, there was left in one ton of the ore about one-eighth ton of solution. This reduces the decantation coefficient and the volume that must be handled. The use of the centrifugal machine for this purpose has been patented by Mr. Sulman, an Englishman. I should have no difficulty in proving that I used the same idea practically for the same purpose in the University laboratory several years before his patent was applied for. The method, however, is I hardly think practicable for handling large quantities of ore, because the centrifugal machine is very expensive, and takes considerable power, and requires some skill to use it, but it is entirely practicable for very rich material.

There is a fourth method available, and that is upward filtration—that is, instead of trying to filter downwards, to let the solution percolate upwards through the ore. By using a very slow upward current it is possible to let the pulp settle against it, but it is one of the most difficult things to perform that you can imagine, because a stream which will rise up through this pulp adjusted to hold it in suspension when it is all loose, does not operate for a long time. In spite of the upward rising current, little particles of ore first widely separated from each other seem to form agglomerations or concentrations. They adhere together, forming little balls of precipitate which sink against that stream, and you have to constantly increase the velocity of the stream. Then channels form in the whole mass of ore, and it is extremely difficult to make the upward filtration successful. It is possible to have a slowly revolving agitator in the bottom of the tank so as to break this up and keep the channels from forming and allow the solution to percolate upward. This idea has, I believe, been patented, though the same idea has been used by Prof. Hilgard at the University of California in the mechanical analyses of soils for thirty years. I will also say that T. J. Grier, the superintendent of the Homestake mine, has invented a process of upward filtration for handling fine slimes, which is now being patented. This he has explained to me confidentially, and I have tried it, and it is one of the most ingenious things I have seen. I am not at liberty to explain it in detail, because the patent is still pending. Whether it will solve this problem commercially or not is a question, but it is extremely ingenious and looks promising.

Another method which has been used has been to attempt to precipitate the gold from the solution by electricity while the pulp is still there. I believe there are several patents on that idea. I have made a number of experiments in this direction myself, and in some cases with fine slimes which did not contain sulphurets. I have obtained good results, but in the case of sulphides the electrical action on the sulphides produces chemical decomposition which interferes with the operation. Besides that the flowing pulp erodes the gold and silver precipitated on the cathodes, and so there is a mechanical loss from this cause, and I do not feel very enthusiastic about the possible success of it as applied to sulphurets. I think, however, if one is willing to be patient and willing to put up with the handling of considerable quantities of solution that the simple decantation method is able to solve the problem to the satisfaction of all concerned.

Lastly, we have to deal with the recovery of the gold and silver from the solution. Here we need use only the well-known standard methods. We can pass a perfectly clear solution either through zinc shavings, or use zinc dust, or use electricity. The electrical method has some advantage over the other two in dealing with large volumes of a solution that come from the decantation process, and I have been working on that part of the subject for a number of years, and I have succeeded by my patented process of progressive electro concentration in recovering from such solution down to 5 or 10 cents a ton, recovering the gold and silver without refining in a perfectly pure state, .996 or even .998 fine, ready to ship to the mint without any refining charges.

I will now say a few words as to the result obtained with some ores. I mentioned the Melones as a type. There are a large number of other mines belonging to the mother lode of California of the same nature which yield low-grade sulphurets, about $25 a ton, that don't pay for working, and are practically a drug in the market. I have been able, by carrying out these ideas, to reduce these concentrates from the $25 a ton to 60 cents under conditions easily reproduced commercially. It is, of course, easy to reduce them even lower, but hardly on a commercial scale. That is a recovery of 97.6% on that ore. I deem it would be entirely practicable to do that commercially, and get it down to $1 a ton right along.

Another type of sulphurets, the Oneida sulphurets, rather richer, ran about $60 a ton. The best I could do with those was to get them down to $3.50. They were rather more difficult to treat. But that is an extraction of 92½% on an arsenical ore. These results compare very favorably with chlorination in both cases. No roasting was required, and nothing but the fine grinding and the treatment with the cyanide, as I have explained it.

I have treated the concentrates from the Treadwell mine, running about $50 a ton, and got them down to about $2.50 a ton, or 95% extraction. But I ought to say that no one should expect or think of putting up a large plant for treating sulphurets on a basis of what I have here explained, without trying experiments on a small scale very carefully and very exhaustively, first, because sulphurets, which often look very much alike, have chemical and physical properties that are not patent at first glance, and these differences often make the process very difficult. I would mention that all those sulphurets which contain tellurides in any quantity, which contain arsenides of iron and antimonides of iron and

*Abstract Trans. Cal. Min. Ass'n.

large amounts of oxidized copper ores are difficult to treat; also gold ores which coutain large silver values, say, containing thirty ounces of silver and two or three ounces of gold, are very difficult to treat. It would seem the silver and gold in those cases were associated together so that the thirty ounces of silver sulphide covered up the smaller amount of gold in such a way as to render it difficult for the cyanide to get at the gold. Silver ores in general require much stronger cyanide solution than do gold ores.

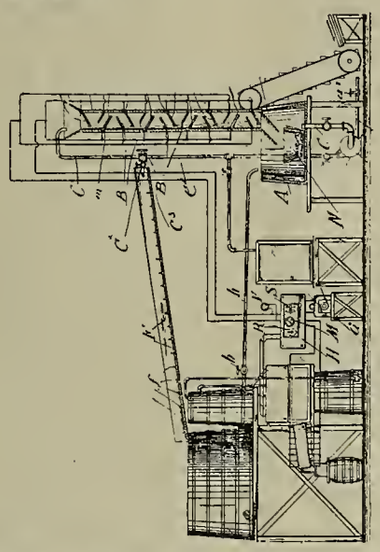
(TO BE CONTINUED.)

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 5, 1904.

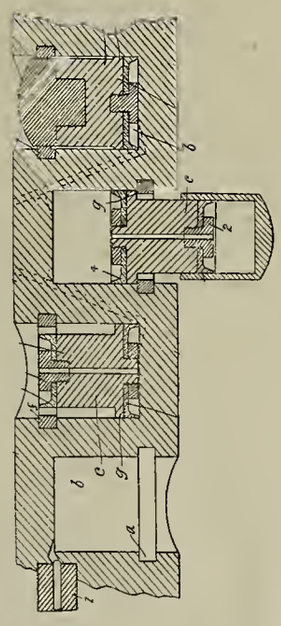
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF TREATING LOW-GRADE ORES AND TAILINGS BY ELECTROLYSIS.—No. 756,223; E. Fahrig, Philadelphia, Pa.



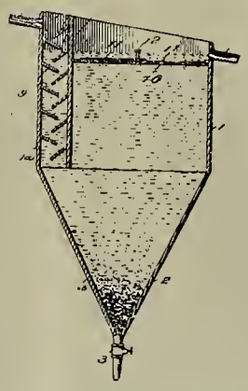
Process of treating low-grade ores and tailings by electrolysis for regaining precious metals contained in same, by grinding ore or tailings, then mixing same with suitable quantity of water and suitable electrolyte to form pulp, passing pulp by gravity between series of pairs of inclined anode and cathode plates arranged one below other, and removing from time to time precious metal deposited on cathode plates.

HYDRAULIC PRESS FOR MINING PURPOSES.—No. 756,738; A. J. Tonge, Chequerbent, near Bolton, J. Tonge, Jr., Westhoughton, near Bolton, and E. Eaves, Stockport, England.



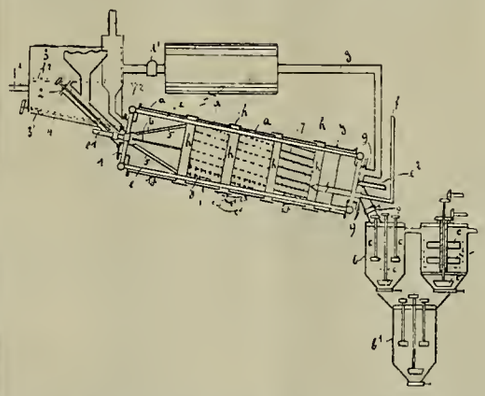
Hydraulic press comprising body provided with cylinders, pistons working in cylinders, and formed of plurality of members operating within and upon each other, means for forcing fluid to operate pistons, and stop plate slidingly mounted within groove in walls of each cylinder and adapted to limit outward movement of pistons.

ORE CONCENTRATOR.—No. 756,305; C. G. Weller, Idaho Springs, Colo.



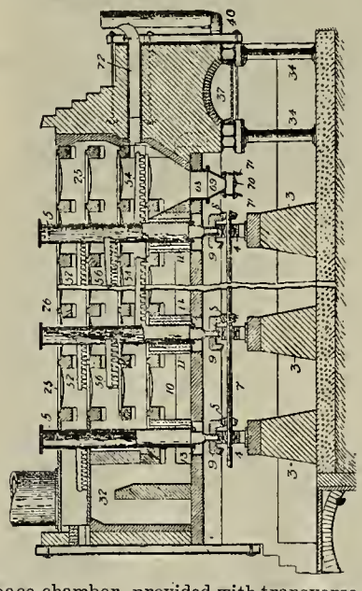
Device for concentrating ore, consisting of hollow body provided with tapered lower portion, having valved outlet and having inlet and outlet at opposite sides, outlet being at lower level than inlet, and having upper portion of inlet side vertical and lower portion inwardly inclined, a partition arranged a short distance from and parallel with vertical portion of inlet side, oppositely inclined plates projected into space formed between partition and vertical portion of inlet side of body, and alternately disposed and having inner ends overlapped, and fine meshed screen arranged near upper end of body below plane of outlet, and knocker frame applied to screen for receiving light blow when it is required to jar screen to dislodge material therefrom.

APPARATUS FOR TREATING SOLIDS, SUCH AS ORES, LIQUIDS OR GASES.—No. 756,271; P. Naef, New York, N. Y.



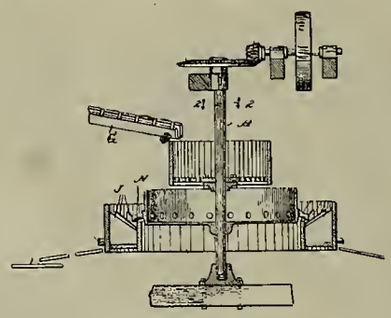
In combination with apparatus for treating liquids and solids, settling tank, inclined bottom on tank and means to run sludge from tank, back to apparatus.

ROASTING OR DESULPHURIZING FURNACE.—No. 756,485; F. J. Falding, New York, Y. Y.



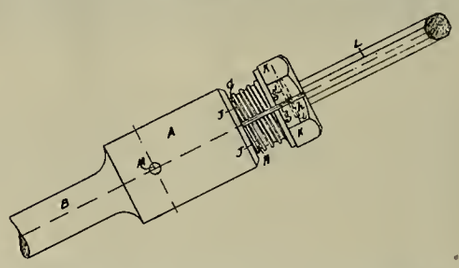
Furnace chamber, provided with transverse arches spaced apart along length of chamber and independent of each other, each having individual buck staves and tie rods, and intervening brick work occupying spaces between arches and completing furnace side walls; also provided with rotatory hollow column having hollow stirrer arms, means for creating flow of cooling medium through column and arms, and means for controlling independently flow through column and through several stirrer arms.

APPARATUS FOR DISTRIBUTING ORE PULP TO CONCENTRATING TABLES. — No. 756,327; W. Carkeek, Butte, Mont.



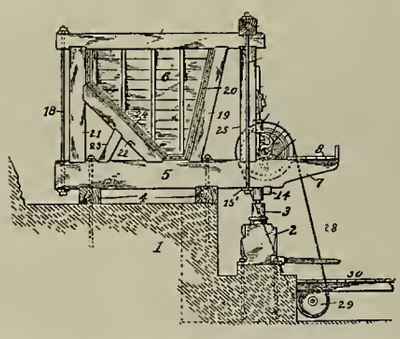
Supply pipe rotary mixer box, having perforatious in bottom, distributor chamber having plurality of openings equally spaced around periphery, series of tubes projecting diagonally downward from openings with respect to plane of rotation, series of boxes having partitions diagonally disposed with respect to plane and interposed in direction of tubes, edges of partitions being perpendicular to tubes, and outlet pipes for receptacles.

CHUCK FOR ROCK DRILLING MACHINE.—No. 756,377; W. E. Kimber, Johannesburg, Transvaal.



In rock drill chuck, body having internally threaded, longitudinally tapered hole and correspondingly tapered, externally threaded split nut, sections of nut being independent and separated, and means independent of stock of nut for holding sections thereof in assembled relation.

STAMP MILL.—No. 756,774; M. P. Boss, San Francisco, Cal.



Stamp mill having beam anchored at one end only, and having its other end projecting beyond supporting wall or column, and overhanging mortar, overhanging end sustaining counter load of working mechanism over mortar.

PRECIPITATING METALS FROM SOLUTIONS.—No. 756,211; C. Butters, Berkeley, Cal.

The improvement in process of precipitating metals from solutions, chiefly cyanide solutions, which consists in employing cathodes having surfaces of tin and anodes of lead peroxide and high density electric current.

PROCESS OF TREATING ORES.—No. 755,951; J. Smith, San Francisco, Cal.

In cyanide treatment of ores, method of rendering insoluble in cyanide solution, ferrous oxide contained in mass of moist crushed ore, by applying heat to mass in presence of air, previous to treatment by cyanide solution.

ONE of the interesting exhibits of Wyoming in the Mines Department of the World's Fair is a single piece of soda weighing 6000 pounds. It was cut from Soda lake, in Albany county, and is the largest single piece of soda ever exhibited. If made into soap of half-pound bars it would do the washing of a small family for 2000 years.

The Copper Arsenides of Lake Superior Region, Michigan.

Written for the MINING AND SCIENTIFIC PRESS.

The first production of copper arsenides, notably domeykite, was from the Sheldon - Columbia mine, near the shore of Portage lake, in Houghton county, Mich. The presence of copper arsenides on the Keweenaw peninsula has been known for some time, and it has been observed that these particular minerals are not found in the bedded deposits of native copper, but always in fissures which intersect the amygdaloidal and conglomerate beds. Thus far these veins have been observed only in connection with the lower beds near the basal members of the formations to the southeast. However, even in the smelted and refined copper of all the mines some arsenic is said to be present (though it does not seem to affect the quality of Lake copper), being a minimum in the conglomerate of the Calumet & Hecla, and a maximum in the copper from the amygdaloid beds of the lower measures in which occur the Mohawk, Wolverine, Arcadian, Sheldon-Columbia, Isle-Royale, Atlantic, Baltic and Champion mines.

In the course of development work at the Mohawk mine, near Allouez, a cross vein at right angles to the copper-bearing amygdaloid was struck, showing 12 inches to 15 inches wide, with a gangue of quartz and calcite. Samples of this ore submitted for analysis proved to be a new mineral species, and was named "Mohawkite." G. A. Koenig (Am. Jour. Science, Vol. X, No. 60,—1900) gives the following contents:

	Per cent.
Cu	61.67
Ni	7.03
CoO	2.20
Fe	trace
As	28.85
	99.75

Considerable variation has been shown by the first and principal fissure, which was cut in the north drift from No. 1 shaft. It was rich near the surface, and low grade on the fifth level, but again increased in values below that point. The width varied from 3 inches to 3 feet, and the vein was mineralized, mainly its crossings with the amygdaloid carrying copper. Mohawkite, as well as the other allied arsenides, occur massive, as well as disseminated in a gangue of granular texture. The ore is hand-cobbed and barreled for shipment to a smelter built by the Guggenheim Expl. Co. for this purpose on Hackensack Meadows, N. J., near New York City, the ore weighing 1300 to 2400 pounds per barrel. In its reduction the ordinary smelting process is not employed because of the high percentage of arsenic, but the ore is readily reduced by the pyritic method. So far as known, the nickel and cobalt values are lost, also most of the arsenic, but all of the copper is recovered. The Mohawk mine during 1902 produced about 150 tons of mohawkite per month; and during the year 1903 the sales of this mineral, according to the annual report of the company recently issued, reached value of $14,467. It is estimated the ore averages twenty ounces in silver per ton. Mohawkite is remarkable for its high specific gravity (8.05)—native copper being 8.8. When first mined it is gray in color, but on exposure to the air, tarnishes to purple or dark yellow. It has a gray streak. Three distinct veins of it were opened in the mine. The report of the Mohawk C. Co. for the year ended Dec. 31, 1903, in referring to the sales of mohawkite, says the cross fissures carrying it have gradually become barren and work has now been discontinued on them.

Of the other arsenides, the following occurrences have been observed:

WHITNEYITE.—In a quartz vein in dark melaphyr near the Mohawk mine.

FOLIATED DOMEYKITE.—At Sheldon-Columbia mine; also at the old Huron location (now the south end of the Isle Royale mine near Houghton.

ALGODONITE.—At the Pewabic mine on the Quincy amygdaloid (5000 feet higher in the geological horizon than the Isle Royale amygdaloid).

A stibio domeykite was found in the Mohawk mine, and in physical properties is not distinguishable from the domeykite of the Houghton county mines. It is free from admixtures, and its occurrence, massive. It tarnishes rapidly, becoming finally a bluish purple. Though brittle, it is not as friable as mohawkite. Hardness is 4 and sp. gr. 7.9. Before the blowpipe, the presence of antimony is detected. Koenig ("ibid"—above) says the following method employed by him will indicate its presence down to as low as 0.1% antimony: In open tube after heating molten globule for five minutes, yellow s ots appear near by with rings and patches; and farther on a copious sublimate of As_2O_3. Wash out tube in jet of water and pass H_2S into tube—ring and patches turn red and As_2O_3 turns gold-yellow. The composition is:

	Per cent.
Cu	72.48
(Fe, Ni, Co)	0.24
As	26.45
Sb	*0.78

* Varying to 1.29 as maximum.

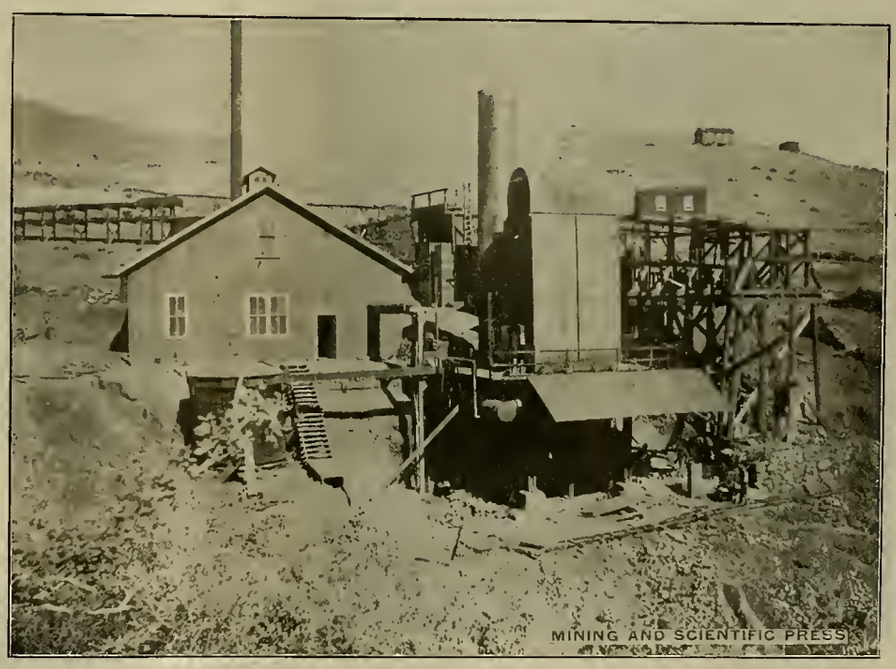
It is a typical domeykite with antimony added.

Mohawk-whitneyite is another occurrence, being, however, a most intimate mixture of those two minerals and not a separate species. In the Mohawk mine considerable masses of it occurred. Still another arsenide of copper, though not as yet known to have been found in the Mohawk mine, is algodonite. It resembles Mohawk-whitneyite, and has a specific gravity of 8.38. It has a color and texture like razor steel, and is tough, not being dented by a hammer blow, as is whitneyite. Its composition is given as:

	Per cent.
Cu	83.72
(Fe, Ni, Co)	0.08
As	16.08
	99.88

The qualities of Lake copper have a well-known standing, so much so that there is a demand for it over other varieties for certain kinds of work; and the presence of arsenic does not seem to have affected these desirable qualities, at least, not to a noticeable degree.

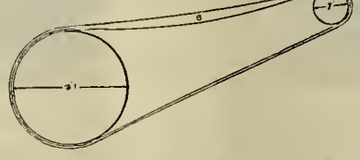
Dumping Buckets, Equator Copper Mine, Near Jerome, Ariz. (See Page 271.)



Equator (Iron King) Smelter, Near Jerome, Yavapai Co., Ariz. (See Page 271.)

Working Double Belts.

Where a belt must turn over small pulleys at high speed it is sometimes advisable to use double belts



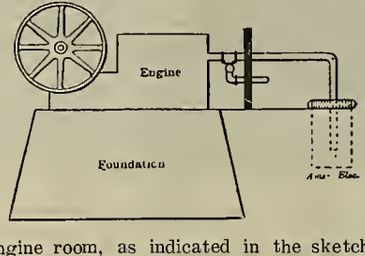
and it is claimed that two thin, wide belts will give better service than a single stiff one would.

The drawing shows how an arrangement of this kind was used on a machine operated at about 4200 revolutions. At first only one belt, a 5-inch, three-ply rubber one, was used, but this soon began to break. It was laced as loosely as possible, and a tightly laced single leather belt, 6 inches wide, placed on top. When the machine was idle the two belts remained close together; but at work the inside belt sagged on the top or loose side about 3 to 6 inches below the outside belt, as shown in the diagram.

After being in use for about two months the inside belt broke. When it was again laced up it was very tight and would run off the pulley as soon as the machine was started, showing that the inside belt should be loose and the outside one tight. In the case referred to, the outside belt traveled about 6 inches per revolution faster than the inside belt.

Home-Made Gas Engine Exhaust Muffler.

A cheap gas engine exhaust muffler consists of a piece of sewer pipe about 10 inches in diameter and 2 feet long, set in the ground just outside the wall of



the engine room, as indicated in the sketch. The exhaust pipe of the engine enters the muffler through a wooden cover, which is perforated with a number of 1½-inch holes. A branch is led off from the exhaust pipe and opens into the air, a valve be-

ing inserted at the junction of this pipe with the exhaust pipe. This is for the purpose of relieving the cylinder of back pressure at the time of starting up, and also in case the holes in the muffler cover become closed up with snow or ice between the time of shutting down and starting up. After a few explosions, the relief valve is closed. This muffler has been found to satisfactorily suppress the sound of the exhaust.

Another point which may be of interest consists of supplying a small radiator with the water discharged from the water jacket of the engine, thus cooling the discharge water, and at the same time contributing to the heating of the room. The engine to which these features were applied is a 3 H. P. machine, operated by gasoline; the radiator is made up of ½-inch pipe.

Some Mine Head Frames and Hoists.

Written for the MINING AND SCIENTIFIC PRESS by WALTER W. BRADLEY.

From time to time there have appeared in the MINING AND SCIENTIFIC PRESS illustrations of various examples of head frame construction. It is thought the accompanying examples observed by the writer will prove an interesting addition to those already published. While all three of the examples shown are California mines, they, however, illustrate somewhat differing arrangements.

Fig. 1 is that at the Cross shaft of the Utica Gold Mining Co. at Angels, Calaveras county. It is for two of the three compartments, the left one carrying a 1500-gallon water-bailing skip and the other a rock skip, the two being run in balance. The water skip has an automatically operated discharge valve at the bottom. The shaft is vertical and 1370 feet deep. The entire head frame structure is very heavy. As seen by the cut, it is a four-post affair, the two rear members acting as back braces, having a greater inclination than the front ones. The skip guides are, of course, vertical, and are braced to the front of the head frame by short timbers—the weight of the load coming on the main frame by reason of hanging from the sheave wheels on top. The enclosed structure on the farther side of the head frame contains the rock breaker and ore bins. From these bins the crushed ore is trammed several hundred feet to the Stickle 60-stamp mill of the company. The tramway track has a slight grade toward the mill, so that the car runs by gravity to the mill. The car has a brake, is side-dumping and of 1½-ton capacity. The timbers used in the gallows-frame are not numerous, but are very heavy. The corner posts are each in two pieces, spliced together. The entire structure is about 100 feet high. The only unusual feature of the construction is that the vertical shaft guides are almost wholly outside of the head frame. The plant connected with this shaft contains one of the largest installations of hoisting machinery to be seen along the Mother Lode section of California, and, as far as the writer knows, it is the only one of this type (cone drums) in the State. It is a double, conical-drum hoist, arranged to use either steam (direct-connected) or water power, built by the Union Iron Works of San Francisco. The two truncated cones are placed with their smaller bases adjacent, the small end being 6 feet 6 inches in diameter, the large end 9 feet 11 inches, with a leugth of 8 feet 10 inches between them. The grooves of each drum are to accommodate seventy-five coils of 1½-inch steel cable, or a total length of 1935 feet. The steam cylinders are 24 inches diameter with a 60-inch stroke, and the impact water wheels are 10 feet in diameter with triple nozzles. The capacity of the hoist is for raising 1500 gallons of water at rate of 500 feet per minute in balance, with boiler pressure at 100 pounds or water head of 250 feet. The block brakes, friction clutches and disc brakes are operated by either steam or water power. During the late summer and fall, when the water supply is low, the steam equipment is used.

The second illustration is of the Empire mine head frame near Grass Valley, Nevada county. The hoisting plant is in the galvanized iron-covered building at the right. It is a double-drum friction hoist operated by water power. The shaft follows the vein

Fig. 1.—Head Frame Cross Shaft, Utica Mine, Angels, Cal.

Fig. 2.—Head Frame Empire Mine, Grass Valley, Cal.

Fig. 3.—Head Frame Tesla Coal Mine, Tesla, Cal.

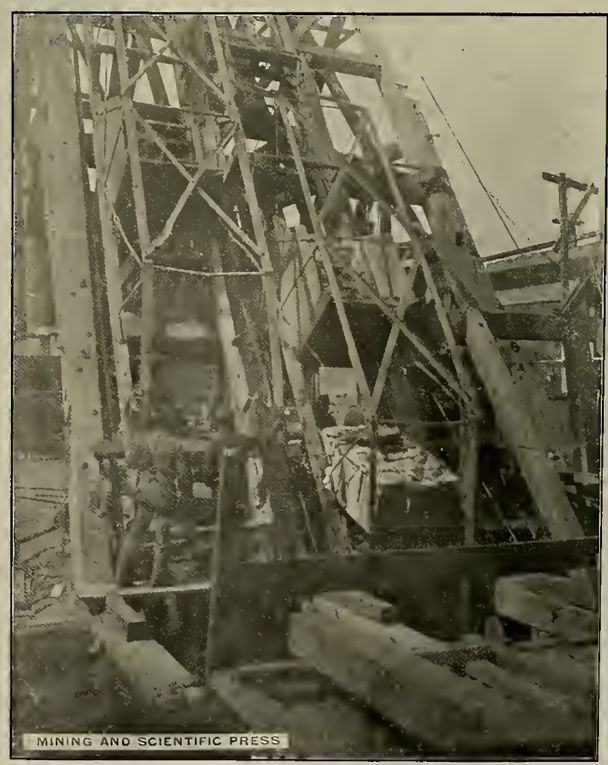


Fig. 4.—Collar of Shaft, Tesla Coal Mine, Tesla, Cal.

formation down at a dip of about 30°. In the head frame are two bins, the lower one for waste rock and the upper for ore. Below the highest bin is a No. 5 Gates gyratory crusher, through which the ore passes to a third bin, from which it is trammed in a side-dump car to the 40-stamp mill. The skips dump automatically. The shaft is down about 3000 feet on the incline. The back braces of the head frame are set steeply, but the resultant strain falls within the structure. There are side braces, also, to minimize vibration. The entire structure is substantially built. The presence of the rock bins necessitates, of course, more timbers, in the way of ties and braces, than would otherwise be required.

The "A" type of frame is shown in Fig. 3, as built at the Tesla coal mine—Sau Francisco & San Joaquin Coal M. Co.—at Tesla, Alameda county. The shaft is of three compartments, the west one—the photograph was taken looking west—being used for sinking. The auxiliary hoisting equipment is on the right and on the hanging wall side of the shaft. Four steel cables are used as side guys for the head frame. The legs are each of a single stick of timber, the front ones being reinforced by an extra piece bolted on top of each, extending about two-thirds of the way to the top from the collar. The back legs are reinforced by shorter pieces. The angle and cross-braces are all of fairly heavy timber. The shaft pitches into the hillside, following the dip (57°) of the sandstone beds in which it is sunk, and being about 200 feet from the "Eureka" coal bed—in which are the principal developments—on the hanging wall side. The formations adjacent to the coal veins being mainly sands, shales and sandstones, make heavy ground to hold.

The cages used have a length sufficient to accommodate three cars; but at the time the photograph was taken the middle deck was boarded on the sides and bottom and used for handling men, tools and timbers. The width of track for these cages is 5 feet, and the rails for the mine cars which run between have a 25-inch gauge. At the surface and at each level underground the mine-car rails curve over onto the level and run out horizontally. In Fig. 4 may be seen a car being loaded onto the cage. There is a bumper roller across the cage, against which the back of the car rests in going up and down the shaft. The cage is built of steel channels and angles, riveted. At each station underground there is a false, narrow gauge track on hinges, which is swung into place for the mine cars to pass. In descending, the gates are closed and the cage is stopped just below the station. Then the gates are opened, and, with two short, quick raises by the engineer, first the upper and then the lower car is thrown out onto the level. From the collar of the shaft the cars are pulled to washer or dump by a mule; but underground, electric haulage is used. Levels have been established at 200, 400, 600, 800 and 1000 feet. The hoist is operated by steam, direct-connected, and has double cyliudrical drums 7 feet in diameter. The speed of hoisting is 1100 feet per minute, at fifty revolutions per minute, and eighty-five pounds steam gauge pressure. The steam cylinders are 20 inches diameter, with 60-inch stroke.

The cars containing waste are run out onto the dump and emptied of their loads by the automatic tipple, shown in Fig. 5. The bed of the tipple is made

Fig. 5.—Automatic Tipple, Tesla Mine, Cal.

of heavy iron plates, and after the loaded car is run onto it, it is automatically tipped, being thrown out of balance by striking the curved ends of tipple, and the load falls out. The change in center of gravity brings the car and tipple back into the horizontal position. There is a projecting bar of steel over the tops of the carwheels to hold the car in place when tipped. The end door of the car is opened automatically, the curved bar seen on the side of the tipple throwing the latch. Doors on top of the car keep the material from falling out while in the shaft.

Where rapid hoisting is required and large quantities of material are to be handled, recent engineering practice—notably at the diamond mines and on the Rand in South Africa, at the copper mines of the Lake Superior region in Michigan and elsewhere—has demonstrated the economy of hoisting with skips over the cage system. In view of this, it would seem advantageous at these coal mines, where a large daily output of a low-grade product like coal is to be handled, to use the skip system instead of cages. Pockets would have to be cut and bins built at each level and bins arranged at the head frame. This, of course, would necessitate some changes in the accessory arrangements around the shaft—a higher head frame might be needed—but the cost of handling would be so reduced and so much larger capacity obtained, that the cost of making the alterations would soon be more than regained.

Comparing the head frames illustrated herewith with several types previously presented by the MINING AND SCIENTIFIC PRESS (e. g., July 11, 1903, p. 21; July 25, p. 47; Aug. 22, p. 109; Feb. 6, 1904, p. 94; March 19, p. 190), and also in the frail structures used in the fluorite, lead and zinc mines of Kentucky and Missouri (see Feb. 7, 1903, p. 81, and Feb. 14, p. 101), they appear unnecessarily heavy. True, they had better be massive and too strong than too weak for their work. But, if the actual breaking strength of the kind of timber to be used be considered, it will be found that much smaller timbers can be used than are ordinarily seen at most Western mines.

A Millman's Experience.

Written for the MINING AND SCIENTIFIC PRESS.

"If you will attend to the repairs I'll help the 'boys' clean up." Thus spoke the boss after I had shut down the mill for a general cleanup. The "boys" referred to were the leasers whose ore we were working.

I want to say, first, that though the method (?) followed at this mill is, perhaps, an exception, it is by no means a rare instance of the laxity of a host of superintendents, for during an experience of eight years I have found innumerable instances where the workings at this mill were followed to a greater or less extent. Only the other day I was talking to a millman of twenty-five years' experience, and who has just returned from Nevada after a couple years' cruise. After relating the incident to follow he remarked: "That's nothing. I have been going through double that since I have been in Nevada."

When my partner and I came to this mill it was rubbish and dirt from the rock breaker to the vanners.

From the cam shaft boxes and the top of the lower guide blocks we scraped two tomato cans full of old axle grease; from under the feeders and plate tables we got half a ton of ore.

The feeder worked whenever it took the notion. The mortar was fed by the vibration of the feeder (due to the falling stamps), which shook the ore into the battery.

The apron plates sagged at least ½ inch in the middle, not to mention the numerous ridges caused by the floor of the table warping.

The pulp was carried from the plates to the vanners by a launder some 2 feet wide. From the battery floor during the first cleanup we made of the mill I am sure we got at least $25. "That don't amount to much," the boss said, "as it has been accumulating for years."

The vanners we actually dug out of the sand. The bearings were solid blocks of pulp and grease and the frame shook like a runaway engine. One vanner had been shut down, as the belt had run too far to one side and would not "come back," we were told.

As we have to do our firing, we examined the boiler and took from the same a wheelbarrow and a half of scale and muck.

Well, we have got the mill in pretty good shape, though it has taken some time. When we were ready to run we asked the boss what size screen to put in, and he said: "You might put in the 30. No, put in the 40-mesh." Later: "No, put in the 30. I guess that will do." He had been working this ore three or four years and did not know exactly what size screen to use.

We never got anything we ordered unless something broke, and then only enough material to repair the break. Why do some superintendents imagine that every article purchased for the mill eats into the returns?

"Boys, you'll have to cut down expenses here in the mill," while at the mine waste is visible at every turn.

But I started out to relate an instance, and not to kick.

I stood on the vanner floor, leveling up one of the machines, while the boss and the boys made the cleanup. The boss took out the screen and set it on the floor with a "dull, sickening thud" that nearly jarred the tacks out, not to mention the amalgam adhering to the frame. A board was then thrown across the plates and the dies pried out with a crowbar, and if the board wasn't wide enough to allow him to step back far enough to get the proper leverage he stepped on the plates instead, which, mind you, had not been cleaned yet. The dies were put into a galvanized iron tub with holes in it big enough to put your finger in. These were washed by throwing a couple of buckets of water at them from a distance of 6 or 8 feet. The pulp from the battery was shoveled into old oil cans, and whenever a piece of hard amalgam was found it was passed around for general inspection.

One weighed it, another broke a piece off to see if the gold was fine or coarse, and the third let it fall on the floor.

The pulp was all panned by hand—no magnet to remove the iron, no muller to clean the amalgam.

"Quite useless," he said, "as we get it all in the melting."

The amalgam is finally collected and ready for weighing. The scales consist of an old pair of tip and balances, with only 15-ounce weights, so the metal has to be weighed in lots.

The amalgam is put into the scoop by grabbing a handful and carrying it across the room to the scales. All hands assist in this.

After this the amalgam is put into an old, rusty retort, sealed and placed on a roaring fire. In fifteen minutes the retort is taken out and the cover removed. The room is white with mercurial vapor, and one fellow flees to save his "teeth."

The retort is overturned upon a piece of sheet iron and lo! the pot metal is visible—or is it a lump of dirt?

All jaws drop two points at this juncture.

"But she'll be O. K., boys, when she is melted. Shines like a twenty."

The pot metal is broken into pieces and placed in a crucible with the necessary ingredients for a flux.

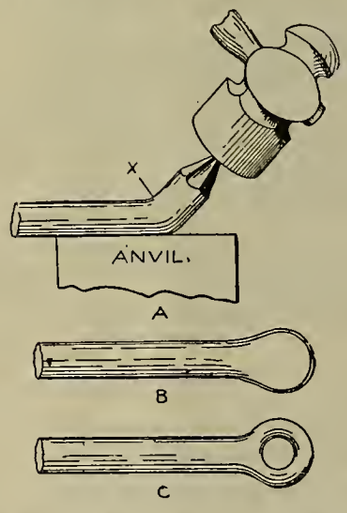
The crucible and its precious contents are taken to a portable forge and the "gang" proceed to get up steam. After half an hour's arduous work the belt breaks and they stop for repairs. But the belt is too old; in fifteen minutes it breaks again, and then again, and finally, for fear it won't hold out much longer, the metal is poured into the mould. The mould, in turn, is quickly dipped into cold water and a slight explosion scatters the slag. The bar is taken from the mould. It is crystallized—and is it gold or iron?

"We will send it to the mint and have them fix it. It will be O. K. then." From the slag and floor we cleaned up about $40.

"It's all easy when you know how."

How to Forge an Eye.

The following is a good method of forging an eye for chain-hooks, braces, eye-bolts, etc., when the whole strength of the rod is wanted in the eye: Take a soft heat on just the end of the rod (using a



hammer of good weight), point it a little, and bend down over corner of anvil. Next turn the point up and strike as in Fig. 1, A, so as to upset the bent part down even with the rod, as in Fig. 1, B. Take care not to get a cold shut. Turn it over and punch as quickly as possible, rounding up on the horn of anvil. With a little experience, one can make a good, strong job, and at one heat.

IRON changing from molten to solid state expands, but, having solidified, it contracts as the temperature further decreases. This action has been utilized in the artificial manufacture of diamonds, and attempts made to explain the origin of the diamond as occurring under similar conditions. Particles of carbon were enclosed in molten iron, outer surface of mass chilled and molten interior allowed to solidify slowly. The pressure thus produced and the temperature caused formation of minute diamonds from the carbon.

Cornu's Spiral as a Transition Curve.*

By D. N. Lehmer.

1. Cornu's spiral, which is of such fundamental importance in the theory of light,† has the remarkable property that the radius of curvature at any point is inversely proportional to the length of the curve up to that point, measured from a fixed point. It is this property that makes it of value as a "transition curve," which is a curve intended to diminish the shock experienced hy a train in passing from a straight track to a circular curve, or from one circular curve to another of different radius.

2. Various other curves have heen considered in this connection, the most successful heing the cuhic parahola, which within the range of ordinary practice agrees very closely with the spiral. The methods proposed for laying out the spiral in the field have been so complicated that the ordinary engineer will not undertake the work. The method herein described has heen in use for some years on the Burlington and Missouri lines, where the curve is known as Green's spiral. It was introduced on that road hy Mr. E. L. Wooley, one of the locating engineers, who prepared a tahle in connection with it hased upon a discussion hy Mr. D. M. Green of the R. P. I. at Troy, N. Y. The tahles given herewith are largely reproductions of the B. & M. tahles, computed for that road hy Mr. F. A. Jones. For the theory of the curve I am largely indehted to Professor O. V. P. Stout of the University of Nehraska.

3. As in staking out a circular curve it is customary to use a suhchord of constant length, usually 100 feet, unless the curvature is very sharp, so in staking out a spiral a suhchord of definite length is chosen. If it is desired to pass from a straight track to an N-degree curve, N of these suhchords are taken. At the end of the first chord the radius of the spiral is made equal to the radius of a one-degree curve, then since the radius of curvature is to vary inversely as the length of the curve at the end of the second chord we shall have the radius of a two-degree curve (very approximately) and so on.‡‡

4. In running a spiral from a tangent to a circular curve the initial and final points are denoted hy P. S. and P. C. respectively. In running a spiral from a circular curve to a tangent the initial and final points are marked P. S′. and P. T. respectively. Denote hy l the length of the spiral measured from P. S. to any point and ρ the radius of curvature at that point. Then hy the definition of the curve

$$\rho = \frac{1}{2\,K\,l} \qquad (1)$$

Also if $\triangle$ is the angle hetween the angle at P. S. and the tangent to the spiral at a point distant l along the curve, we have (Williamson's Calculus, p. 286)

$$\frac{d\triangle}{d\,l} = \frac{1}{\rho}$$

or from the equation (1)

$$\frac{d\triangle}{d\,l} = 2\,K\,l$$

whence integrating

$$\triangle = K\,l^2 \qquad (2)$$

which is the intrinsic equation of the spiral (Williamson, p. 304). It is evident from (2) that the constant of proportionality is the angle hetween the tangent at P. S. and the tangent to the spiral at a unit's distance from P. S. In general we see from (2) that the change in direction effected hy any length of spiral is proportional to the square of the length of the spiral.

5. It is not possible to get the equation of the spiral in rectangular co-ordinates. We may, however, express x and y in terms of $\triangle$ hy certain infinite series. Taking the tangent at P. S. for axis of x and the origin at P. S. we have

$$\frac{d\,x}{d\,l} = \cos\triangle$$

and from equation (2)

$$\frac{d\,l}{d\triangle} = \frac{1}{2\sqrt{K\triangle}}$$

so that

$$\frac{d\,x}{d\,l} = \cos\triangle = \frac{d\,x}{d\triangle}\cdot\frac{d\triangle}{d\,l} = \frac{d\,x}{d\triangle}\,2\sqrt{K\triangle}$$

whence

$$\frac{d\,x}{d\triangle} = \frac{\cos\triangle}{2\sqrt{K\triangle}}$$

or

$$x = \frac{1}{2\sqrt{K}}\int_0^{\triangle}\frac{\cos\triangle\,d\triangle}{\sqrt{\triangle}}$$

Replacing $\triangle$ hy z^2 we get hy easy reduction

$$x = \frac{1}{\sqrt{K}}\int_0^{z^2}\cos z^2\,dz.$$

This quadrature can not he effected in finite terms. It defines a function known as Fresnel's integral, of importance in the theory of light and of importance, also, in the theory of numhers.

The value of y is similarly found to he

$$y = \frac{1}{\sqrt{K}}\int_0^{z^2}\sin z^2\,dz.$$

Expanding cos z in a series and integrating each term separately we ohtain

$$x = \frac{1}{\sqrt{K}}\left(z - \frac{z^5}{5.2!} + \frac{z^9}{9.4!} - \frac{z^{13}}{13.6!} + \cdots\right)$$

or in terms of

$$x = \frac{1}{\sqrt{K}}\left(\triangle^{\frac{1}{2}} - \frac{\triangle^{\frac{5}{2}}}{5.2!} + \frac{\triangle^{\frac{9}{2}}}{9.4!} - \frac{\triangle^{\frac{13}{2}}}{13\,6!} + \cdots\right) \qquad (3)$$

TABLE 1

Table of Deflections — **5 Foot Sub Chord**

D	O=PS	2	4	6	8	10	12	13	14	15	16	17	18	19	20	21	22
0 00	O=PS	0°2′	0°08′	0°18′	0°32′	0°50′	1°12′	1°24.5′	1°38′	1°52.5′	2°08′	2°24.5′	2°42′	3°00.5′	3°20′	3°41.5′	4°02′
2°00	2		0°08′	0°20′	0°36′	0°56′	1°20′	1°33.5′	1°48′	2°03.5′	2°20′	2°37.5′	2°56′	3°15.5′	3°36′	3°57.5′	4°20′
4°00	4	0°4′		0°14′	0°32′	0°54′	1°20′	1°34.5′	1°50′	2°06.5′	2°24′	2°42.5′	3°02′	3°22.5′	3°44′	4°06.5′	4°30′
6°00	6	0°16′	0°10′		0°20′	0°44′	1°12′	1°27.5′	1°44′	2°01.5′	2°20′	2°39.5′	3°00′	3°21.5′	3°44′	4°07.5′	4°32′
8°00	8	0°36′	0°28′	0°16′		0°26′	0°56′	1°12.5′	1°30′	1°48.5′	2°08′	2°28.5′	2°50′	3°12.5′	3°36′	4°00.5′	4°26′
10°00	10	1°04′	0°54′	0°40′	0°22′		0°36′	0°49.5′	1°08′	1°27.5′	1°48′	2°09.5′	2°32′	2°55.5′	3°20′	3°45.5′	4°12′
12°00	12	1°40′	1°28′	1°12′	0°52′	0°28′		0°18.5′	0°38′	0°57.5′	1°20′	1°42.5′	2°06′	2°30.5′	2°56′	3°22.5′	3°50′
13°00	13	2°24′	2°10′	1°52′	1°30′	1°04′	0°34′		0°20′	0°41′	1°08′	1°32.5′	1°58′	2°25′	2°50′	3°18.5′	3°48′
14°00	14	2°49′	2°34′	2°15′	1°52′	1°25′	0°54′	0°19′		0°21.5′	0°44′	1°07.5′	1°32′	1°57.5′	2°24′	2°51.5′	3°20′
15°00	15	3°16′	3°00′	2°40′	2°16′	1°48′	1°16′	0°40′	0°22′		0°23′	0°47′	1°12′	1°38.5′	2°05′	2°33′	3°02′
16°00	16	3°45′	3°28′	3°07′	2°42′	2°13′	1°40′	1°03′	0°43′		0°23.5′	0°24.5′	0°50′	1°16.5′	1°44′	2°12.5′	2°42′
17°00	17	4°16′	3°58′	3°36′	3°10′	2°40′	2°06′	1°28′	1°07.5′	0°46′			0°25′	0°52′	1°21′	1°50′	2°20′
18°00	18	4°49′	4°30′	4°07′	3°40′	3°09′	2°34′	1°55′	1°34′	1°12′	0°49′			0°27.5′	0°56′	1°25.5′	1°56′
19°00	19	5°24′	5°04′	4°40′	4°12′	3°40′	3°04′	2°24′	2°02.5′	1°40′	1°16.5′	0°52′	0°26′		0°29′	0°59′	1°30′
20°00	20	6°01′	5°40′	5°15′	4°46′	4°13′	3°36′	2°55′	2°33′	2°10′	1°46′	1°21′	0°55′	0°28′		0°30.5′	1°02′
21°00	21	6°40′	6°18′	5°52′	5°22′	4°48′	4°10′	3°28′	3°05.5′	2°40′	2°17.5′	1°52′	1°25.5′	0°58′	0°29.5′		0°32′
22°00	22	7°21′	6°58′	6°31′	6°00′	5°25′	4°46′	4°03′	3°40′	3°16′	2°51′	2°25′	1°58′	1°30′	1°01′	0°31′	
		8°04′	7°40′	7°12′	6°40′	6°04′	5°24′	4°40′	4°16.5′	3°52′	3°26′	3°00′	2°32.5′	2°04′	1°34.5′	1°04′	0°32.5′

N	Δ	C	Co-ordinates	Long Chord	R	D
2	06′	5.00	.01	10.00	2864.93	2°00′
4	24′	10.00	.05	20.00	1432.69	4°00′
6	54′	15.00	.16	30.00	955.37	6°00′
8	1°36′	19.99	.37	40.00	716.78	8°00′
10	2°30′	24.97	.73	49.99	573.69	10°00′
12	3°36′	29.94	1.26	59.98	478.34	12°00′
13	4°13.5′	32.43	1.60	64.97	441.68	12°09′
14	4°54′	34.91	1.99	69.95	410.28	13°59′
15	5°37.5′	37.38	2.45	74.93	383.06	14°59′
16	6°24′	39.86	2.98	79.91	359.26	15°58′
17	7°13.5′	42.33	3.57	84.87	338.27	16°57′
18	8°06′	44.19	4.24	89.83	319.62	17°56′
19	9°01.5′	47.26	4.98	94.78	302.94	18°55′
20	10°00′	49.42	5.81	99.72	287.94	19°54′
21	11°01.5′	52.17	6.72	104.64	274.37	20°52′
22	12°06′	54.62	7.72	109.55	262.04	21°50′

TABLE 2

Table of Deflections — **10 Foot Sub Chord**

D	Transit	O=PS	2	4	6	8	10	12	13	14	15	16	17	18	19	20	21	22
0°00		O=PS	0°04′	0°10′	0°36′	1°04′	1°40′	2°24′	2°49′	3°16′	3°45′	4°16′	4°49′	5°24′	6°01′	6°40′	7°21′	8°04′
2°00		2	0°08′	0°16′	0°40′	1°12′	1°52	2°40′	3°07′	3°36′	4°07′	4°40′	5°15′	5°52′	6°31′	7°12	7°55′	8°40′
4°00		4	0°32′	0°20′	0°28′	1°04′	1°48′	2°40′	3°09′	3°40′	4°13′	4°48′	5°25′	6°04′	6°45′	7°28′	8°13′	9°00′
6°00		6	0°56′	0°32′		0°40′	1°28′	2°24′	2°55′	3°28′	4°03′	4°40′	5°19′	6°00′	6°43′	7°28′	8°15′	9°04′
8°00		8	2°08′	1°48′	1°20′	0°56′	0°52′	1°52′	2°25′	3°00′	3°37′	4°16′	4°57′	5°40′	6°25′	7°12′	8°01′	8°52′
10°00		10	3°20′	2°56′	2°24′	1°44′	0°56′	1°04′	1°39′	2°16′	2°55′	3°36′	4°19′	5°04′	5°51′	6°40′	7°00′	8°24′
12°00		12	4°48′	4°20′	3°44′	3°00′	2°08′	1°48′	0°38′	1°16′	1°57′	2°40′	3°25′	4°12′	5°01′	5°52′	6°45′	7°40′
13°00		13	5°38′	5°08′	4°30′	3°44′	2°50′	1°48′	0°38′	0°40′	1°22′	2°06′	2°52′	3°40′	4°30′	5°22′	6°16′	7°12′
14°00		14	6°32′	6°00′	5°20′	4°32′	3°36′	2°32′	1°20′	0°41′	0°43′	1°28′	2°15′	3°04′	3°55′	4°48′	5°43′	6°40′
15°00		15	7°30′	6°58′	6°14′	5°24′	4°26′	3°20′	2°06′	0°44′	0°46′	1°34′	2°24′	3°16′	4°10′	5°06′	6°04′	
16°00		16	8°32′	7°56′	7°12′	6°20′	5°20′	4°12′	2°56′	2°15′	1°32′	0°47′	0°49′	1°40′	2°33′	3°28′	4°25′	5°24′
17°00		17	9°38′	9°00′	8°14′	7°20′	6°18′	5°08′	3°50′	3°08′	2°24′	1°38′	0°53′	0°52′	1°46′	2°42′	3°40′	4°40′
18°00		18	10°48′	10°08′	9°20′	8°24′	7°20′	6°08′	4°48′	4°05′	3°20′	2°33′	1°44′	0°55′	1°52′	2°51′	3°52′	
19°00		19	12°02′	11°20′	10°30′	9°32′	8°26′	7°12′	5°50′	5°06′	4°20′	3°32′	2°42′	1°50′	0°58′	1°58′	3°00′	
20°00		20	13°20′	12°38′	11°44′	10°44′	9°36′	8°20′	6°56′	6°11′	5°24′	4°35′	3°44′	2°51′	1°56′	0°59′	2°04′	
21°00		21	14°42′	13°56′	13°02′	12°00′	10°50′	9°32′	8°06′	7°20′	6°32′	5°42′	4°50′	3°56′	3°00′	2°02	1°02′	
22°00		22	16°08′	15°20′	14°24′	13°20′	12°08′	10°48′	9°20′	8°33′	7°44′	6°53′	6°00′	5°05′	4°08′	3°09′	2°08′	1°05′

N	Δ	C	Co-ordinates	Long Chord	S	R′	R	D
2	0°12′	10.00	.02	20.00	.01	2864.94	2864.93	2°00′
4	0°48′	20.00	.19	40.00	.05	1432.74	1432.69	4°00′
6	1°48′	30.00	.63	60.00	.16	955.58	955.37	6°00′
8	3°12′	39.97	1.49	79.99	.37	717.00	716.78	8°00′
10	5°00′	49.73	9	99.93	.72	574.41	573.69	9°59′
12	7°12′	59.87	5.02	119.82	1.25	479.59	478.34	11°58′
13	8°27′	64.87	6.38	129.74	1.59	443.27	441.68	12°57′
14	9°48′	69.79	7.97	139.62	1.98	412.26	410.28	13°56′
15	11°15′	74.74	9.80	149.47	2.44	385.51	382.06	14°54′
16	12°48′	79.67	11.88	159.26	2.95	362.22	359.26	15°52′
17	14°19′	84.59	14.24	169.00	3.54	341.81	338.27	16°49′
18	16°27′	89.50	16.89	178.67	4.20	323.82	319.62	17°46′
19	18°03′	94.39	19.84	188.26	4.93	307.87	302.94	18°42′
20	20°00′	99.27	23.11	197.75	5.75	293.69	287.94	19°36′
21	22°03′	104.13	26.72	207.13	6.65	281.02	274.37	20°30′
22	24°12′	108.98	30.67	216.39	7.64	269.68	262.04	21°25′

* Cal. Jour. Tech.

† See Vol. III, series 1, Journal de Physique, 1874.

‡‡ The degree of curve is defined as follows: In an N-degree curve a chord of 100 feet subtends a central angle of N degrees. The radius of an N-degree curve is given by the formula $R = \frac{50}{\sin\frac{1}{2}N^\circ}$. Taking the angle of the sine we see that the radii of the two circles are approximately inversely proportional to their degree of curve.

and similarly

$$y = \frac{1}{\sqrt{K}}\left(\frac{\triangle^{\frac{3}{2}}}{3} - \frac{\triangle^{\frac{7}{2}}}{7.3!} + \frac{\triangle^{\frac{11}{2}}}{11.5!} - \frac{\triangle^{\frac{15}{2}}}{15.7!} + \ldots\right) \quad (4)$$

6. In actual practice $\triangle$ is seldom greater than half a radian or 27°. For values of $\triangle$ of this order we have approximately

$$x = \frac{\triangle^{\frac{1}{2}}}{\sqrt{K}}$$

$$y = \frac{\triangle^{\frac{3}{2}}}{3\sqrt{K}}$$

so that

$$K x^3 \sqrt{K} = 3 y \sqrt{K} \text{ or}$$

$$y = \frac{K}{3} x^3$$

and in actual practice the curve resembles a cubic parabola. A beautiful sketch of the curve is given on page 13 of the Journal de Physique, Vol. III, 1st series.

7. With the same approximation as in the preceding paragraph

$$\frac{y}{x} = \frac{\triangle}{3}$$

Now $\frac{y}{x}$ is the tangent of the angle which the long chord from (xy) makes with the axis of x. For values of this angle which occur in ordinary practice we may call this the angle itself instead of the tangent, and we may employ $\frac{1}{3}\triangle$ as the angle of deflection from P. S. to set the point (x, y).

8. Having selected a value of c, the length of the subchord, K must be determined so as to make the radius of curvature of the spiral equal to 5730 feet at the end of the first subchord (¶3). Expressing all lengths in terms of c, we have at the end of the first chord

$$l = 1$$

$$\rho = \frac{5730}{c}$$

and since by (1) $\rho = \frac{1}{2Kl}$ we have

$$\frac{5730}{c} = \frac{1}{2K}$$

or

$$K = \frac{c}{11{,}460}$$

Now K ¶4 is the change of direction effected by a unit length of the spiral and for field work is more conveniently expressed in angular measure. Therefore

$$K \text{ (in minutes)} = \frac{c}{11{,}460} \cdot \frac{180}{\pi} \cdot 60 = {}^{3}_{10}\, c \text{ (approximately).} \quad (5)$$

Therefore the change in direction effected by the first chord length of the spiral is in minutes approximately equal to three-tenths of the length of the subchord in feet.

9. By using equation (2) this last statement may be generalized as follows: The change of direction effected by n subchords of the spiral is in minutes equal to n^2 times three-tenths of the length of the subchord in feet, or in symbols

$$\triangle_n = {}^{3}_{10}\, c\, n^2. \quad (6)$$

10. Using the result of ¶7, we may state the simple rule for calculating the deflection from P. S. to the end of the nth subchord. The deflection in minutes from the tangent at P. S. to set the end of the nth subchord is n^2 times one-tenth of the length of the subchord in feet, or in symbols

$$d_n = {}^{1}_{10}\, c\, n^2. \quad (7)$$

11. PROBLEM—To compute the deflection from the tangent at any point on the spiral to set any other point.

Taking axes as in ¶5 let the point at which the instrument is set up be (x_n, y_n), and the point to be set (x_m, y_m). If θ be the angle which the chord joining the two points makes with the axis of x, then

$$\tan\theta = \frac{y_m - y_n}{x_m - x_n}$$

and using the approximate values of x and y given in ¶6 and taking θ for $\tan\theta$

$$\theta = \frac{1}{3}\frac{\triangle_m^{\frac{3}{2}} - \triangle_n^{\frac{3}{2}}}{\triangle_m^{\frac{1}{2}} - \triangle_n^{\frac{1}{2}}}$$

or using formula (6) of ¶9, $\triangle_m = {}^{3}_{10}\, c\, m^2$, and $\triangle_n = {}^{3}_{10}\, c\, n^2$

$$\theta = {}^{1}_{10}\, c\,(m^2 + m\,n + n^2).$$

Now the desired deflection is $\theta - \triangle_n$. We have then

$$\theta - \triangle_n = d_{n\,m} = {}^{1}_{10}\, c\,(m^2 + m\,n + n^2) - {}^{3}_{10}\, c\, n^2$$

$$d_{n\,m} = {}^{1}_{10}\, c\,(2\,n + m)\,(m - n). \quad (8)$$

which is therefore the required deflection in minutes from the tangent at the nth chord point to set the mth. The formula serves to run the curve backward or forward from any point and may be used for fractional values of m or n. The approximation is no closer than the formula of ¶6 upon which it is based.

12. The co-ordinates x, y of a point on the spiral may be computed from the infinite series of ¶5. A more convenient method, however, is by latitudes and departures, taking P. S. as the initial point and the tangent at P. S. as the meridian and the subchords as the courses. The angle which any chord makes with the meridian is easily computed from the value of θ given in ¶11, putting $n = m - 1$, to be $\frac{c}{10}(3m^2 - 3m + 1)$. Call this

Table of Deflections

TABLE 3

15 Foot Sub Chord

D	Transit O=PS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0°00	O=PS	0°01.5′	0°06′	0°13′	0°24′	0°37.5′	0°54′	1°13.5′	1°36′	2°01.5′	2°30′	3°01.5′	3°36′	4°13.5′	4°54′	5°37.5′	6°24′
1°00	1	0°03′	0°06′	0°15′	0°27′	0°42′	1°00′	1°21′	1°45′	2°12′	2°32′	3°15′	3°51′	4°30′	5°12′	5°57′	6°45′
2°00	2	0°12′	0°07.5′	0°10.5′	0°24′	0°40.5′	1°00′	1°22.5′	1°48′	2°16.5′	2°48′	3°22.5′	4°00′	4°40.5′	5°24′	6°10.5′	7°00′
3°00	3	0°27′	0°21′	0°12′	0°15′	0°33′	0°54′	1°18′	1°45′	2°15′	2°48′	3°24′	4°03′	4°45′	5°30′	6°28′	7°09′
4°00	4	0°48′	0°40.5′	0°30′	0°19.5′	0°19.5′	0°42′	1°07.5′	1°36′	2°07.5′	2°42′	3°18.5′	4°00′	4°43.5′	5°30′	6°19.5′	7°22′
5°00	5	1°15′	1°06′	0°54′	0°39′	0°21′	0°24′	0°51′	1°21′	1°54′	2°30′	3°09′	3°51′	4°36′	5°24′	6°15′	7°09′
6°00	6	1°43′	1°37.5′	1°24′	1°07.5′	0°48′	0°25.5′	0°28.5′	1°00′	1°34.5′	2°12′	2°52.5′	3°36′	4°22.5′	5°12′	6°04.5′	7°00′
7°00	7	2°27′	2°15′	2°00′	1°42′	1°21′	0°57′	0°30′	0°33′	1°09′	1°48′	2°30′	3°15′	4°03′	4°54′	5°48′	6°45′
8°00	8	3°12′	2°58.6′	2°42′	2°22.5′	2°00′	1°34.5′	1°06′	0°34.5′	0°37.5′	1°18′	2°01.5′	2°48′	3°37.5′	4°30′	5°25.5′	6°24′
9°00	9	4°03′	3°48′	3°30′	3°09′	2°45′	2°18′	1°48′	1°15′	0°39′	0°42′	1°27′	2°15′	3°06′	4°00′	4°57′	5°57′
10°00	10	5°00′	4°43.5′	4°24′	4°01.5′	3°36′	3°07.5′	2°36′	2°01.5′	1°24′	0°43	0°46.5′	1°36′	2°28.5′	3°24′	4°22.5′	5°24′
11°00	11	6°03′	5°45′	5°24′	5°00′	4°33′	4°03′	3°30′	2°54′	2°15′	1°33′		0°51′	1°45′	2°42′	3°42′	4°45′
12°00	12	7°12′	6°52.5′	6°30′	6°04.5′	5°36′	5°04′	4°30′	3°52.5′	3°12′	2°28.5′	1°49′	0°52.5′		0°55.5′	1°04′	2°55.5′	4°00′
13°00	13	8°27′	8°06′	7°42′	7°15′	6°45′	6°12′	5°36′	4°57′	4°15′	3°30′	2°42′	1°51′	0°57′		0°03′	2°03′	3°09′
14°00	14	9°48′	9°25.5′	9°00′	8°31.5′	8°00′	7°25.5′	6°48′	6°07.5′	5°24′	4°37.5′	3°48′	2°55.5′	2°00′	1°01.5′	1°06′	1°04.5′	2°12′
15°00	15	11°15′	10°51′	10°24′	9°54′	9°21′	8°45′	8°06′	7°24′	6°39′	5°51′	5°00′	4°06′	3°09′	2°09′	1°06′		1°09′
16°00	16	12°48′	12°28.5′	11°54′	11°22.5′	10°58′	10°10.5′	9°30′	8°46.5′	8°00′	7°10.5′	6°18′	5°22.5′	4°24′	3°22.5′	2°18′	1°10.5′	

N	Δ	C	Co-ordinates		Long Chord	S	R	R′	D
1	0°04.5′	7.50	.01	15.00	15.00	.00	5729.65	5729.65	1°00′
2	0°18.0′	15.00	.05	30.00	30.00	.01	2864.93	2864.94	2°00′
3	0°40.5′	22.50	.18	45.00	45.00	.04	1910.08	1910.12	3°00′
4	1°12.0′	30.00	.42	60.00	60.00	.11	1432.69	1432.80	4°00′
5	1°52.5′	37.50	.82	74.99	75.00	.20	1146.28	1146.48	5°00′
6	2°42.0′	44.98	1.41	84.98	90.00	.35	955.37	955.72	6°00′
7	3°40.5′	52.46	2.24	104.96	104.99	.56	819.02	819.58	7°00′
8	4°48.0′	59.94	3.35	119.92	119.97	.84	716.78	717.62	7°59′
9	6°04.5′	67.41	4.77	134.85	134.95	1.19	637.27	638.47	8°59
10	7°30.0′	74.87	6.54	149.75	149.93	1.63	573.69	575.32	9°58′
11	9°04.5′	82.31	8.70	164.59	164.86	2.17	521.67	523.84	10°57′
12	10°48.0′	89.73	11.28	179.36	179.77	2.88	478.34	481.05	11°56′
13	12°40.5′	97.13	14.32	194.05	194.65	3.56	441.68	445.24	12°54′
14	14°42.0′	104.52	17.88	208.63	209.50	4.45	410.28	414.73	13°51
15	16°52.5′	111.86	21.95	223.06	224.09	5.46	383.06	388.53	14°47′
16	19°12.0′	119.18	26.60	237.33	239.01	6.58	369.26	365.85	15°43′

Table of Deflections

TABLE 4

20 Foot Sub Chord

D	Transit O	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0°00	O=PS	0°02′	0°08′	0°18′	0°32′	0°50′	1°12′	1°38′	2°08′	2°42′	3°20′	4°02′	4°48′	5°38′	6°32′	7°30′	8°32′
1°00	1	04′	0°08′	0°20′	0°36′	0°56′	1°20′	1°48′	2°25′	2°56′	3°36′	4°20′	5°08′	6°00′	6°56′	7°56′	9°00′
2°00	2	0°16′	0°28′	0°16′	0°32′	0°54′	1°20′	1°50′	2°24′	3°02′	3°44′	4°30′	5°20′	6°14′	7°12′	8°14′	9°20′
3°00	3	0°36′	0°54′	0°40′	0°20′	0°44′	1°12′	1°44′	2°20′	3°00′	3°44′	4°32′	5°24′	6°20′	7°20′	8°24′	9°32′
4°00	4	1°04′	0°54′	0°40′	0°22′	0°26′	0°56′	1°30′	2°08′	2°50′	3°36′	4°26′	5°20′	6°18′	7°20′	8°26′	9°36′
5°00	5	1°40′	1°28′	1°12′	0°28′	0°32′	1°08′	1°48′	2°32′	3°20′	4°12′	5°08′	6°08′	7°12′	8°20′	9°32′	
6°00	6	2°24′	2°10′	1°52′	1°30′	1°04′	0°38′	1°20′	2°06′	2°56′	3°50′	4°48′	5°50′	6°56′	8°06′	9°20′	
7°00	7	3°16′	3°00′	2°40′	2°16′	1°48′	1°16′	0°40′	0°44′	1°32′	2°24′	3°20′	4°20′	5°24′	6°32′	7°44′	9°00′
8°00	8	4°16′	3°58′	3°36′	3°10′	2°40′	2°06′	1°28′	0°46′	0°50′	1°44′	2°42′	3°44′	4°50′	6°00′	7°14′	8°32′
9°00	9	5°24′	5°04′	4°40′	4°12′	3°40′	3°04′	2°24′	1°40′	0°62′	0°56′	1°56′	3°00′	4°08′	5°20′	6°36′	7°56′
10°00	10	6°40′	6°18′	5°52′	5°22′	4°48′	4°10′	3°29′	2°42′	1°52′	0°58′	1°02′	2°08′	3°18′	4°32′	5°50′	7°12′
11°00	11	8°04′	7°40′	7°12′	6°40′	6°04′	5°24′	4°40′	3°52′	3°00′	2°04′	1°04′	1°08′	2°20′	3°36′	4°56′	6°20′
12°00	12	9°36′	9°10′	8°40′	8°06′	7°28′	6°46′	6°00′	5°10′	4°16′	3°18′	2°16′	1°10′	1°14′	2°32′	3°54′	5°20′
13°00	13	11°16′	10°48′	10°16′	9°40′	9°00′	8°16′	7°28′	6°36′	5°40′	4°40′	3°36′	2°28′	1°16′	1°20′	2°44′	4°12′
14°00	14	13°04′	12°34′	12°00′	11°22′	10°40′	9°54′	9°04′	8°10′	7°12′	6°10′	5°04′	3°54′	2°40′	1°22′	1°26′	2°56′
15°00	15	15°00′	14°28′	13°52′	13°12′	12°28′	11°40′	10°48′	9°52′	8°52′	7°48′	6°40′	5°28′	4°12′	2°52′	1°28′	1°32′
16°00	16	17°04′	16°30′	15°52′	15°10′	14°24′	13°34′	12°40′	11°42′	10°40′	9°34′	8°24′	7°10′	5°52′	4°30′	3°04′	1°34′

N	Δ	C	Co-ordinates		Long Chord	S	R	R′	D
1	0°06′	10.00	.01	20.00	20.00	.00	5729.65	5729.65	1°00′
2	0°24′	20.00	.09	40.00	40.00	.02	2864.93	2864.95	2°00′
3	0°54′	30.00	.31	60.00	60.00	.08	1910.08	1910.16	3°00′
4	1°36′	39.99	.74	79.99	80.00	.19	1432.69	1437.88	4°00′
5	2°30′	49.98	1.45	99.98	100.00	.36	1146.28	1146.64	5°00′
6	3°36′	59.96	2.51	119.95	119.98	.63	955.37	956.00	6°00′
7	4°54′	69.94	3.99	139.90	139.95	1.00	819.02	820.02	6°59′
8	6°24′	79.90	5.95	159.80	159.87	1.48	716.78	718.26	7°59′
9	8°06′	89.85	8.47	179.64	179.79	2.11	637.27	639.39	8°58′
10	10°00′	99.78	11.61	199.40	199.69	2.89	573.69	576.58	9°57′
11	12°06′	109.68	15.44	219.03	219.43	3.85	521.67	525.52	10°55′
12	14°24′	119.53	20.01	238.49	239.20	4.98	478.34	483.32	11°53′
13	16°54′	129.36	25.40	257.76	258.89	6.33	441.68	448.41	12°49′
14	19°36′	139.12	31.66	276.75	278.40	7.89	410.28	418.17	13°44′
15	22°30′	148.83	38.84	295.42	297.74	9.68	383.06	392.75	14°38′
16	25°36′	158.45	46.98	313.68	316.90	11.71	359.26	370.98	15°30′

θ_m. Calculate θ_m from m = 1 up as far as the point x, y, and take out of the tables the sine and cosine of each angle. Then

$$\left.\begin{aligned} x &= c \sum_m \cos \theta_m \\ y &= c \sum_m \sin \theta_m \end{aligned}\right\} \quad (9)$$

As an illustration of the closeness of the approximation in using tbis method we may compute the co-ordinates of the extremity of 200 feet of a 10-foot subchord spiral. The results are x = 197.75 and y = 23.11. By actual calculation, using the series of §5, the co-ordinates are found to be x = 197.58 and y = 23.07. Tables have been computed by Mr. C. L. Crandall giving the values of $\frac{x}{l}$ and $\frac{y}{l}$ for various values of Δ using the series of §5.

Table of Deflections — TABLE 5 — 25 Foot Sub Chord

D	O=PS	1	2	3	4	5	6	7	8	9	10	11	12
0°00		0°02.5′	0°01′	0°22.5′	0°40′	1°02.5′	1°30′	2°02.5′	2°40′	3°22.5′	4°10′	5°02.5′	6°00′
1°00	1	0°05′	0°01′	0°25′	0°45′	1°10′	1°40′	2°15′	2°85′	3°40′	4°20′	5°25′	6°25′
2°00	2	0°20′		0°17.5′	0°40′	1°07.5′	1°40′	2°17.5′	3°00′	3°47.5′	4°40′	5°37.5′	6°40′
3°00	3	0°45′	0°20′		0°25′	0°55′	1°30′	2°10′	2°55′	3°45′	4°40′	5°40′	6°45′
4°00	4	1°20′	0°50′	0°27.5′		0°32.5′	1°10′	1°52.5′	2°40′	3°32.5′	4°30′	5°32.5′	6°40′
5°00	5	2°05′	1°30′	1°05′	0°35′		0°40′	1°25′	2°15′	3°10′	4°10′	5°15′	6°25′
6°00	6	3°00′	2°20′	1°52.5′	1°20′	0°42.5′		0°47.5′	1°40′	2°37.5′	3°40′	4°47.5′	6°00′
7°00	7	4°05′	3°20′	2°50′	2°15′	1°85′	0°50′		0°55′	1°55′	3°00′	4°10′	5°25′
8°00	8	5°20′	4°30′	3°57.5′	3°20′	2°37.5′	1°50′	0°57.5′		1°02.5′	2°10′	3°22.5′	4°40′
9°00	9	6°45′	5°50′	5°15′	4°35′	3°50′	3°00′	2°05′	1°05′		1°10′	2°25′	3°45′
10°00	10	8°20′	7°20′	6°42.5′	6°00′	5°12.5′	4°20′	3°22.5′	2°20′	1°12.5′		1°17.5′	2°40′
11°00	11	10°05′	9°00′	8°20′	7°35′	6°45′	5°50′	4°50′	3°45′	2°35′	1°20′		1°25′
12°00	12	12°00′	10°50′	10°07.5′	9°20′	8°27.5′	7°30′	6°27.5′	5°20′	4°07.5′	2°50′	1°27.5′	

N	Δ	C	Co-ordinates	Long Chord	S	R	R′	D
1	0°07.5′	12.50	.02	25.00	.00	5729.65	5729.65	1°00′
2	0°30′	25.00	.15	50.00	.04	2364.93	2864.97	2°00′
3	1°07.5′	37.50	.49	75.00	.12	1910.08	1910.20	3°00′
4	2°00′	49.99	1.16	99.99	.29	1432.69	1432.98	4°00′
5	3°07.5′	62.47	2.27	124.96	.57	1146.28	1146.85	5°00′
6	4°30′	74.95	3.93	149.91	.98	955.37	956.35	6°00′
7	6°07.5′	87.42	6.23	174.81	1.55	819.02	820.57	6°59′
8	8°00′	99.87	9.30	199.63	2.32	716.78	719.10	7°58′
9	10°07.5′	112.30	13.23	224.33	3.31	637.27	640.59	8°57′
10	12°30′	124.70	18.13	248.87	4.53	573.64	578.22	9°55′
11	15°07.5′	137.06	24.10	273.18	6.03	521.67	527.70	10°52′
12	18°00′	149.37	31.23	297.20	7.82	478.34	486.16	11°48′

Table of Deflections — TABLE 6 — 30 Foot Sub Chord

D	Transit	O=PS	1	2	3	4	5	6	7	8	9	10	11	12
0°00		O=PS	03′	12′	27′	48′	1°15′	1°48′	2°27′	3°12′	4°03′	5°00′	6°03′	7°12′
1°00	1													
2°00	2		15′	42′	1°21′	2°00′	2°42′	3°30′	4°24′	5°24′	6°30′	7°42′		
3°00	3		24′	54′	2°12′	2°48′	3°36′	4°33′	5°36′	6°45′	8°00′			
4°00	4		1°36′	1°21′	3°15′	3°48′	4°45′	5°57′	7°12′	8°36′				
5°00	5		2°30′	2°12′	4°24′	4°48′	5°57′	7°12′	8°48′					
6°00	6		3°36′	3°15′	5°57′	5°24′	7°12′	8°48′						
7°00	7		4°54′	4°30′	7°36′	6°00′	8°48′							
8°00	8		6°24′	5°57′	9°27′	7°00′								
9°00	9		8°06′	7°36′	11°30′	8°48′								
10°00	10		10°00′	9°27′	13°45′									
11°00	11		12°06′	11°30′										
12°00	12		14°24′	13°45′										

N	Δ	C	Co-ordinates	Long Chord	S	R	R′	D
1	09′	15.00	.03	30.00	.01	5729.65	5729.66	1°00′
2	36′	30.00	.21	60.00	.05	2864.93	2864.98	2°00′
3	1°21′	45.00	.71	90.00	.18	1910.08	1910.26	3°00′
4	2°24′	59.99	1.67	119.98	.41	1432.69	1433.10	4°00′
5	3°45′	74.97	3.27	149.94	.82	1146.28	1147.10	5°00′
6	5°24′	89.93	5.65	179.84	1.41	955.37	956.78	5°59′
7	7°21′	104.88	8.97	209.66	2.24	819.02	821.26	6°59′
8	9°36′	119.79	13.38	239.33	3.84	716.78	720.12	7°58′
9	12°09′	134.67	19.02	268.80	4.75	637.27	642.03	8°56′
10	15°00′	149.48	26.05	297.96	6.50	573.69	580.19	9°53′
11	18°09′	164.30	34.64	326.80	8.68	521.67	530.35	10°49′
12	21°36′	179.04	44.86	355.13	11.27	478.34	489.61	11°43′

13. THEOREM.—The change of direction effected by a spiral of length l isequal to the change of direction effected by a circular arc of length $\frac{l}{2}$ whose radius is the final radius of curvature of the spiral.

Tbe change of direction effected by tbe circle is $\frac{l}{2\rho}$ in circular measure. But since by (1) $\rho = \frac{1}{2\,K\,l}$ this becomes $K\,l^2$ whicb by (2) is equal to Δ.

14. From the theorem of §13 it follows that if a circular arc tangent to the spiral at P. C. and a radius equal to the radius of curvature of the spiral at P. C. be run backward toward P. S. its direction will become parallel to the tangent at P. S. when it reaches a point opposite the mid-point of the spiral. The distance between the tangent to this circular arc at its extremity and the tangent at P. S. is called the shift. Thus, in the figure, the shift is F G.

15. PROBLEM.—To calculate tbe shift.

Let R be radius at P. C. Then in the figure, if S is the shift,

$$\begin{aligned} S &= GF = GK - FK \\ &= y - R \text{ vers } \Delta. \end{aligned} \quad (10)$$

16. The point G in the figure is clearly the P. C. of a circular curve with radius OG = R′ = R + S and center O joining the two tangents T T′. The distance IG is easily seen to be

$$IG = \frac{OG}{\tan \frac{1}{2} I}$$

where I is the angle between T and T′. To calculate the distance from I to P. S. we add to IG the distance G to P. S. which call c. We have

$$c = x - GH = x - R \sin \Delta. \quad (11$$

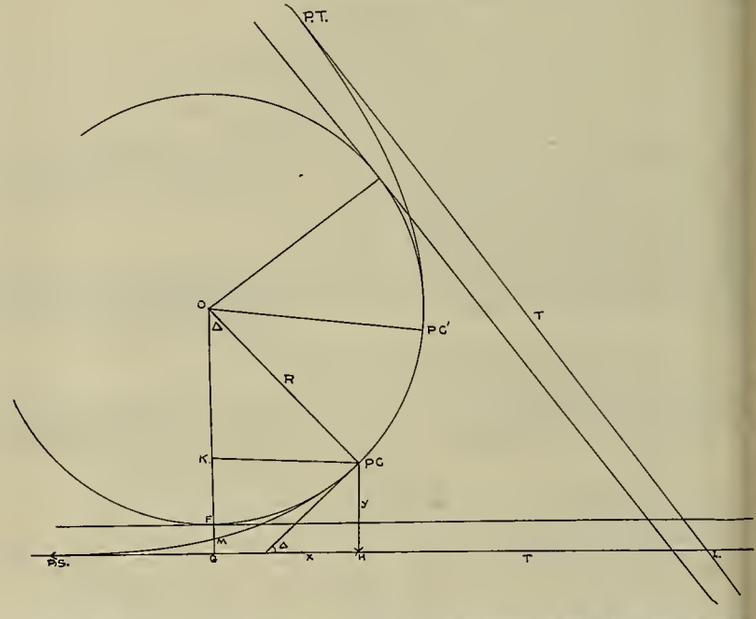
17. All the formulæ employed in calculating the quantities in the tables have now been obtained. The use of the formulæ may be illustrated by computing some of the quantities in table 4, where tbe subchord c is 20 feet.

With transit at tbe eighth subchord, point to calculate the deflections to the other points. Using formula (8) we have, m = 8 and c = 20,

$$d_{n\,m} = \frac{20}{10}(16 + m)(m - 8)$$

or

$$d_{n\,m} = 2(16 + m)(m - 8).$$



Putting m = 0, 1, 2, 3, ... 16, we get the deflections in minutes 256, 238, 216, 190, 160, 126, 88, 46, 0, 50, 104, 162, 224, 290, 360, 434, 512, wbich when reduced to degrees and minutes correspond to the line opposite "Transit at 8th cbord point." These deflections may be calculated easily by tbe method of differences.

To calculate the column headed Δ use formula (6)

$$\Delta_n = \frac{3}{10}\,c\,n^2$$

whicb in this instance becomes

$$\Delta_n = 6\,n^2.$$

Give n the values 1, 2, ... and we get in minutes 6, 24, 54 ....

To calculate the columns headed co-ordinates, we use formulæ (9)

$$\begin{aligned} x &= 20 \sum_m \cos \theta_m \\ y &= 20 \sum_m \sin \theta_m \end{aligned}$$

where $\theta = \frac{c}{10}(3\,m^2 - 3\,m + 1) = 2(3\,m^2 - 3\,m + 1)$. Giving successive values to m we have

$\theta_1 = 2'$	$\cos \theta_1 = 1.00000$	$\sin \theta_1 = .00058$
$\theta_2 = 14'$	$\cos \theta_2 = .99999$	$\sin \theta_2 = .00407$
$\theta_3 = 38'$	$\cos \theta_3 = .99994$	$\sin \theta_3 = 01076$
$\theta_4 = 74'$	$\cos \theta_4 = .99977$	$\sin \theta_4 = .02152$
$\theta_5 = 122'$	$\cos \theta_5 = .99937$	$\sin \theta_5 = .03548$

Adding these cosines and sines, we have successively

$\Sigma \cos \theta_m$	$\Sigma \sin \theta_m$
1.00000	.00058
1.99999	.00465
2.99993	.01541
3.99970	.03693
4.99907	.07241

The values of x and y are then obtained by multiplying these by 20. They are

20	01
40	.09
60	.31
79.99	.74
99.98	1.45

The "long chord" or distance from the point x, y to P. S. is $\sqrt{x^2 + y^2}$
The shift S is given by formula (10)

$$S = y - R \text{ vers } \Delta.$$

Thus for a 5° curve the radius $R = \frac{50}{\sin 2° 30'} = 1146.28$, $\Delta = 2° 30'$ and $y = 1.45$

hence $S = 36.$

The value of c for a 5° curve is calculated by the formula (11)

$$c = x - R \sin \Delta.$$

As before $\Delta = 2° 30'$, $R = 1146.28$ and $x = 99.98$

hence $c = 49.98.$

The values of R′ are calculated from the formula $R' = R + S$.

18. To illustrate the problem most frequently met with, supposed a spiralized 5° curve to be located between two tangents which intersect at an angle of 40° and that the spiral shall have a subchord of 20 feet. Then the spiral at each end will have five such chords and will be 100 feet long. From table 4

$$R' = 1146.64$$

so that the distance P. I. to G is R′ tan 20° = 417.33. To this we add c = 49.98, giving 467.31 as the distance from P. I. to P. S. This locates P. S. Set up the transit at P. S. and run in the spiral by deflections given in the table as 0° 2′, 0° 8′, 0° 18′, 0° 32′, 0° 50′, 1° 12′, 1° 28′, 1° 40′. This last point is P. T. Set up on P. T. and, sighting on P. S′., deflect outward 0° 50′ to throw transit on tangent.

19. If a spiral with 20 feet subchord is to join a 5° 15′ curve and it is desired that the radius of curvature of the spiral at P. C. shall be more nearly equal to the radius of the circular branch than it is at the fifth subchord, proceed as follows:

Make the number of subchords equal to the degree of the circular branch; namely 5¼. Everything is as above except that the co-ordinates of P. C. have to be computed. This is done by adding to the co-ordinates of the fifth chord point the increments due to the subchord of 5 feet. The angle which the fractional chord makes with the x axis computed by the formula for θ given in ¶11. $\theta = \frac{c}{10}(m^2 + m n + n^2)$. Putting m = 5 and n = 5 + ¼ we find $\theta = 2° 35'$. Therefore the increments of x and y due to the ¼ subchord are 5 cos 2° 35′ and 5 sin 2° 35′. S. C. and R are calculated as before.

Table of Deflections — TABLE 7 — 40 Foot Sub Chord

D	Transit	O=PS	1	2	3	4	5	6	7	8	9	10
0°00	O=PS		0°04′	0°16′	0°36′	1°04′	1°40′	2°24′	3°16′	4°16′	5°24′	6°40′
1°00	1	0°08′		0°16′	0°40′	1°12′	1°52′	2°40′	3°36′	4°40′	5°52′	7°12′
2°00	2	0°32′	0°20′		0°28′	1°04′	1°48′	2°40′	3°40′	4°48′	6°04′	7°28′
3°00	3	1°12′	0°56′	0°32′		0°40′	1°28′	2°24′	3°28′	4°40′	6°00′	7°28′
4°00	4	2°08′	1°48′	1°20′	0°44′		0°52′	1°52′	3°00′	4°16′	5°40′	7°12′
5°00	5	3°20′	2°56′	2°24′	1°44′	0°56′		1°04	2°16′	3°36′	5°04′	6°40′
6°00	6	4°48′	4°20′	3°44′	3°00′	2°08′	1°08′		1°16′	2°40′	4°12′	5°52′
7°00	7	6°32′	6°00′	5°20′	4°32′	3°36′	2°32′	1°20′		1°28′	3°04′	4°48′
8°00	8	8°32′	7°56′	7°12′	6°20′	5°20′	4°12′	2°56′	1°32′		1°40′	3°28′
9°00	9	10°48′	10°08′	9°20′	8°24′	7°20′	6°08′	4°48′	3°20′	1°44′		1°52′
10°00	10	13°20′	12°36′	11°44′	10°44′	9°36′	8°20′	6°56′	5°24′	3°44′	1°56′	

N	Δ	C	Co-ordinates		Long Chord	S	R	R′	D
1	0°12′	20.00	.05	40.00	40.00	.02	5729.64	5729.67	1°00′
2	0°48′	40.00	.37	80.00	80.00	.09	2864.93	2865.02	2°00′
3	1°48′	59.99	1.26	119.99	120.00	.32	1910.08	1910.40	3°00′
4	3°12′	79.98	2.98	159.95	159.98	.75	1432.69	1433.44	4°00′
5	5°00′	99.96	5.82	199.86	199.94	1.46	1146.28	1147.74	5°00′
6	7°12′	119.91	10.04	239.65	239.86	2.51	955.37	957.88	5°59′
7	9°48′	139.85	15.94	279.25	279.70	3.99	819.02	823.01	6°58′
8	12°48′	159.73	23.76	318.53	319.41	5.95	716.78	722.73	7°56′
9	16°12′	179.56	33.78	357.35	358.94	8.48	637.27	645.76	8°53′
10	20°00′	199.30	46.23	395.51	398.21	11.63	573.69	585.32	9°48′

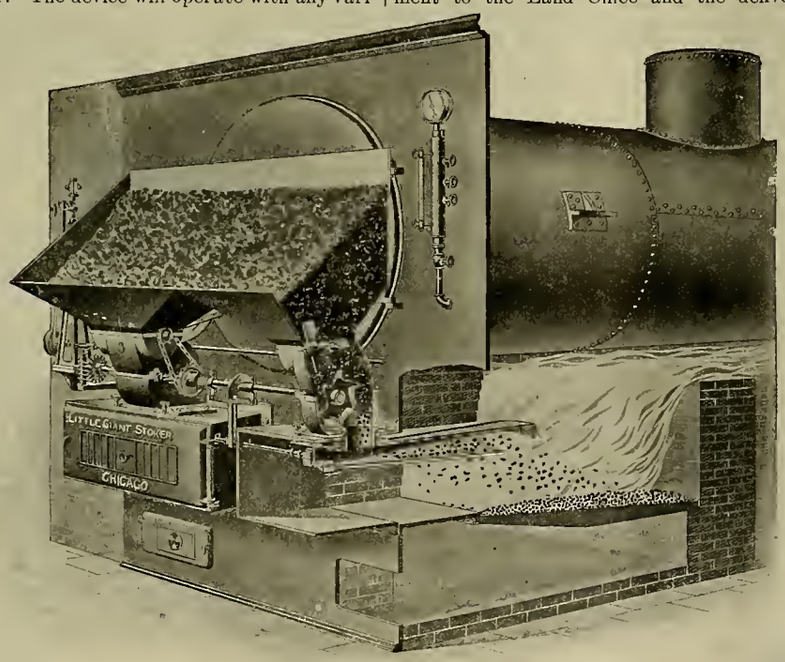
Table of Deflections — 50 Foot Sub Chord

D	Transit	O=PS	1	2	3	4	5	6
0°00′	O=PS		0°05′	0°20′	0°45′	1°20′	2°05′	3°00′
1°00′	1	0°10′		0°20′	0°50′	1°30′	2°20′	3°20′
2°00′	2	0°40′	0°25′		0°35′	1°20′	2°15′	3°20′
3°00′	3	1°30′	1°10′	0°40′		0°50′	1°50′	3°00′
4°00′	4	2°40′	2°15′	1°40′	0°55′		1°05′	2°20′
5°00′	5	4°10′	3°40′	3°00′	2°10′	1°10′		1°20′
6°00′	6	6°00′	5°25′	4°40′	3°45′	2°40′	1°25′	

N	Δ	C	Co-ordinates		Long Chord	S	R	R′	D
1	0°15′	25.00	.07	50.00	50.00	.02	5729.65	5729.66	1°00′
2	1°00′	50.00	.58	100.00	100.00	.15	2864.93	2865.08	2°00′
3	2°15	74.99	1.96	149.98	149.99	.49	1910.08	1910.57	3°00′
4	4°00′	99.97	4.65	199.91	199.97	1.16	1432.69	1433.85	4°00′
5	6°15′	124.94	9.08	249.73	249.89	2.27	1146.28	1148.55	4°59′
6	9°00′	149.87	15.69	299.32	299.73	3.93	955.37	959.30	5°59′

A Mechanical Stoker.

Mechanical firing of coal gives good results as applied to boiler firing. The mechanical stoker illustrated herewith is designed to utilize the slack and cheaper grades of coal ordinarily of so little value to the engineer. The device will operate with any variety of coal, from a size which will conveniently pass through an 1¼-inch screen to the smallest size of slack. The coal, which is first dumped into the hoppers, passes over a revolving cogged wheel, which regulates the flow. It then passes into a slowly oscillating spreader, shown herewith. This spreader moving slowly backwards and forwards distributes the coal evenly, permitting only such a quantity to enter as the conditions may require, and distributing it in such a manner as to cause an even incandescent fire of intense heat.



Mechanical Stoker Designed to Utilize Slack and Cheaper Grades of Coal.

Having but very few wearing parts, all of which are of slow movement and subjected to very little strain, there is practically nothing to wear out. The only part which comes in actual contact with the flames is the spreader, and this can be taken off at will in five or ten minutes. No alteration or damage to boiler front is necessary in attaching the stoker. It is simply bolted on by means of four studs and can be removed if for any reason hand firing should be desired. This device is supplied by Eccles & Smith, 91 Fremont street, San Francisco, Cal.

United States Patents for Mineral Lands.

To the Editor:—I have read in one of your recent issues an interesting piece of information concerning the issuing of patents, to the effect that the assessment work is no more required after the final payment to the Land Office and the delivery of the receipt by said office. This settles a question about which I have heard attorney and surveyor arguing without being able to agree. Now, then, it is manifestly very important for an applicant for a patent to stop as soon as possible the expense of assessment work, mainly when he owns several claims, and it is a fact to be regretted that no one can ever be able to foresee how long it will take before said final payment can be made. The applicant is, of course, willing and able to use all diligence either to survey or correct his survey, but the Surveyor-General's office nearly always requires corrections, technicalities and amended locations, and, unfortunately, informs the applicant of his decision too often only after several months' delay, which results in many hundred dollars of assessment expenses for the applicant, who can not make his final payment before December 31.

There lies all the trouble, and you would render great assistance to the mining interests in bringing the attention of the public to this matter, with the hope that some one competent will see that proper regulations be imposed in the Surveyor-General's office by the Land Office to the effect that a limit of time be given to the Surveyor-General's office in which he should notify the applicant of the corrections deemed necessary. N. E. Imhaus.

Baker City, Or.

The Jackson Electric Drill.

The Jackson electric drill is now being put upon the market by the Jackson Electric Drill & Supply Co. of Denver, Colo., and combines a hammer and piston movement, designed for rapid work, with minimum weight, a big item to mining properties that are compelled to ship machinery long distances by railroad or pack across country. As will be noted by accompanying cut, the motor rheostat and controller is a part of the drill proper, so that when this drill is mounted on tripod or column "it is all there," requiring only a wire stretched from a power plant that may be 50 feet or 5 miles away, or power can be taken from a small $125 gasoline engine or water wheel, should this latter power be convenient.

Jackson Electric Drill.

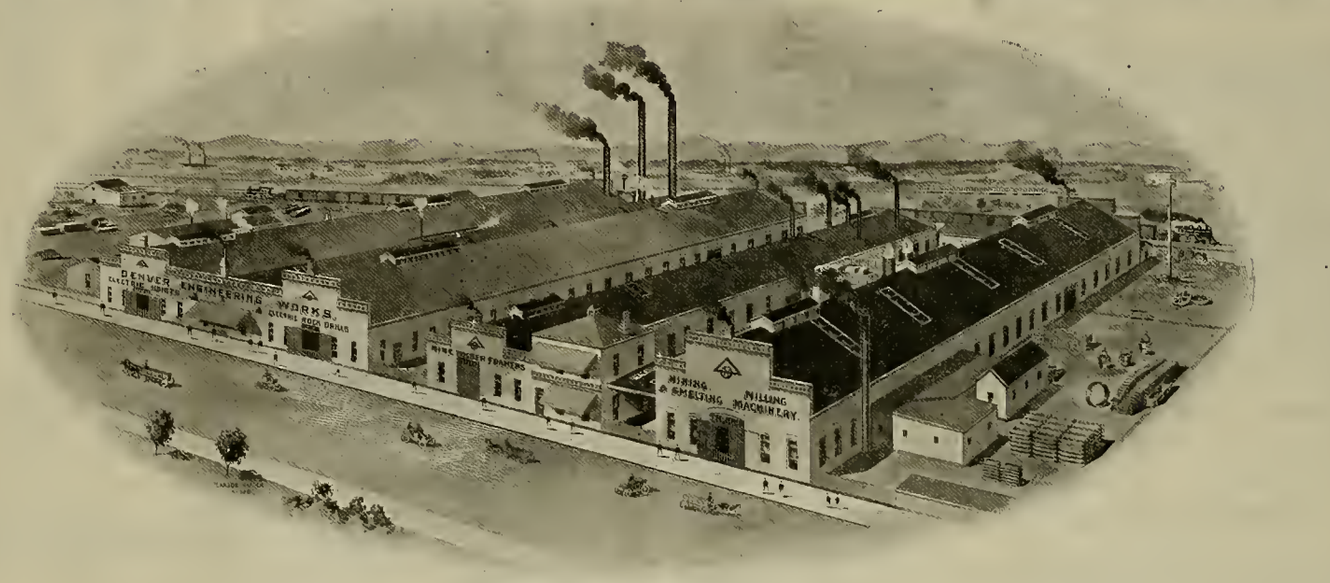
This drill is made in three sizes: No. 1 for stoping or following vein matter, or work not requiring a heavy machine; No. 2 for drifting and tunnel work, upraising, shaft sinking, etc., and No. 3 for heavy tunnel work, crosscutting, and all work in exceptionally hard ground.

The American-Hawaiian line steamer Nebraskan recently made the longest trip ever accomplished with oil fuel. She left San Francisco, Cal., on Jan 23, San Diego on Feb. 3, and passed through the Straits of Magellan to the Atlantic on Feb. 23. Her time from San Francisco to New York, sixty-three days, compares favorably with that of coal steaming vessels. The Alaskan, burning coal, which sailed from New York on Jan. 16, was sixty-three days in reaching San Diego, Cal. The distance from San Diego to New York through the Straits of Magellan is more than 16,000 miles.

The Denver Engineering Works Co.

The Denver Engineering Works Co. operates a plant between 29th and 31st on Blake street, Denver, Colo., with a trackage of two blocks on the U. P. R. R. The tracks enter the shop yard at the rear of the works. The plant was formerly owned by the Overland Machinery Co., who acquired it from the Hendy & Meyer Engineering Co., who started business in 1875.

Messrs. Shepard & Searing acquired the present plant, now known as the Denver Engineering Works, from the Overland Machinery Co. in 1895, since which time many improvements and additions have been made and a large business built up. The plant



The Denver Engineering Works.

now consists of complete patteru shop and foundry, forge and sheet iron shops, machine and erecting shops, all equipped with modern tools and appliances. The shop system is well organized; any piece of work can be duplicated from the records kept by the engineering department, and the accurate cost of any work in the shop, from the time the order is placed on the books, can be determined at any time from the daily records.

The Denver Engineering Works are manufacturers, not solely agents, are equipped to produce the completed machine or plant, from its inception through the various processes of manufacture to its practical operation.

They make their own drawings, patterns and castings, do their own machine and forge work, and finish, erect and test the product of their works. The owners and operators, Messrs. Shepard and Searing, are technically trained and educated men. Mr. Shepard completed his course in engineering at Massachusetts Institute of Technology in 1887, and Mr. Searing at Stevens Institute of Technology in 1888. In 1889 they formed the firm of Shepard & Searing, consulting mechanical and electrical engineers, with offices at Denver, Colorado, and frequently served as experts in legal cases, and in the design and construction of many large plants which are in operation at the present day. As engineers they established a reputation for high grade and honest work, which continued with them and made possible the success of the Denver Engineering Works. On account of the technical knowledge and experience of these men and the fact that they give their persoual attention to detail affairs of the Denver Engineering Works, Mr. Shepard being president and chief engineer, and Mr. Searing vice-president and general manager, the Denver Engineering Works has always occupied a high position among manufacturers of mining machinery.

Improved machines, several designed to cheapen the cost of installation and operation of mining, milling and smelting work, have been originated and put on the market by this company—among these the following: The Box electric drill, requiring only 1½ H. P. to operate; ore crushiug rolls with rigid bearings; the Deuver spitzkasten or ore classifier, built on correct principles derived from extensive experiments by Professor Richards, and made in standard sizes to suit the various conditions; the Cammett concentrating table, to successfully separate mineral from mineral in addition to the concentration of mineral from the waste, designed to make the cost of maintenance less than ¼% of the cost of the table per year; the Denver electric mining hoist, built to meet the severe conditions imposed in mining works; the Deuver mine timber framer, a standard and regularly manufactured machine for framing timbers used in underground mining work, and which does the work of twenty carpenters in one-tenth the time.

Among the numerous customers of the Denver Engineering Works are found some of the largest and wealthiest mining and smelting companies of the world.

On two orders recently placed by the American Smelting & Refining Co., the Denver Engineering Works supplied sixteen of the largest silver-lead furnaces ever built. This company also built for what was formerly the Globe Smelting Co. a lead smelting furnace which is reported to have been the largest ever constructed in the world.

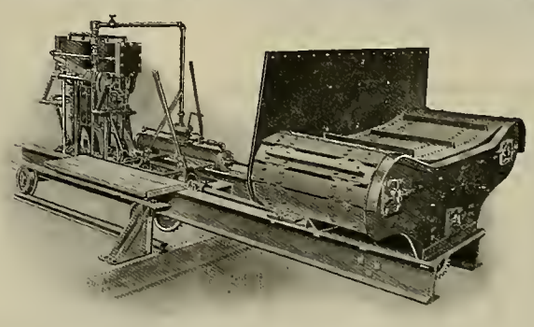
The product of this company's shops is not limited to the immediate vicinity of Colorado, for shipments have been made to almost every mining country on the globe. Their timber framers are in use from British Columbia to South America. One order from South Africa included eight of their sample grinders. One single order from the Colorado Fuel & Iron Co. required 300 tons of castings, all of which were turned out of the Denver Engineering Works' foundry. A recent order from the same company called for a 500 H. P. double drum, double engine, steam mine hoist, probably as large as ever built by any manufacturer in Colorado. A recent order from a Mexican mine called for ten carloads of machinery, and one for Colorado called for twelve carloads. Their stock of gear wheel patterns is probably the largest owned by any manufacturer between Omaha and San Francisco.

They were first in the mining field with their electric mine hoists, which have a national reputation. They build these electric hoists in sizes from 1 H. P. to 2000 H. P.; probably 80% of the electric hoists now operating in the Cripple Creek mining district were built by this company. One mine in Mexico has over forty of this company's hoists in operation.

Modern Mechanical Method of Loading Minerals into Box Cars.

Many railroads have found it advantageous to supply box and stock cars for a large portion of shipments of coal, ore and other minerals, as in doing so this class of cars cau be kept constantly in the earning capacity; and it also insures the delivery of all minerals with quality unimpaired from weather influences and without weight shrinkage in transit.

The loading of minerals into box or stock cars by hand labor has proven to be a slow and expensive method. This difficulty is claimed to have been overcome by a mechanical loader manufactured by the Christy Box Car Loader Co. of Des Moines, Iowa, and illustrated herewith.

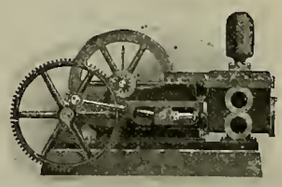


Christy Box Car Loader.

This company on request will furnish a fine catalogue descriptive of their box car loader, showing the manner of operation, with half tone cuts of all parts of both steam and electric loaders, portraying plants having these machines in use, and reproducing testimonial letters from satisfied operators.

Gasolene Pumping Engine.

The Columbus gas engine, as will be noted from cut, is their standard machine, mounted on cast iron sub-base and geared through cast iron cut gears to pumping engine mounted on same sub-base. The crank pin of the pumping engine is carried by a large gear. The frame of the pumping engine is of the girder pattern, the main being very long with an oil reservoir in the center. The cross-head guides are bored, the cross-head being fitted top and bottom with adjustable slippers. The connecting rod is of open-hearth steel forged. The cross-head end is closed with bronze boxes adjusted with wedge and screw. The water end is bolted to the main frame with recess joint to insure alignment. The pump is of the submerged-piston type, piston packed with fibrous packing. The valve seats are of bronze, screwed into decks. The valves are of rubber. All parts of the pump are accessible for attention. The Columbus Machine Co., Columbus, Ohio, also build for mining service hoisting engines aud geared air compressors.



Columbus Gasolene Engine.

Cyaniding Sulphurets Direct.

TO THE EDITOR:—The excellent article by Prof. Christy on "Cyaniding Gold-Bearing Sulphurets" recalls some experiences of my own in that line. The sulphurets in question had been leached for eight days with a 0.25% KCN solution.

Original value of sulphurets	$36.38
Tailings	16.95
Percentage of extraction	53.13

The above values were in gold, no account being taken of silver, as the sulphurets carried but about one ounce per ton.

A sample of the tailings was sized on woven wire screens and assayed separately, with the following results:

	%	Gold Values per Ton.
No. 1—Retained on 60-mesh screen	12.10	$27 70
No. 2—Retained on 80-mesh screen	6.80	25 22
No. 3—Retained on 100-mesh screen	11.69	21 49
No. 4—Passed 100-mesh screen	69.40	12 40

I had no finer screen than a 100-mesh at the plant where this work was done, nor any means of making a water classification, but it is very probable that the portion which would have passed a 150-mesh screen would have shown a very complete extraction.

E. J. BONSTELL.

REGARDING the use of borax in welding steel, an ounce of carbonate of iron to the pound of borax is considered a good addition.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

A report from Fairhanks says another hig strike has heen made on a new creek 4 miles from Chena, called Cripplo creok. It is midway hetween Chena and Fairhanks and has hoen passed over by almost everyhody traveling hetween these two points. Recently prospectors put down holes on what is now discovery. They got good pay, hut kept tho matter quiet; hut others prospected their dumps and fouud things so satisfactory they started a stampede. Sinco then the discoverers have allowed men to pan in their holes, and roports coming from there are to the effect that the ground averages 15 cents to tho pan.

It is reported that letters from Tanana, the newly discovered placer region, state that the clean up of the past winter's work will approximato $1,000,000. Numerous new discoverics aro reported.

Reports from Bullion creek continue to come in, says the Skagway Alaskan. It is stated by those returning from the diggings that everywhero hedrock has heen struck the pay runs from 50 cents to the pan upward. F. Attermost and F. Ater say that they struck hedrock on one o their claims at a depth of 44 feet and found an average of 52 cents to the pan. The hedrock was covered with a sediment 2 feet deep which avoraged 3 cents a pan. T. Flaherty says that of every claim being worked or prospected the same story is told. Those on the trail are having no difficulty in getting their outfits over the trail. Bullion creek claims are selling at Whitehorse. No. 147 above discovery is reported sold for $1000. Ruby creek is deeper than Bullion creek, hut the henches, which are shallow, have heen discovered to he rich.

ARIZONA.

Maricopa County.

(Special Correspondence). — A Lane roller mill and other machinery is to be installed at the Relief mine, near Peoria, at an early date.

J. Creath has completed a cyanide plant near the arrastra on the Broadway ditch. He will soon be ready to cyanide the tailings from the arrastra.

The Ben Hur mine, a gold property near the Phœnix mine, in Cave Creek district, is working.

J. G. Hardin has sold a number of claims near the Union mine, 18 miles north of Phœnix.

Cave Creek, April 11.

(Special Correspondence).—Some fine specimens of muscovite (mica) have recently been obtained from the Santa Estrella mountains, southwest of Phœnix. Preparations are being made to do work on the claims. The mica is found in large plates, which are seldom clouded.

The Michigan Gold Co., who have been operating dry placer machines near Morristown, have shipped the concentrators to Congress Junction, whence they will be freighted to Plomosa district, in the Quartzite country. They will install a plant having a capacity of 15 tons of gravel per hour.

C. E. Philes is developing a gold property in Cave Creek district.

The Wickenburg smelter will be blown in within the next few days, awaiting the arrival of coke. Considerable ore is at the smelter.

B. Carr, B. Cosner and W. Dennison have started work on a claim they recently located south of Phœnix. The ore is free milling and carries about two ounces of gold per ton.

The Pike's Peak M. Co., operating property 8 miles west of Frog Tanks, have an incline down 269 feet, and sinking continues. A large vein of sulpbides, carrying gold values, has been cut. A 40 H. P. steam hoist is in use.

J. Anderson and H. H. Gillespie are in the McDowell mountains doing assessment work on their property.

Ohio men have recently bought an interest in E. Howard's gold property, northeast of Cave Creek, and work will be started. The shaft will be cleaned out and retimbered, and sinking resumed. The ore is free milling.

The Gila Monster mine, near the Union mine, in the Union district, has been surveyed for patent.

Phœnix, April 11.

(Special Correspondence).—Des Moines, Iowa, men contemplate the purchase of the Roberts group of claims in the White tank mountains north of Buckeye.

R. F. Doll and J. Sthrole are developing their gold property in Cave Creek district, it is reported, with good results.

J. Johnson has recently located a claim north of Phœnix, in the Union district. The ore assays in copper, silver and gold.

I. Moore and C. Warner of Glendale havo left Phœnix for the Eagle Tail and Harqua Hala mountains, where they will prospect. Somo weeks ago they discovered good copper and lead ore in tho Eaglo Tails.

Phœnix, April 10.

(Special Correspondence).—G. E. Sanders has sold to the Vulture Dev. Co. the St. Charles group of claims in Vulture district.

F. E. Withey is working men on tho Grand Traverse mine, north and east of Cave Creck. He also has a numhor of men doing assessments on other claims.

Wickenburg, April 12.

Mohave County.

(Special Correspondence).—F. W. Theis has struck shipping ore in his Apex shaft, near Chloride. The owner will remove the steam hoist from the Silver Age mine and continue sinking to 200 feet.

Drifting and stoping on the Treasuro Vault mine is progressing. The ore mills $80 in gold and silver.

Another shipment of ore from the Fourth of March mine leaves for tho smelter next week.

The drift on the 240 level of the Sunrise mino is in good ore.

The Buckeye mine, at Mineral Park, where work was recently resumed under lease, has cut the vein in the 350-foot tunnel. Three shifts are heing put on.

The Sun Cloud mine on Burro creek, south of Kingman, has received all the machinery for the 100-ton mill. The mine has a large tonnage of ore hlocked out.

The Standard mine, in Chimehuevis district, is outputting high-grade gold ore. This and other claims in that camp helong to the Standard G. M. Co. They are contemplating reduction works.

The Cedar Valley M. Co., at Cedar, has struck high-grade ore.

G. Goetz has found a vein of gold ore, 4 feet wide, in Cedar district.

The Samoa mine is sacking ore for shipment.

The Altata mine is in a 15-inch vein of horn silver ore.

The Brunswick mine, belonging to Hughes & Mitchell, has a 10-inch vein of high-grade gold ore.

A good flow of water has heen struck in the Manzanita mine, which will he used in the Minnesota mill. The vein is small, containing gold and copper.

The Buckeye mine at Mineral Park, recently leased by M. Neilson & Co. of Wickenburg, is in good ore.

The Gem mine at Cerhat is heing developed under contract.

H. T. Blackwell has struck a vein of sulphide ore in his Dufferin mine.

It is reported the Tennessee mine and mill are to resume work. The mine has 8 feet of milling ore on the 500 level.

G. F. Milliken of New York has a bond on the Gem mine at Cerbat and is now there unwatering the mine.

The J. Carter lease on the Gold Road mine at Acme is outputting $300 gold ore.

The double-department shaft on the De La Fountaine mine at Stockton hill is down 350 feet in good ore.

It is reported that A. J. Pickerel of Prescott, manager of a gold mine 4 miles west of Kingman, visited the property this week with the intention of starting up and later installing a milling plant.

Chloride, April 10.

The new hoisting plant on the Yavapai mine in Clifton district is completed and in operation.——The new addition to the Shannon Co.'s concentrator is in operation.

Development on the Lezinsky property, near Clifton, is progressing. The vein in the Copper Bluff tunnel has heen opened to a width of 75 feet.

A strike of a 2-foot vein of red oxide ore, averaging 40% copper, is reported on the property of W. Keathing, near Morenci.

Pinal County.

(Special Correspondence).—Men are at work at Superior, near the Silver King mine.——G. A. Howell is working on a promising gold property, east of the Buttes and north of the Gila river.

Mammoth, April 9.

(Special Correspondence).—The Pinal Paraffine Oil Co., who are drilling in the Hackherry wash near Kelvin, have their well down to a depth of 1608 feet and indications for oil are very good. It is now necessary to put in more casing before drilling can be resumed.

Kelvin, April 12.

Yavapai County.

(Special Correspondence).—H. Herford of London, representing an Englisb syndicate, has interested his company in the Cleopatra and Con. King and Columbia properties, near Jerome. A smelter will he huilt. The properties surround the United Verde and lie between it and the North and South Venture claims, which are detached and lie to the south of the smelter site, across Walnut creek. The new company proposes to install their smelter on Walnut creek. A tunnel 1400 feet long is projected into Jerome mountain, which will give them the depth of the 500-foot level in the Jerome mine, and from this crosscutting and raising will open up the property. G. W. Howe, from whom the property was hought, retains an interest and will remain in charge at Jerome.

In and about Jeromo considerable interest centers just now in the new smelter which was hlown in last week at the Equator mine, 8 miles south of Jerome. This mine is the old Iron King property, which, after years of litigation, was divided hy compromises, one part going to the Clark interests and named the Equator, the other to Eastern parties and called the Copper Chief. The latter has been developed, and it is stated hy the agent, A. Hendey, that there is in sight a large amount of oxidized ore. The company has installed a leaching process which had heen previously tested in the laboratory and found successful. A 100-ton plant was so arranged that it could he added to, and the process, it is said, extracts 98% of the values. Work was discontinued, but the plant is in good order and work may be resumed on this property at any time. The Equator has heen developed by tunnel and upraise and bodies of ore are opened up sufficient, it is said, to justify a smelter, which had its initial run last week. (The engravings on page 263 illustrate the plant.) To connect mine and smelter a section of bucket tram was utilized that before the construction of the railroad into Jerome had heen used to convey supplies from the top of the mountain to Jerome smelter. The section in use at the Equator is ¾ of a mile long. It is a continuous cahle, carrying 100 huckets, each with a capacity of 400 to 600 pounds, and a complete revolution made once an hour. The weight of the loaded huckets generates considerable power, one of the greatest difficulties heing the control of the cahle. The recent storm necessitated a shut down, as the wet cable slipped in the cushion wheel, causing a runaway. J. A. Grace is in charge of the smelter. The matte is hauled to Jerome and all supplies are brought in by wagon, a distance of 11 miles hy the road. J. F. Case, foreman of the mine, is a recent arrival from Butte, Mont. The mine force consists of fifty men, and stoping is in progress.

Jerome, April 12.

(Special Correspondence).—The Rigby M. & R. Co.'s plant at Mayer, now being erected, is intended to treat all classes of ore by the Pohle-Croasdale process, owned hy The Metal Volatilization Co. (The engraving on the front page shows the plant and surroundings.)

The ore is delivered to the Mayer plant hy the Santa Fe, Prescott & Phœnix Railway Co. over a spur 3000 feet long from their main track to the Rigby Co.'s works, weighed and dropped onto the unloading track in front of the sampler, where it is shoveled into the ore chute feeding the crusher sampler, this being the only time the ore is handled by shovels. The sampler building is 38x36 feet, the ore from the cars going to a 20x10-inch Blake crusher, thence to an elevator, which delivers it to a ¾-mesh screen, the finished product going to a double Vezin automatic sampling machine, oversize returning to 36x14-inch rolls, which discharge into the same elevator as the crusher. The sample from the sampler goes to the sample bin on the cutting floor, where it follows the usual custom in making a sample for control and umpire assays. The reject from the sampler is taken by a 16-inch belt conveyor and dumped into one of the ore bins adjoining the west end of the sampler building, which have a capacity of 750 tons. From them the ore is drawn into cars and taken to the dryer huilding, 56x30 feet, where it is fed by automatic feeders into two revolving dryers. From the dryers the ore is dumped through a brick chute into a car and taken to the fine crushing building, 56x30 feet, where it is crushed to the required fineness by three pairs of 30x14-inch rolls, the finished product heing taken from the screens to the pulp ore bin by a 16-inch belt conveyor. In this huilding the salt used in the process is crushed by a pair of 20x12-inch rolls to the same fineness as the ore and is taken by car to the salt bin, adjacent to the pulp ore bin. Besides the rolls, screens, elevators and conveyors in this huilding, there are three dust collectors and fans and four feed hoppers, with feed screws, feeding elevators and rolls.

The ore and salt from the fine crushing building goes to the pulp ore and salt bins in the mixer building, through the conveyor building, 28x8 feet. The mixer huilding, west of the fine crushing building, is 64x14 feet. There is a hopper scale under the pulp ore bin, another under the salt bin, from which charges are run onto a 16-inch helt conveyor, which carries them to the receiving hopper over the mixer, and from which it is discharged into a 5-ton hox mixer, when after mixing it is dumped into a storage hopper under the mixer, from which it is drawn as needed into a car and taken to the furnace feed hoppers, through a tram house, 100x8 feet, one story high.

The furnace building is 132x88 feet. In it are four revolving, hrick-lined furnaces, 7 feet 6 inches at the large end, 5 feet 6 inches at the small end, and 36 feet long. From the feed hopper of the furnace the ore is fed into the furnace by a screw feed, the roasting process being continuous, similar to the operation of a White-Howell furnace. The tailings from the furnaces are automatically conveyed to cars by a hot ore conveyor and taken to the dump in them. The fuel used is California crude oil. The ore having heen mixed with the proper amount of salt and sulphur before going to the furnace, the mixture permits of a double decomposition, by which the metal values are converted into chlorides, volatile at the roasting heat, and the sulphur into sulphate of soda. The chlorine fumes are drawn from the furnaces hy lead-lined pressure blowers, through a series of chambers and flues into the flue house, a building 100x31 feet 6 inches, from there into the condenser building, 96x44 feet, passing through a cooling tower which contains gravel filters kept wet hy constant sprays of water. This cools the fumes passing into the pressure blowers and the linings are not injured hy heat. From the hlowers the fumes are forced into condensers and through the diaphragms and water contained in them, until the values are removed from the fumes.

The solution thus formed is conveyed to the filter house, 56x30 feet, through lead-lined launders. The gold and silver present in the liquid are in insoluble form. The lead, when present, is recovered in the form of sulphate, by reason of the acid solution, and is insoluble, so that all three of these metals are easily removed from the solution hy filters. The copper, heing in solutiou, passes through the filters to the precipitation house, where it is precipitated on iron or hy electricity. The precipitation house is 42x55 feet. The power is steam. The hoiler house is 56x30 feet and contains three 125 H. P. hoilers, together with hot water heater, boiler-feed pump and injector. The fuel used is California crude oil.

The power is applied hy two 14x36-inch and one 12x30-inch Reynolds-Corliss engines, located in two engine houses. In one house, 64x29 feet, are placed the two 14x36-inch engines, one driving the machinery in the mixer, condenser and furnace houses, the other driving the machinery in the dryer and fine crushing houses. The 12x30-inch engine is placed in a house 34x20 feet and drives the sampler house machinery.

In addition to the huildings which are directly connected with the working of the plant are the following: Brick office, 41x31 feet 6 inches; brick laboratory and assay office, 49x17 feet 6 inches; carpenter and machine shop, 60x20 feet; hlacksmith shop, 30x20 feet; warehouse, 40x20 feet; oil house, 16x12 feet; wooden dwelling house, 112x14 feet, with three wings. All buildings are wood frames covered with corrugated iron, unless otherwise described. An oil reservoir, excavated in solid rock and cemented, 55x22 feet and 9 feet deep, holding 75,000 gallons of crude oil, furnishes the fuel for the plant, and is distrihuted through the various buildings by a gravity system of steam-heated pipes.

The plant is designed to have a capacity of 100 tons of ore per day and will be in operation in June.

Mayer, April 11.

(Special Correspondence). — The Braganza G. M. Co., locally known as the Henrietta, is located at Big Bug, on the Poland branch of the Bradshaw Mountain Railroad. The 20-stamp mill stands near the railroad, and ore is conveyed to it from the mine on the hill above by cable tram. The Henrietta is on the same belt with the McCabe, Gladstone, Jessie and Dividend and has a long record of production. At present the twenty stamps crush only thirty tons per day, but Superintendent J. D. McLaughlin hopes to replace the mill with a new one during the season. There are six claims in the group. At the 300 level a tunnel 1500 feet long cuts the hill from north to south. On the south side of the hill sulphide ore was found from the surface with an average value of $15 per ton. On the north side the ore was oxidized down to the 400-foot level. There is a total of 1100 feet of timbered shaft on the property. The labor trouble last season closed this property, but since Septemher last it has again been operating with a force of sixty men. E. E. McNasser has charge of the mill, amalgamation and concentration being em-

ployed, sending from two to three carloads of concentrates, averaging $40 per ton, to Val Verde smelter each month.

The Alto M. Co. has seventeen claims in Eugene gulch, 2 miles northwest of the Henrietta. A. J. Frame of Athens, Ohio, is president and S. I. Johnson superintendent. A road has been completed to the Paymaster group, on which a 400-foot tunnel has opened up a vein of sulphide ore carrying gold values running from $8 to $171. A raise from this tunnel, 100 feet to the surface, has been completed and a hoist is being installed and a shaft will be sunk from the tunnel level. The principal work has been done on the Jefferson group, where the working shaft has now reached a depth requiring a larger hoist, which will soon be installed. The ore will be sent either to the new Rigby chlorination plant at Mayer or to the Val Verde smelter, equidistant, 6 miles away, until development has been carried far enough to determine the process to treat the ore.

Providence camp, in Big Bug gulch, 3 miles east of Poland, is lifeless at present. The Belcher property is idle, as also the Stirling and Merchants. The Annie and Red Rock mills are silent. From the Lottie tunnel, now in 3700 feet, on Wood gulch, flows 175,000 gallons of water per day. The owners—the Oriental M. Co.—are operating their mill near Poland with ore from the Paymaster mine, the only mill operating in the district at present. The mill is in charge of B. F. Thomas. Lately plates have been added with good results, saving the fine gold that has lately appeared in the ore. The mill is running smoothly and saving, it is claimed, 90% of the values. The ore is hauled from the mine, 1 mile away, over a good road at a cost of about 27 cents per ton. It is sulphide, carrying gold and silver, with some lead, zinc and copper. Concentrates are being shipped to El Paso, Texas. The company contemplate building a mill in Wood gulch of 100 to 200 tons capacity to handle ore from the Lottie mine. The Oriental is a close corporation; A. F. Kent, Jamestown, N. Y., is president and W. A. Kent superintendent of mine and mill. Since the strike, last June, but twenty men are employed.

Big Bug, April 10.

(Special Correspondence).—The Knickerbocker G. M. Co., locally called the Hidden Treasure, started its 10-stamp mill a few weeks ago, employing amalgamation and cyaniding, with encouraging results. The mine is operated through a 200-foot shaft, having 800 feet of drifting on the two levels. The property is on Turkey creek, 4 miles southeast of the station of that name on the Bradshaw Mountain Railroad.——Thiesing & Riley are developing copper property near this mine.——Assessment work is now being done on the Silver Cord, owned by C. E. Mills, J. A. Robeson, J. R. Lowry and G. Zika. There is a 280-foot tunnel on the property and some rich ore has been struck.

Turkey Creek, April 10.

(Special Correspondence).—J. B. Richman, one of the owners of the Alaska mine, near Congress, says a gasoline hoist will be installed at once.

Congress, April 10.

(Special Correspondence). — Nineteen miles northwest of Hillside station is the Golden Link mine and mill. Hillside is 20 miles north of Congress junction, on the S. F., P. & P. R. R. A trial run of the 20-stamp mill was made last season, but work was discontinued while changes were made, and it was not until February of this year that regular work began. The mill has a capacity of sixty tons per day. About 60% of the values are plated, the remainder being extracted by cyaniding. From mine to tailings every step is by gravity. Oil is used for fuel, hauled from Hillside by teams, 1000 gallons a day being required for the plant. Water is pumped from the Santa Maria river, 1 mile away, to an elevation of 500 feet by a pump operated by electricity, which also furnishes light for the mill. A compressor plant supplies air for agitation in cyaniding purposes. There are five leaching vats, each seventy tons capacity.

The mine is worked by tunnels, which enter the hill above the level of the mill. The ore is siliceous, in granite, and while little free gold can be seen, it yields readily to the treatment. Fifty men are employed. H. R. Johnson of New York, at present at Pasadena, Cal., is president of the company, and H. L. Montagne is general manager.

John Roberts of Sultan, who, with others, owns copper prospects on Copper creek, 19 miles north of Sultan, is negotiating the sale of the property. It is 3 miles from the Hillside mine, which with its 5-stamp mill is now in operation under direction of John Lawler of Prescott, the owner.

Hillside, April 11.

(Special Correspondence).—On the Agua Fria, 5 miles east of Mayer, are the properties of T. T. Stoddard (the Copper Mountain), J. Mayer (the Miner) and the Lion Copper M. Co. of Los Angeles, Cal. The ore of this section is principally copper bearing. On the first-named property a great deal of development work has been done, and a smelter, now idle, formerly reduced the ore. H. E. Schaefer is in charge of the property.

The Lion has a shaft down 250 feet and is working nine men in two shifts, sinking. The work is in charge of H. Reifsnyder. C. Matthews of Los Angeles, Cal., is president of the company.

Mr. Mayer has a force of men under Frank Thornton on his property, the Miner, and the showing of ore in shaft and tunnel, as far as developed, is encouraging. Considerable high-grade carbonate ore is piled on the dump and the shaft is coming into a body of sulphide ore.

Mayer, April 11.

(Special Correspondence). — The Dividend Con. G. M. Co. is a consolidation of four adjoining groups of claims, the Dividend, Galena, Independence and Comstock, comprising eleven full claims. T. G. Smith of Los Angeles, Cal., and an owner, is at the mine. F. E. Byles is general manager of the company and Kelvin Hartwell of Los Angeles, Cal., is president. The mill has ten stamps, with a capacity of twenty tons, having two Bartlett and one Wilfley table. Concentrates are shipped to Val Verde smelter. Water for operation is pumped from the mine.

There is a shaft on each of the four groups, the deepest being 400 feet, and about 4000 feet of drifting has been done. Little stoping has been done. A new hoist has been installed on the Dividend and a new 75 H. P. engine and 80 H. P. boiler installed in the mill.

All development that has heretofore been done has been paid for by the ore mined. A 1200-foot gravity tram is being installed to connect the Dividend shaft with the mill, which is located at Chaparral postoffice, ½ mile south of the Jessie mill.

Chaparral, April 11.

(Special Correspondence). — North of Blanchard the Douglas-Lacy Co. is operating an extension of the Iron King ledge. They have sunk four shafts through the wash gravel, varying from 80 feet to 252 feet, and have located the ledge at two points. The second shaft is now down 284 feet. Some good carbonate copper ore has been taken out.

Val Verde, April 11.

(Special Correspondence).—The Jessie and surrounding claims, about 1 mile south of McCabe, was located in 1890. Rich surface ores were found and the initial 5-stamp mill was increased to twenty stamps, with concentration and cyaniding plant. The mill was located ½ mile west of the mine, near water, and a tunnel driven 1333 feet, crosscutting several ledges. For thirteen years work has been carried on in the surface levels.

The property is owned by the Jessie Mines Co. of Columbus, O.

A new system of development is now being inaugurated. The water question has been settled by the company acquiring the De Large ranch, on the Agua Fria river, where a 500 H. P. electric plant will be installed as a power and pumping plant. From this a pipe line will conduct water to a point 4½ miles from the pump, at an elevation of 1100 feet, and from here it will flow by gravity 2 miles to a tunnel reservoir above the Jessie. This reservoir is now being made by drifting on a vein which furnishes ore enough to pay cost of construction. It will be cement lined and will hold 1,000,000 gallons. Its location furnishes a good head of water as fire protection.

A large shaft house has been constructed over the old Jessie shaft, down 657 feet, double compartment. It is being retimbered and straightened to a uniform incline of 75°. The shaft followed the vein. Now, in straightening it, lenses of high-grade ore are found lying contiguous to the main vein. Below the shaft will be built a 60-stamp mill, with concentrating and cyaniding plant, which it is expected will be in operation this year.

On the dump is about 40,000 tons of ore, stated by Mr. Jones to have an average value of $8.35. The main ledge is 100 feet wide, the paystreak from a few inches to 12 feet. On the walls of this vein, and also in seams through it, are streaks of ore from 6 inches to 3 feet in width, running in value from $250 to $300 gold. The main ore body, second grade, runs $12 to $16. The high-grade ore is pyritic. The new shaft will be sunk to the 1000-foot level. At present thirty men are on the payroll.

The old Jessie mill is on another part of the property not included in the present company's holdings, but will be operated under another company, Jones Bros. being the present owners.

The southern extension of the McCabe vein is owned by the Ideal M. & D. Co., locally known as the Gladstone Co. It is worked at present under lease by C. G. Fennell and J. L. Davis, who are taking out high-grade galena ore. They also have the Val Verde smelter, to which the ore is shipped. The mine lease expires Jan. 1, 1905, and the smelter will be turned over to the Middleton Co. within a few days. L. Martin, resident at the mine, looks after the interest of the owners.

Between the Jessie Mines Co. and the Dividend Con. G. M. Co. is the Lelan group of eight claims, of which E. W. Wells of Prescott is president and Elmer W. Wells is general manager. Development is in progress, a contract having been let to sink the shaft from the fourth to the fifth level. The company is negotiating for a mill, which will be commenced when sufficient water is encountered in the mine to operate. M. B. Hazeltine of Prescott is treasurer of the company.

McCabe, April 12.

CALIFORNIA.

Amador County.

The first cleanup of the new 20-stamp mill at the Bunker Hill Con. mine, near Amador City, was made last week, says the Amador Ledger. Owing to an accident to the rock breaker, only ten stamps were run part of the month. The month's run averaged, it is reported, $6 per ton. The ore came mostly from the 1200-foot level, which is stated to be poorer than the ledge in the 800 and 1400 levels.

The underground men at the Zolla mine at Jackson have been laid off because of the large volume of water in the works, requiring constant running of the water tanks.

Butte County.

Two hundred acres of land, located 2 miles south of Oroville and 1 mile from Feather river, are reported sold to the Vilora Mining Syndicate, Ltd., of England. The price paid was $800 per acre.

Calaveras County.

(Special Correspondence).—A rich strike is reported on the 1900 level of the Gwin mine, where a shoot of ore, presumed to be the downward continuation of a shoot found in the upper levels, has been cut. The drift is in on the lens about 40 feet, the vein having widended from a thin edge to over 3 feet. The rock mills $40 per ton and resembles the rich ore found above, on the 1200 and other levels.

Gwin Mine, April 12.

Ore from the Merrimac claim, on lower Carson creek, is being milled in the mill of the Carson Creek M. Co. The ore consists of schist with stringers of quartz, carrying free gold and auriferous iron sulphides.

El Dorado County.

Superintendent W. E. Everson of the El Dorado C. Co. reports finding the ledge in the Ford copper mine, east of Georgetown. They have 8 inches of solid mineral. The tunnel is in 203 feet.

At the Mameluke hill hydraulic mine, operated by the New Highland G. & C. M. Co., new sluice boxes are being put in under Foreman Biddell. It is thought sluicing will commence by May 1st.

Mariposa County.

(Special Correspondence)—The Raynor Copper M. Co., operating mines 4 miles south of Lewis, made the second carload shipment to Selby's last week, the first shipment being made two months ago, and averaged 21% in copper and two ounces in silver per ton. J. C. Jens is general manager and L. J. Beeve foreman. The company has a new hoist on one of their shafts and is down about 200 feet.

Mariposa, April 11.

A number of new locations have been recently made in the Quartzburg district, near Hornitos. The Washington mine is the most extensively developed property in the district. It is 1500 feet deep, but has been idle for years.

Mono County.

The North Rapidan mine at Como is being prepared for development work. The mill is to be started early in April, says the Bodie Miner.

Manager W. A. R. Loose of the Sunshine Co. has laid off the men, except those on the Sunshine claim. He has located six claims for the New Bodie M. Co. A tunnel will be run which will tap and drain the mines at a depth of 1500 feet. The tunnel will be 3 miles long when completed.

There is a report at Benton that the old Tower mine at that place is to resume operations.

Napa County.

(Special Correspondence.). — Recently the miners at the Boston quicksilver mine struck for an advance in wages. General Superintendent B. M. Newcomb ordered the furnace fires drawn and all work suspended indefinitely. Fully 100 men are affected by the shut-down.

Oat Hill, April 12.

Nevada County.

(Special Correspondence).—The Oustamah mine is regularly shipping concentrates to the Pioneer Works. They are hoisting thirty tons of quartz and thirty tons of waste per day, mostly from the 300 and 500 foot levels. It will be remembered that this mine was abandoned as being worked out after sinking 800 feet and taking out all the ore south of the shaft. The main ore body was lost north of the shaft, the miners having followed the foot wall. The new company followed the banging wall and found the ore body at the 500-foot level. Subsequently it has been found at the other levels and promises well for the future. At present they are in 600 feet and stoping on the 300-foot level 800 feet, and two stopes on the 500-foot level, 450 feet in the 600 and 275 feet in the 700. Below the 700-foot level the shaft is filled with water. The company intends pumping and cleaning this out, sinking farther as is necessary and drifting both north and south below the 800-foot level, as the south was worked out by the old company above this. The vein formation in this mine is looked upon as a fine exemplification of Janin's "rhomboidal theory." Mr. Morgan is superintendent.

Nevada City, April 9.

(Special Correspondence).—The Empire mine, G. W. Starr, superintendent, is hoisting 100 tons of quartz and 100 tons of waste per day, about half the capacity of the plant. The hydraulic pump at the 1100-foot level is handling all water brought to this level from the 2200-foot level and raising it to the 400-foot level. This pump is operated by water falling 930 feet vertically from the surface and entering the power cylinder of the pump. The piston in this cylinder operates the suction and pressure valves, forcing the exhaust power water as well as the mine water to the drainage tunnel at the 400-foot level. The Word drill sharpener lately taken on thirty days' trial has proved satisfactory and has been purchased.

Grass Valley, April 10.

(Special Correspondence).—The experimental 10-ton cyanide plant at the North Star mine has been in operation over a week and so far has proved satisfactory. The pulp from the plates is run over Dodd buddles, thence the tailings are run into a settling tank or spitzkasten. The slimes and sands are allowed to settle to the bottom and the clear water flows gently over the circumference. Lime is added to hasten settling. An air pump forces the sands and slimes from the settling tank to the solution and precipitation tank. The cyanide solution, pumped from the sump tanks and made of proper strength, is added to the pulp. A continuous circulation and agitation is produced by forcing air through a pipe up the middle of the tank, carrying the solution with it. The solution goes up the center and comes down the sides. In the bottom of the tank a series of amalgamated copper and iron plates is arranged concentrically about the center and connected to a plating dynamo of one and one-half volts and fifteen amperes. This deposits the gold from the cyanide solution upon the amalgamated copper plates, which are subsequently treated as are battery plates to recover the gold.

Experiments show that this method gives 90% to 95% extraction with the fine slimes, which carry three-quarters of the assay value of the tailings and 70% extraction with the coarse sands. The tailings run about $2 per ton, and the estimated cost of treatment by this method is 50 cents.

If the experimental plant proves successful the North Star Co. will put in a complete plant for treating the entire product of their 40-stamp mill and also the new mill being erected at the Central.

Grass Valley, April 12.

Manager Campbell, for the Mountaineer G. M. Co., has bought the Reward mine, near Nevada City, from the Gold Tunnel Co. This mine is between the Walrath and Summit mines, which the Mountaineer Co. also has. This, with a tunnel right through the Weisenburger ranch, which was recently obtained, gives them a continuous right from the Mountaineer mine on the north to the East Orleans mine on Gold Flat, a distance of 3½ miles. Manager Campbell is driving ahead the tunnel which starts from the 400-foot level of the Mountaineer mine. In the meantime the work of reopening the Mountaineer proper is progressing.

The Continental C. & G. M. Co. has been organized to operate gold and copper properties in Nevada county. The company has a bond on the Badger claim at Pike Flat, in addition to a number of copper claims near Newtown. U. P. Koenig of Milwaukee, Wis., is president, with

T. C. Robinson, F. H. Kline, S. M. Harris, L. C. Wilhelm and W. George directors. The shaft of the Badger will be cleaned out and retimbered, after which sinking will start. It is intended to go down 500 feet. The company will put in a hoist and pumping plant. At same time it will open up its copper properties west of Nevada City. It has five claims, in addition to the Williams ranch of 240 acres, in the copper belt running through to Spencoville. A 50-foot shaft has been sunk on one of the claims, being in gossan. Assays are said to show gold and silver values with the copper.

O. Woehler, general manager of the South Yuba M. & S. Co., near French Corral, says No. 6 tunnel shows great improvement. The tunnel is in 275 feet. The vein is from 25 to 50 feet wide.

During the heavy rains the management of the Centennial and Green Mountain mines, in Grass Valley district, decided it would be more economical to allow the mines to fill with water, pumping them out later, than to keep the pumps going all the time, says the Nevada Minor. Now that the water has subsided somewhat the management has decided to install heavier pumping machinery, and will move the compressor from the Centennial mine to the Green Mountain, where it will be used to drain both mines of water. These mines have been consolidated as the Sultana mines. J. M. O'Brien of San Francisco is looking after the property. Another motor will be bought that the hoisting machinery may be capable of working to greater depth. Both mines will be worked from the Green Mountain shaft.

A new canvas plant is being built at the Oustomah mine, near Nevada City.——A vein of gold-bearing quartz was discovered while excavating for a building in Nevada City a few days since. It is thought to be an extension of the Nevada County vein.

Plumas County.

The main tunnel of the Clay bank mine, near La Porte, is again being driven. A raise to connect with the channel which was being put up was abandoned recently, owing to the downpour of water.

The Wild Boar mine, near La Porte, is temporarily idle, owing to scarcity of fuel.

Riverside County.

The Oro Copia M. & M. Co. are sinking a well near Dos Palmos station in the Salton basin, to supply water to their mines, 10 miles to the northward, in Quartz Peak canyon. A mill has been taken to the mine.

Sierra County.

A rich strike is reported at the Mabel Mertz mine, says the Downieville Messenger. The company were running a bedrock tunnel for gravel when they found a quartz ledge 10 feet wide. A good prospect has been obtained from the ledge, which is in porphyry and slate, and free gold can be seen in the rock. The mine is owned by the Forest City M. Co. and is 8 miles from Downieville. Good prospects in gravel were obtained at this mine some time ago.

Siskiyou County.

The Liberty quartz ledge on Cherry creek, worked by Hahn & Ohm, was an abandoned claim, reopened by the present owners, who, after sinking on the old workings, took out $4000, the quartz yielding $45 per ton. They are now running a tunnel 600 feet to strike the ledge.

Work is to be resumed in the Cherry Hill quartz mine on Cherry creek, says the Yreka Journal. This mine is equipped with a mill and compressed air machinery, all of which will be run by electricity, now available by the Siskiyou Electric Power Co., extending through that section to Scott Valley.

Gisang & Co. are working rich diggings 2 miles from Garretson's springs, at head of Beaver creek. It consists of both quartz and placer. There are about 12 feet of snow in the mountains, which will afford a good supply of water for spring and summer operations.

The Pine Grove claim on the bar at Quigley's ranch, in Riverside district, Klamath river, has been pumped out, and the miners are at work.

The Punch Creek mine on Humbug, recently bought by G. W. Grayson and now known as the Mono mine, has been sold to a San Francisco company, with Mr. Newcomb at the head.

The McKean M. Co., at South Fork of Scott river, near Callahans, intends sinking a new perpendicular shaft 200 feet. The quartz from the McKean mine has been successfully worked by the cyanide process. A large number of men will be employed.

The Ashland Tribune says LaShells & Kobb will put in a dredger 9 miles south of Hornbrook. The machine will have a capacity of 2400 yards a day. The lumber and machinery is already at Hornbrook. They expect to have the machine in operation within six weeks.

Trinity County.

It is reported from Coffee Creek district that a landslide recently swept away the mill, concentrators and air compressor at the Wagner mine. The men employed at the property were not at the mill at the time the slide occurred. The mill is buried in debris.

Tuolumne County.

The Confidence mine at Confidence will start operations on a large scale as soon as the weather and condition of the roads permit hauling wood and timber.

The Black Hawk mine, near Soulsbyville, has started up for the season. A steam pump is unwatering the mine.

The Draper mine, near Soulsbyville, will resume operations. A small crew is cleaning ditches and fixing up top works.

The Seminole mine, south of Tuolumne, is being unwatered for examination. The work is being done under direction of H. M. Stanley.

It is reported that Wilson & Cullers have struck good ore in the Little Beauty mine, near Arrastraville. The vein shows free gold.

The Black Oak mine at Soulsbyville is putting more men to work and in a short time will be running full-handed.

COLORADO.

(Special Correspondence). — Unsettled weather has delayed placer operations in several districts. In Breckenridge and vicinity much development work is being planned by the larger companies, and it is believed the coming summer will be a busy one in placer mining.

The judgment for nearly $500,000 of J. Doyle against J. F. Burns of the Portland G. M. Co. has been reversed and decision rendered in favor of Burns by the Iowa Supreme Court. Burns and Doyle were partners in mining for a number of years, and during the partnership the Portland mine of Victor was discovered. Doyle brought suit for the recovery of nearly $1,000,000, which he claimed was due him from Burns. He secured judgment in the lower court of Iowa, where the suit was brought, but the higher court reversed it.

The latest move in the strike situation at Telluride is the decision of Judge Stevens at Ouray ordering the arrest of General Bell and Captain Wells for not producing Moyer of the Federation in his court when ordered to do so.

Denver, April 12.

Clear Creek County.

The Chicago Mountain M. & T. Co., which is driving the Three Friends tunnel into Chicago mountain, near Idaho Springs, has cut a 3-foot body of concentrating and cyaniding ore, which assays $7 to $12 a ton gold. The tunnel is in 175 feet, and will reach the Three Friends shaft in 30 to 40 feet. The intention is to raise to the shaft.

Progress on the Grass Valley tunnel of the Santa Fe Mountain Gold Mines Co. continues, and is in 190 feet, having cut several veins. The breast is said to be in ore that assays $800 a ton.

Work is progressing in the Baltimore tunnel, owned by the Hazleton Con. Co., near Silver Plume. A vein 8 feet in width has been cut by this tunnel. The Santiago group, owned by this company, has men at work developing in all its levels and blocking out ore. The company will build a mill at the Baltimore tunnel for treatment of the ores from these two mines, and will also build a tramway from the Santiago group to the mill during coming summer.

The Waldorfs' holdings on McClellan mountain, viz., the Tobin, Commonwealth, Kitty Owsley, Paymaster and other properties, are in bonanza. The Stevens mine on the western slope of the mountain and the main workings of the group, have produced about $1,500,000. A mill of fifty tons capacity was erected last fall to handle the ore in stopes and dumps; finding them to contain so much ore the mill has been enlarged to 100 tons capacity, and will be running full time in a few days.

The Mary Etta group, which has been steadily developed the past eleven years, has justified a tunnel from the base of the mountain to tap the group at great depth. The average of the ore from this group is $144 per ton, principally in gold. The Santiago has a large amount of ore ready for treatment.

On the Indiana group, west of Daisy gulch, they are now crossing the porphyry with good values all through. On reaching the west vein a bonanza is expected, as surface workings showed rich ore there.

The Robert E. Lee tunnel, being driven by the Southern M. & M. Dev. Co., will cut many lodes that have produced fine surface pockets. This tunnel is also being driven on a porphyry dike that for 15 feet wide is mixed with iron and contains good gold values.

Fremont County.

It is reported at Florence that the Colorado Fuel & Iron Co. will reopen the Canfield coal mine at Coal Creek. This property has been idle since the coal strike was declared. It will be worked with non-union men. It is the oldest coal mine in the county.

Gilpin County.

At the Old Town mine, in Russell district, near Central City, shipping has been delayed on account of the lowering of an engine from the 600 to the 1500 station and putting in a new pump and air lines. Manager Kimball says the new electric transformer and motor for operating the new compressor, as well as the electric lighting of the top plant and workings, will soon arrive. Manager Kimball has ordered a 25 H. P. hoist, to take the place of the steam plant at the Wautauga mine, which will be operated by electricity from the Old Town mine. The property made an output of $160,000 in 1903.

Two cars of $100 smelting ore were shipped from the Fairfield mine to Denver last week, and three carloads of concentrating ores from the Waltbam mine, in Russell district, were shipped to the Alpine concentrator at Idabo Springs, and one carload of smelting ores from the Twolon M. Co.'s 2:40 mine in Willis gulch; also shipments by leasers on the Saratoga mine, in Russell district, to smelters, and several cars of concentrating ores from the Old Town mine to mills at Idabo Springs.

Good ore is being opened up in the St. Louis extension claim of the Newfoundland group on Gunnell mountain, owned and operated by G. W. Mabee, Sr., of Denver. During the past week free-gold ore was found in the 600-foot west level, and in the 500 east level there is ore assaying $150 to the ton. Work is being carried on in the 450 level and there is ore in all of the five levels, the ore body in the 600 level having been opened up for a distance of 100 feet. Its past records show a production of about $200,000, principally in gold.

A steam pump is being installed at the main shaft of the Haseltine property, on South Willis gulch, and it is the intention of the Druid M. Co. to unwater the shaft and get ready for operations at as early a date as possible.

The Perigo mill started up Monday, says the Register-Call, and is running on leasers' ore from the Perigo property. It is expected there is enough ore on hand to keep the mill running. The last run made cleaned up better than previous ones.

Lunwall Bros. have opened up copper-iron ore in their Copper King property on Lump gulch, also ore showing lead.

The Gold Dirt mine is getting in shape for regular shipping. Some ore has been uncovered in the lower levels which show increased values. When the Moffat road reaches Rollinsville this property will become a regular shipper.

Willard & Heitman have at their Swear Off lode in Lump gulch, near Rollinsville, at a depth of 70 feet, a 5 foot crevice, 4 feet of which is a good milling ore. The lessees are trying to reach the 100 foot point before they are troubled with surface water. They recently put up a whim and shaft building, but they will install a steam hoisting plant later.

W. Kelly has three men at work on the Claudia J. on Tip Top mountain, crosscutting south at a depth of 110 feet in the Millie B. shaft to cut the Claudia J. and Stewart veins. The Millie B. shows milling ore, which will be left standing until the other veins are reached. Ore shipped to the sampling works from the Claudia J. has given ten ounces gold to the ton.

Ten stamps are dropping at the new mill of the Blue Grass M. Co. at Phœnix, on the dump of the Champion property.

Hinsdale County.

The management of the Contention mine, near Lake City, has bought concentrating machinery, consisting of crushers, rolls, tables and slimers. J. D. Kazar, superintendent, says during the installation of the machinery the Mayflower tunnel will be enlarged.

Kilvert & Watkins have shipped a carload of concentrates from the Golden Fleece mill.

D. M. Jamieson, superintendent of the Hanna Co.'s mines at Capitol City, says there are forty men at work for the company and more will be added. One of the batteries is closed down for repairs. At the mine large ore bodies are exposed above level No. 3. The system of concentration at the mill is working smoothly.

Lake County.

The mines of Leadville district for the month of March show an increase in production over a year ago, and the month of April will show a further increase. The opening of spring shows a renewed activity in the outlying districts, while in the properties already working there is a large amount of new work under way, with an increased tonnage, says the Denver Republican. In the zinc production it is predicted that there will be a still further increase over last year. E. Anderson, who is looking after the zinc situation for the United States Zinc Co. of Colorado, is closing important contracts here. Mr. Anderson says that the company contemplates the erection of a concentrating and a separating plant in connection with the zinc mill at Pueblo.

The Iron-Silver M. Co. reports that both their shafts, the Moyer and the North Moyer, are making a large production, and shipping more ore than for a long time. The Moyer properties are the heaviest producers in the Leadville district, the average production amounting to 11,000 tons a month. The Moyer people are making a systematic development of their property on Iron hill. The North Moyer shaft, the new shaft placed in operation the first of this year, is taking out a good grade of iron sulphide ore. The production will run about 4800 tons of zinc ore, 1000 tons of zinc lead ore, 4000 tons of iron sulphide and iron bearing ore. In addition to this, 2000 tons a month is coming from the mill.

A series of drill holes has been put down in the section southwest of Leadville, which show the existence of the regular ore-bearing horizon of blue lime and porphyry over a mile southwest of Leadville. The white porphyry was cut 40 feet below the surface and blue limo at 680 feet, with mineralized contact showing gold and silver. This discovery opens up for development several square miles of territory.

The developments of the year are not to be confined to silver, lead, zinc and iron properties. It is reported that an extensive movement is being organized for work in the gold belt. J. J. Brown has been laboring for the past few months to obtain control of a large group of properties in the gold belt, near Leadville, and has succeeded in securing the control of extensive territory, which it is the intention to develop.

San Miguel County.

The delegation of 100 deported Telluride union miners who have been living at Ouray since their eviction from Telluride returned on the 9th inst. Word of their departure from Ouray had been received at military headquarters, and Adjutant-General Bell, in command of the troops, ordered out the military force, eighty men. Under the direction of the officers, the unionists were separated from the other passengers on the train, searched and lined up along the station platform. When all had left the train they were marched, under escort of the troops and the citizen guard, to the opera house, where they were given supper. At 9 o'clock they were returned to the train, with the exception of eight. General Bell and a detail of thirty soldiers also boarded the train, which started for Ridgeway, the first station out from Telluride.

The Japan group of mines in Savage basin, near Telluride, is under steady development. A crosscut tunnel, 2700 feet long, last season cut the vein at depth of 840 feet below lowest level in upper workings. During the winter a drift has been started on the vein east from intersection, and after it has been driven 160 feet or to a point directly under the bottom of a shaft sunk from the upper workings, a raise will be made to connect with the shaft. The raise will be 460 feet, and it is expected to have the connection made by July 15. The Japan vein carries a shoot of mineral 1 to 3 feet in width, running in gold, silver and lead.

Summit County

The Result group, near Kokomo, it is reported in Mayflower Gulch district, has opened up a fine streak of solid lead ore. C. Andorson has been working this property all winter with three men, driving the tunnel 300 feet. He has cut a streak of solid galena running across the tunnel and is now drifting upon it. He is also driving the main tunnel ahead to cut the lime formation where he hopes to cut another ore body. Snow is too deep for shipments to be made.

The Gold Belt, near Kokomo, continues to take out high-grade gold quartz. Assays show 11 to 14 ounces gold per ton. A great amount of snow fell recently and will prevent shipments for several weeks. The Gold Belt was opened up late last fall.

It is reported that the Union group on Gold hill, near Kokomo, is to start up. M. Gagan, manager, is now in Denver to make arrangements.

Preparations are making to resume dredging near Breckenridge, says W. W. Dyar, superintendent of the American G. D. Co.

Teller County.

The Stratton's Independence Co. shipped during March 4650 tons of ore averaging $30 a ton. The ore is coming from levels one, two, five, six and seven. The grade is above the average shipped from this property for months.

La Belle plant at Goldfield, it is reported, will double its compressor capac-

ity. The company now furnishes power to neighboring mines for fifty drills.

The flow of water from the El Paso drainage tunnel is now 6800 gallons per minute. The flow increases as the tunnel advances toward the Elkton mine.

Eakins & Co., who have five years' lease on the White Horse workings from the 900 level to the surface at Victor have made a shipment of twenty-five tons, estimated to he worth $30 a ton. The ore shipped came from a drift at the 350-foot level. Plans have been drawn for the cyanide mill which is to he erected at the mine, according to one of the conditions of the lease, for the treatment of low grade and dump ore. The construction work will be commenced before the end of he month. Work is to begin on the Deadwood of the United G. M. Co. at Victor.

Lessees who have a hlock of the Anaconda estate, near the Anaconda depot, have their shaft down 75 feet and are sinking with two shifts of four men each. The shaft is 4½ by 9 feet. They will sink to 500 feot before lateral work is started.

In 1902 the Last Dollar at Victor ceased operations at a depth of 1200 feet. The mine at that time was making eighty-five gallons of water a minute and the management decided to confine operations to the upper levels. Since the drainage tunnel has tapped the Beacon hill water course the water in the Last Dollar shaft has entirely disappeared and Manager Waldron has resumed sinking, having made 70 feet helow the starting point. There is no water in sight and sinking is to be continued to 1300 feet. Ore continues downward and is showing in the bottom. Manager Waldron also says that he has lately found a new shoot at the 900 level for which he has been searching for three years. The vein at this point is 4 to 5 feet wide with a pay streak ahout 16 inches in width. The mine is shipping 1000 tons a month of a better average value than at any time during the previous six months. The washer works satisfactorily; all the waste and ore is put through the washer and slimes saved which are high grade.

Murphy & Hamlin, lessees of the Isabella mine of the Isahella M. Co. on Bull hill, Cripple Creek district, are making a record for rapid driving with two shifts, under contract. In a month the contractors have advanced the crosscut 200 feet, an average of 6⅔ feet a day. It may he a month before the vein is encountered. Yet the lessees helieve it may be cut at any day. They are drifting for the Empire State shoot opened in the Maloney workings.

Thirty-five tons were sent out the latter end of last week from the Glockner & Co. lease on the Old Mallory shaft on the Empire State, now merged with the Isabella Co., says the Record. The ore was graded; controls from the local sampler show values: No. 1, $25 a ton; No. 2, $52 a ton; No. 3, $205 a ton; No. 4, $9540 a ton. The hulk of the ore was of the two lower grades.

Lessees are contemplating extensive work on the C. O. D. on Poverty gulch and are overhauling the machinery. The mine in the earlier days of the camp was a heavy producer. Water hampered the French owners, and although powerful pumps were bought they were never operated. The water has entirely disappeared through the various drainage tunnels and the mine is now dry.

The high-grade shipments from the mines on the west slope of Beacon hill are attracting attention to various unworked claims on the hill. An Eastern syndicate with a representative in the district is now attempting to close a lease in this section, and his company is prepared to expend a considerable sum in development work, hut declines to negotiate for ground under a less period than three years.

GEORGIA.

Cobb Coonty.

(Special Correspondence).—The Kennesaw M. E. & D. Co. own the Georgia Bell gold mine, 7 miles from Acworth. The property consists of 240 acres. The improvements on the mine consists of a 30 H. P. hoist, 40 H. P. hoiler, 60 H. P. engine, and shop with all required modern tools and appliances. The mill consists of one grinder 40 tons capacity, one amalgamator 100 tons capacity, a 10-stamp mill, two concentrators and a Gates rock crusher, automatic feeders, all constructed so that when the miner shovels the ore into the hucket it is not touched hy hands any more. The developments of the mine consist of twelve shafts about 30 feet deep for a distance of 1¼ mile iu length and 600 feet in width, all in ore and on five different ledges. The main working shaft is 65 feet deep. At the hottom of the shaft there is one drift in 45 feet south cutting ore, one drift east 65 feet in pay ore. J. H. Brown is superintendent. There are many other good properties in both Cobb and Cherokee counties that will later develope into good paying mines.

Acworth, April 8.

IDAHO.

Blaloe Coonty.

(Special Correspondence).—During the '80s the towns of the Wood River valley were the center of an extensive silver-lead mining district. Twelve years ago the greatest producers were closed, since which time the country has been quiet, but within the last two years many of these old claims have heen reopened. Of these old properties the Minnie Moore, 1½ miles west of Bellevue, was one of the largest producers. It was owned by Englishmen who, after taking out several million dollars, thought they had exhausted it. In this county there is a fault or break in most of the silver-lead veins and they had struck this hreak, and, not understanding mining geology, abandoned operations. Three years ago the property was bought by Eastern men, and, under the systematic management of I. E. Rockwell, it has taken its former place among the great producers. After taking the water from the mine, a crosscut was run on the 900 level and an ore body cut containing, approximately, a gross value of $2,000,000. The main ore shoot now exposed is 350 feet long. The first-class ore at the 1000-foot level is steel galena, from 1 foot to 9 feet wide, and samples 70% lead and 110 ounces silver per ton. The second-class ore is concentrated four tons into one, and runs ahout 55% lead and 60 to 70 ounces silver. All the ore thus far produced has come from one claim less than 1400 feet in length. Recently, while the men were at work, the water commenced to come in from the bottom. It rose so rapidly that the men were compelled to abandon one of tho pumps. The water rose rapidly for about 300 feet and then the pumps were ahle to check it, and it was finally pumped out. Evidently a large underground reservoir had been cut.

Hailey, April 6.

Idaho County.

(Special Correspondence).—On the H. Y. group the tunnel on the Dakota claim is in 200 feet, the values running from $1 to $16 per ton. The second payment on the purchase price of the group has been made and a discount for cash is being considered hy the owners. Sinking of the 100-foot shaft on the Climax is making good progress. The Diamond Chief Mining Co. has heen organized at Asotin, Wash., to operate a group of sixteen claims on the west fork of Monumental creek, which includes a fine town site in Thunder Mountain district. The driving of two tunnels has been under way all winter, under charge of J. Cassell. Each tunnel is in 60 feet. and they will he continued 200 feet to get into solid formation. Ore giving good assays has heen taken out. The company also owns a group of claims at Copper Camp on lower Big creek, where developments are heing made hy G. Brewer and Babendorf Bros. On the Black Bear claim a 12-foot ledge has been uncovered, carrying 6% copper and $8 in gold per ton.

F. S. Allison of Sugar creek says the 300-foot tunnel on the Pickwick group is ahout half completed. A crosscut 50 feet each way from the 150-foot station shows ore from the face of the left drift worth $47 per ton. Considerahle active work is being done on and near Sugar creek.

The Blue Bird group of five claims on McCann creek has one ledge of white quartz porphyry 35 feet wide carrying values of $3.50 per ton. Another ledge 30 feet wide of dark ore, between granite walls, has 4 feet of talc on each wall that gives a value of $4.80 per ton, the entire ledge giving from $3.50 to $4.80 in gold.

The Confidence group of seven claims on Gold mountain, half a mile from Sugar creek, is sold to Mr. English of Omaha, Neh. It has a 30-foot tunnel on a 12-foot ledge running $6.40 to $8.75 per ton. The Independence group of six claims owned hy F. B. McCann of Lucile, Ida., lies hetween the Confidence and Blue Bird groups. A 60-foot tunnel is driven on a ledge from 80 to 100 feet wide between granite walls, and has values running from $4 to $6 per ton in gold. The crosscut tunnel on the Burr Oak claim of the Sunnyside group is in 1200 feet and has encountered quartz-porphyry, which is helieved to indicate an approach to the ore hody developed in the north drift of the upper tunnel.

Roosevelt, April 5.

At Hump, the Jumbo's March cleanup is stated to have been $15,000, the largest in the history of the camp. This hullion was from the plates, and between $4000 and $5000 in concentrates are ready for shipment or cyaniding.

The Wise Boy mine is working several men in the lower tunnel and is making a good showing.

The Crackerjack, in the Buffalo Hump camp, is working twenty-five men. In the lower tunnel they are opening a large ore body that has been tapped above. The property has a 10-stamp mill.

The Lucky Lad, operated hy Seattle people, has increased its force and sunk 150 feet. It has from 8 to 12 feet of milling ore.

The Atlas, owned hy Spokane people, is sinking and is down 175 feet, working twenty men.

Owyhee County.

(Special Correspondence).—An important strike is reported on War Eagle mountain, parallel with the Golden Chariot lode. J. Hogan and K. H. McLeod made the discovery. These experienced prospectors found rich float and started a shaft, and found a pay streak 18 inches wide, the ore running, it is thought, $750 in gold. They have fifteen tons out and a mill run will he made as soon as conditions permit.

J. Beaton has been running a tunnel the past four years on his claim—the Industry — adjoining the Empire mine. When in 300 feet a 3-foot vein was crosscut, with a pay streak of 18 inches, the ore running from $100 to $1000 in gold. He has ten tons sacked, employing two men to assist him.

Preparations are heing made to work the Fourth of July group this season. This property is a recent location and remained unnoticed for years, the surface being capped with rhyolite. In following the course of the Golden Chariot vein the discovery was made hy Hogan, Connors & Evans. A shaft was sunk, showing the vein to be 8 feet wide. The entire vein matter will average $10 in gold, which can he recovered at an expense of $2.50 per ton.

The Poorman Gold Mines, Ltd., it is reported will be consolidated with the Sinker Tunnel Co for the purpose of more economical development. The latter company suspended operations a year ago. The reported consolidation and the new strikes made this season are encouraging to individual claim owners and a lively season is anticipated.

The Trade Dollar Con. M. Co., operating on Florida mountain, shipped 1000 pounds of bullion to the mint tbis week. This is a portion of the monthly production, as 25% of the values are contained in concentrates. This property has ore reserves in sight, it is said, to keep the mill at Dewey running for two years. The large tunnel is in nearly 2 miles, with another mile to be run before completion. The company has received eight more elcctric transformers, which will be utilized in the haulage plant. The property has produced $10,000,000. F. Irwin is general superintendent, J. B. Mattenson foreman, J. Inglis master mechanic, and E. C. Given chief clerk. The company employs 250 men, and wages are $3 per day for miners, $3.50 for machine men and $4 for mill foreman and mine bosses.

The Trade Dollar Extension M. Co., adjoining the Trade Dollar, is doing extensive development work, two tunnels heing driven to cut the veins. Several huildings are completed and electric machinery will be in place in a few days. The property shows high values in gold on the surface. The property is owned by Salt Lake men, who are having the group patented. W. Williams is mine manager and A. F. Stevens consulting engineer.

The De Lamar mine is producing 100 tons a day, the ore heing treated hy the cyanide process at a cost of $2.50 per ton. This property was reputed to be worked out four years ago and now has over two years ore in sight. It has produced between $10,000,000 and $11,000,000. E. V. Orford is general manager.

The old Flint district, 9 miles southwest of Silver City, promises to be active this season. The mill, which has been idle for a number of years, is again to he put in commission, and several men will he employed. The White Bros. and D. Adams have a small mill in operation, which is run in the spring during the water season. They have some high-grade ore.

South mountain promises to be lively the coming season and is attracting attention on account of the high-grade argentiferous ores. The American Standard M. & M. Co. is making preparations to work their property on an extensive scale and will he on the ground about May 1 to commence operations. This company had a carload of high-grade carhonate ore ready to ship last season, hut was prevented on account of the roads not heing completed until too late in the fall. T. F. Walsh of Denver is president of the company and F. T. Clemmons will he manager. What is needed most in this camp is capital to properly develop the district.

Dewey, April 6.

Shoshone County.

Two feet of ore has heen opened in the lower tunnel of the Trade Dollar, at Burke. The strike was made when the tunnel had heen driven 1300 feet. At first there was only small stringers, but it has opened up into a well defined ledge, with 2 feet of good milling ore. This is at a depth of 700 feet. The Trade Dollar is on Gorge gulch, half a mile from Burke, and 1 mile south of the Hercules mine. The principal stockholders in the company are C. Amonson, A. P. Hunter, B. O. Skonnard, M. C. Peterson and A. Shoff.

The new electric power plant at the Hercules mine, near Burke, will be in operation this month. The mine is working 120 men. The new power plant will supply the mine with electric lights.

After a closedown of several weeks, during which time a hoist and pump were installed, the Evolution mine, the first location made in the Cœur d'Alenes, has resumed development. During the winter seven men have been sinking a shaft to tap the ledge at a depth of over 200 feet. When the creek level was reached water was encountered, and it was necessary to install a pump. The shaft will have to be sunk 150 feet more hefore the ledge is encountered. The Evolution was located by A. T. Pritchard in 1878. The ledge that has been uncovered abovo tho shaft has returned values in gold, silver, lead and copper.

Lessees of the upper workings of the Snowstorm, near Wardner, expect to hegin shipments of copper ore to the Tacoma smelter. Development has disclosed high grade silver-copper ore.

MONTANA.

Fergus County.

G. M. Anderson of Maiden bas secured a lease on the Maginnis mine at Maidon and has struck high-grade shipping ore. He hegan work in the mine several weeks ago and found a good grade of milling rock, but not carrying values sufficient to ship profitahly. Since then in a winze off the main tunnel he has discovered a body of high-grade ore.

In Tilden gulch, on east slope of the range, in Cone Butte section, near Lewistown, the Case-Wilson Cyanide Dev. Co. is working the Tilden gulch group of ten claims, which the company has under bond. Seven men are working on this group, and during the winter 550 feet of development has heen done. Low-grade ore hodies are showing in the workings, particularly on the Myrtle and Daisy lodes. A mill will be added to the group during the summer. On the Myrtle a crosscut tunnel is heing driven for exploration. This tunnel has reached 180 feet. The ore of the Tilden gulch group is a cyaniding proposition on the surface, but in the deeper workings much of the ore is impregnated with fluorite. Losinger, Daugherty & Pender have the Laura B. and other claims adjoining the Tilden group on tho west.

NEVADA.

Esmeralda County.

At Goldfields, the new camp west of Tonopah, the January and Jumbo lessees are shipping five cars of ore weekly to Reno. It is reported to run over $300 per ton.

Lincoln County.

(Special Correspondence). — The Nevada Copper Co., in Yellow Pine district, is driving a crosscut to tap the ore shoot developed on the surface. The tunnel will tap the vein at depth of 300 feet. —— It is reported that the numher of men on the Green Monster will he increased. This property is 8 miles northeast from Sandy, which is the base of supplies. The mine is located on a lime contact which can he traced for ahout 1 mile. On the property are three shafts down 350 feet; also levels from the different stations cutting bodies of lead carbonate and galena, carrying good values iu silver. The ore also carries copper. Throughout the mine copper glance is found which is rich in silver. The accompanying spar also carries some values. An ahundance of water is obtainable about 1 mile from the mine, and with the Salt Lake railway now nearing completion the profitable working of the propery now seems assured.

The Nevada-Keystone M. Co. has issued thoir report for the last quarter of 1903, which shows a total of 1280.8 tons of ore milled, from which was recovered $29,298.85, besides values recovered by cyanidation of tailings. The total amount of development work during this period was 900 feet. The new working shaft has reached the 670-foot level, showing ore at the hottom which assays as high as $100 per ton. The 540-foot level has been driven 200 feet through a continuous ore shoot. This level will tap the hottom of the old incline in ahout 30 feet more. The main tunnel is heing pushed ahead to prospect the Honduras claim adjoining

the Keystone. Twenty-five men are employed in development work. On January 20th the regular semi-annual dividend was paid, amounting to $19,325, making a total of $42,623 of dividends paid since September, 1902, at which time the present company started milling. C. Andersen, E. M., is the general superintendent of the property.

Sandy, April 12.

The Searchlight M. & M. Co. is running a drift along the foot wall of the vein, now in 40 feet.

Two miles northwest of Searchlight, in the low hills running up to Pinto mountain, is the property of Onkey & Conley. They are down 40 feet and have a 3-foot ledge. The vein all "horns" and there is a streak in it of high-grade ore.

The Empire Co., near Searchlight, has a millsite surveyed at Empire Camp. The company intends running a 500-foot crosscut from above the millsite to tap the Empire lead. A mill is contemplated.

The latest water strike at Searchlight was made last week by the Pompeii M. Co., operating the Miess property. The strike was made in the main shaft at a depth of 262 feet. An 8-foot sump has been cut and a west drift is being run, from the end of which crosscuts will be run.

The Quartette mill at Searchlight has been closed down for several days while a change of engines was made. A new 40 H. P. gasoline engine has been installed and the old engine moved to the electric room, says the Searchlight. The electric plant adjoins the mill. The plant will furnish power for lighting the property above and below ground and also for operating the pumps. The elevated platform for the six settling tanks is up and the tanks will be set up in a few days. Superintendent F. J. Harrington is taking advantage of the close down of the mill to straighten the shaft.

Nye County.

On the 800 level of the Belmont mine at Tonopah the west drift on the hanging wall is out 25 feet and shows 5 feet of shipping ore. The east drift on the foot wall is out 40 feet and producing a good grade of milling ore. The ledge is 28 feet wide where crosscut.

G. Zanoli last week shipped ten tons of high-grade silver-lead-gold ore from the Rabbit mine at Ely to Selby's Smelting Works, says the Eureka Sentinel.

The McNamara mine at Tonopah is crosscutting through mineralized country rock, which is there considered an indication of proximity to a vein.

The January lease at Goldfields is hoisting thirty tons of ore daily. The sorted first-class runs $200 per ton.

It is reported that J. Campbell has cut 4 feet of $90 rock on a claim southeast of Gold mountain.

In the United-Tonopah a streak of shipping ore has come in on the hanging wall at a depth of 290 feet, says the Bonanza. The remainder of the vein carries gold in milling values.

White Pine County.

It is reported that rich finds of silver and gold ore have been made at Dolly Varden, a camp near the Utah line.

OREGON.

Baker County.

The 20-stamp mill for the Belcher mine, near Baker City, is now being shipped to Whitney. Superintendent Brady expects to get the machinery to the property before the roads soften too much.

Gold ore running $40 per ton is reported near Austin. The formation in which the vein occurs is said to be phonolite. The new strike is near the Wisconsin, and is known as the Oro Fino.

A compressor of 6-drill capacity is to be put in at Midway, near Sumpter. Manager Hendryx says the work will be carried out as soon as climatic conditions permit. The compressor will be run by steam. The present plant generates 125 H. P., which runs the hoist, pumps and compressor. The shaft is below the 200 level and a station will be cut at the 260 level.

It is proposed to put in a grinding machine in the Dixie Meadows mill, near Sumpter, to crush the ore from the rolls, which work to 16 mesh. Only 20% to 30% of the values in the ore are free milling, and it is now proposed to crush finer and concentrate.

The strike at the E. & E. mine, near Sumpter, has been settled and the mine has resumed, though not full handed, as some repairs and changes are to be made.

A report from Granite says rich ore has been found at the Cougar, under direction of I. Nail. The ledge measures 7 feet.

The I X L mine, near Greenhorn, which has a 2-stamp mill, is reported to be taking $300 per day from the plates and is shipping ore that averages net over $800 per ton. The last car shipped brought $13,000 for twelve tons, making the production $20,000 per month.

The machinery for the New York Con. is going in and will be in operation by May 1.

Douglas County.

The Oregon Securities Co. at Bohemia reports increase of work projected, both in mine and for the railroad. The tunnel will be completed by Aug. 1. It is in 300 feet into Champion mountain, through which it will be run to make connection with the Musick mine, allowing the ore to be hauled by electric tramway from that producer to the mill built in Champion basin. Running this tunnel will cost $12,000 to $15,000, says G. B. Hengen of New York, president of the company, but by so doing they will crosscut two veins of ore already known as producers. The first one is the Excelsior, which will be cut at distance of 150 feet from present face, and the second, the Champion, will be reached at distance of 350 feet from face. The tunnel when completed will be 1500 feet long, and will be large enough for a railway train to pass through. When the Champion ledge is cut it is intended to follow that vein the entire distance through the mountain, securing ore for milling. As soon as the tunnel is completed ore can be obtained from the Musick mine, but until that time they will use ore from the Champion mine. Three air compressors, with drills, are in operation. As soon as the snow clears they will get the road in shape from the Musick mine, the rails being already on the ground. The electric plant is completed. Connections for electricity have been installed. The railroad will be completed by May 1 to the warehouse, where the electric plant is built. It is then intended to put in an electric car line from there to the mill. The distance is 5 miles.

Josephine County.

The Allen mine, a gold-copper property, on Rogue river, 3½ miles south of Galice creek, is reported sold to C. d'Autremont of Duluth, Minn., for $750,000.

SOUTH DAKOTA.

Lawrence County.

March averages at the Spearfish G. M. & R. mines, in Ragged Top district, were a dollar better than those of February, being $5.50 a ton. February, however, was a month of profit, $21,000 having been turned out during that month. The average value of February ore was $4.68; the average recovery $4.46, showing an extraction of 95.4%. The net profits were between $9000 and $10,000. This was on ore extracted in the course of development. A header has been started toward another ore body, making six drifts for exploratory purposes. All are in ore.

Arrangements are being made by the Clover Leaf Co., near Perry, for the sinking of the shaft to 1000 feet depth. A small hoist will be installed at the bottom of the shaft at 700 feet to be used in sinking. The large engine at the surface has all the work it can do in hoisting ore and rock broken in development on the proper levels. Improvements are being made in the mill.

UTAH.

Grand County.

F. B. Hammond reports another strike in the Blue Jay, adjoining the Big Indian mines, near Moab, says the Tribune.

In the Stone Cabin group, owned by Mr. Hammond and associates, 20 feet of copper ore is opened that will average 7.5% copper, with some silver. The group is near the Paradox mines.

The Big Indian group is owned by C. E. Loose, Gov. Wells, the L. Taylor estate and J. Skowes.

The first cyanide plant in the La Sal region is about to be built by the Interstate M. & M. Co., 20 miles southeast of Moab, says J. H. Clark, superintendent. The ore is reported to average $7.50 gold per ton. Trials have demonstrated that the cyanide process is adapted to the ore.

On the Grouse Mountain group Superintendent J. W. Wheat has opened up 20 feet of similar ore.

The uranium deposits in the same locality continue to attract attention, with a prospect of extensive development.

Tooele County.

W. P. Richards, of the Utica group, on Dutch mountain, in the Deep Creek section, says another gold discovery has been made in that locality, in territory acquired by himself and associates in the Utica. Recently the manager, while looking for a suitable site to begin a shaft, found the rock rich in gold.

The Sacramento mine, at Mercur, has about $13,000 worth of quicksilver on hand reduced from the mercury-gold ores of that mine. The gold is obtained by cyanidation.

Utah County.

March, in the ore and bullion market, closed on settlements aggregating $2,013,600, with copper bullion output from furnaces independent of those operated by the American S. & R. Co., increasing the output to $2,911,357, says the Salt Lake Tribune. During same month last year settlements in the open market amounted to $2,029,540, with the total from all sources of $2,780,000. The output of copper bullion containing gold and silver from furnaces aside from those of the American shows total of 2,958,990 pounds, compared with 2,921,642 pounds for same period in 1903, as follows:

	Pounds.
Bingham Con.	727,190
United States	1,023,400
Utah Con	1,208,400
Total	2,958,990

In addition to this copper bullion the American S. & R. Co. forwarded matte containing 765,000 pounds of copper, increasing the total copper bullion to 3,723,990 pounds. The output will be still further increased as there are enlargements going in at plants now in operation and new plants in process of construction. Equipment at the United States will take care of the increased output of lead ore, but a sixth furnace being added to its battery will add to its facilities for reduction of copper ores, while in June the Utah Con. will be reducing 50% more, and the fourth furnace at the Bingham Con. is ready for operation.

WASHINGTON.

Ferry County.

(Special Correspondence). — Three months of the new year have gone and the promise of progress in mining has not materialized. At the beginning of the year the opinion was general that ere this the boom of prosperity would have been launched. That this is not the case cannot be attributed to any fault of the mine managers. The mines are sufficiently developed to furnish a large tonnage of ore daily. The real cause is inadequate treatment facilities. The smelters have been unable to take more than 50% of the possible output of the mines and, therefore, the mines could be operated only in a small way. This fact also prevented the opening of new mines, as it was useless to do so if no market could be found for the ores. The hope of the camp at the beginning of the year was the Heudryx process. When the Mountain Lion Co. began the erection of a plant to test the ore by the new process, it was believed that it would prove a success. There was much delay in getting the machinery started, and when started there were the usual drawbacks incident to the installation of new machinery. A test run has been made of 150 tons. The figures have not been given officially to the public, but it can be said with safety that the test was satisfactory, and it is reported that the Mountain Lion Co. will install machinery to handle 100 tons per day. Should it do this, no doubt others will do the same, and mines which have been shippers in the past will install similar plants. It is probable the results of the test in the Mountain Lion plant will soon be made public. Meanwhile the shipping mines will continue to operate in a small way, as in the past.

The Quilp, which has sent out sixty tons per day for the past eighteen months, is continuing its output for the present. The mine is reported looking well, and opened to the 500 level. Its producing capacity is 150 tons daily, but it is probable the mine will close, as the management do not think it good business to mine such a small quantity of ore as the smelters can take. Complete success cannot be made of mining in this section until the treatment facilities are greatly enlarged.

The Belcher mine continues development. Recent assays show a value of $49.70 in gold, $2 in copper and $1.46 in silver, from an 80-foot vein.

Republic, April 7.

WYOMING.

Carbon County.

(Special Correspondence).—The North American C. Co., owning the Ferris-Haggerty and other copper properties near Encampment, are ready to start up the new concentration mill, which is equipped with breakers, rolls, tables and other accessories to the concentration of the ore.

Encampment, April 11.

FOREIGN.

AFRICA.

Transvaal.

The Rand Victoria bore hole No. 2 is now 4975 feet deep and is in slate. Boring has ceased. No new signs of reef in bore have been discovered, and it is thought the series has been disturbed by the dike overlying reefs. This bore hole cut the main reef series at a depth from surface of about 4580 feet, approximately the depth at which they were expected to be met. The bore hole, after passing through dike near the reefs, found the formation was disturbed, and the bore hole was continued farther to make sure that the whole series had been passed through. No further reefs were met, but the slate formation which underlies the main reef series was encountered in correct position, adding additional proof that the reefs previously met with were the main reef series. The fact of the reef being disturbed in the neighborhood of the dike is not an unusual occurrence. The Rand Victoria bore hole No. 2 has secured results for which it was put down, to ascertain accurately the depth at which the main reef series would be cut.

AUSTRALIA.

New South Wales.

Diamond drill prospecting, both vertical and horizontal, in the British Broken Hill proprietary, is resulting in discovery of new bodies of good grade sulphide ore, from 14 to over 60 feet wide. The mill is treating about 9000 tons monthly.

BRITISH COLUMBIA.

J. Hyland, trader of Telegraph Creek, has arrived at Victoria with specimens of gold from the latest field, the Nahani river, near the junction of the Liard and Dease rivers, northeastern British Columbia, says the Rossland Miner. The discovery was made by J. Morrow two years ago. Recently Morrow sent an Indian to try the river bed, not thinking there was much in it. The Indian, who had mined in Cassiar, made a sluice box and shoveled in some dirt, and in an hour he got a handful of gold, which he brought to Telegraph Creek. The news, it is said, has caused a stampede from all over the north, although ice and snow are heavy on the ground and water. The new field is reached by way of Telegraph Creek.

The weather conditions dominate the mining business to a great extent in this Province. During the winter shipments of ore are made from many mines by the method known as "rawhiding" over the snow, for which ore is gotten out in advance as far as possible. When spring comes, there is an interval of several weeks when the snow is too soft for rawhiding or the mud too deep for wheeling, and ore shipments come to a standstill, though if the management has provided the necessary supplies during winter, the operation of the mines can be continued. This is the season of the year when shipments to a great extent cease, owing to the condition of the roads.

Nelson District.

The Broken Hill M. & M. Co., operating the Wilcox mine, near Ymir, reports having struck black sulphurets and pyrites, carrying gold, silver and lead. The find was made in the tunnel at vertical depth of 240 feet. The ledge is 2½ feet wide and the sulphides from 14 to 16 inches wide, the balance of the vein being high-grade milling ore. The company is opening a new vein on the first level and has drifted 40 feet. In this vein there is a high-grade streak 2 feet in width. The stamp mill is kept in continuous operation. There are twenty-seven men at work. S. Bywater of Spokane, Wash., is president of the company and E. A. King of Chicago, Ill., manager.

The Reliance G. M. & M. Co., Ltd., has been incorporated by A. H. Kelly, J. A. Turner, W. P. Tierney, B. White and R. S. Lennie of Nelson. The company has bought the May and Jennie group of claims on Forty-nine creek, 8 miles from Nelson and 5 miles from the tracks of the Columbia & Kootenay Railway. Over 3000 feet of work have been done in tunnels, shafts, drifts, raises and crosscuts.

CUBA.

An extensive deposit of chromic iron ore is reported found on the coast of Cuba, 30 miles from Baracoa. It shows from 8 to 12 feet in thickness. It is said the freight rate by water will permit of its transportation.

Two companies are mining manganese ores in Cuba, according to the Mineral Resources, issued by the U. S. Geological Survey—the Ponupo M. &. T. Co. and the Standard Manganese Co., shipments being made through port of Santiago de Cuba. The Ponupo manganese mines are near La Maya, 16 miles northeast of El Cristo, the ore averaging 47% metallic manganese. The Standard Co.'s Boston mine is 3 miles southeast of El Cristo. The mine is worked by open cuts, through mixed sandstone and manganese. The ore occurs in pockets. When sorted for shipment, the ore is said to average 50% metallic manganese, and 1% to 3% iron.

FRENCH GUIANA.

The output of gold in 1903 is reported at Cayenne and St. Laurent at 4033 kilograms. Of this total 3597 kilograms were entered at Cayenne, as compared with 4645 kilograms in 1902.

INDIA.

The output of the gold mines of India for month of February was 50,151 ounces, as compared with 51,588 ounces for January, and with 46,268 ounces for February, 1903. It was distributed as follows:

	February.
Champion Reef at Kolar—	
Mill, tons	15,062
Mill, ounces	14,600
Tailings (cyanide), tons	19,400
Tailings, ounces	3,021
Total ounces	17,621
Mysore at Kolar—	
Mill, tons	15,750
Mill, ounces	14,756
Tailings (cyanide), tons	11,817
Tailings, ounces	1,661
Total ounces	16,417
Ooregum at Kolar—	
Mill, tons	10,402
Mill, ounces	5,288
Tailings (cyanide), tons	10,012
Tailings, ounces	1,001
Total ounces	6,289
Nundydroog at Kolar—	
Mill, tons	5,800
Mill, ounces	5,065
Tailings (cyanide), tons	4,825
Tailings, ounces	566
Total ounces	*5,786
Balaghat at Kolar—	
Mill, tons	2,800
Mill, ounces	2,180
Tailings, tons	2,280
Tailings, ounces	230
Total ounces	2,410
Mysore West-Mysore Wynaad at Mysore—	
Mill, tons	1,816
Total ounces	977
Hutti at Nizam's—	
Tons	960
Ounces	651

*Including 15.5 ounces from cyanide slag.

MEXICO.

Chihuahua.

The Harmon M. Co. has its shaft on the Monte Cristo, near Parral, down 150 feet and on the San Nicolas 300 feet.

The Buena Ventura Co., near Parral, has begun operations by starting a shaft and exploring the old open cuts. J. W. Pender is manager.

The third California company to operate at Santa Eulalia has begun operations on La Minerva mine. The owners are Los Angeles, Cal., men.

At Terrazas camp Dale Bros. and F. McDonald have out 800 tons of shipping ore at the Americano mine. They are taking out forty tons daily, much of which is said to be of shipping grade.

At the Quebradillas mine, near Parral, there are eleven shafts, ranging in depth from 120 to 200 feet. It is reported $1200 worth of ore is mined daily. J. W. Pender is manager.

The output of the Santa Eulalia mines is 30,000 tons of ore monthly, says the Chihuahua Enterprise. This ore comes principally from four mines, the properties of the American S. & R. Co., the Santa Eulalia Exploration Co., the Chihuahua M. Co. and El Potosi M. Co. The Mineral Railroad is hauling 8000 tons per month, principally from the first two companies named; and the Chihuahua M. Co. Railroad is hauling 12,000 tons monthly from El Potosi and Santo Domingo mines. Other mines ship irregularly as development produces ore. Both railroads are taxed to full capacity. The output is expected to be increased. The Santa Eulalia M. Co. (Hearst) has struck ore in No. 3 shaft. The Santa Eulalia Ex. Co. is hoisting ore through the shaft of the American S. & R. Co., hut as soon as the shaft of the former is completed both companies will increase their outputs. In the Parcionera the known ore body has not heen reached, but is expected this month.

Sonora.

There is considerable activity in the Sierra Tordillo country, west of Fronteras, a station on the Nacozari railroad. Many Americans are taking up copper concessions and gold and silver properties are heing opened.

The Santa Rosalia is to he worked again. This property is within 15 miles of Arizpe, the capital of the district, and 65 miles from Cananea. G. Mitchell, formerly manager of the Cananea Con. C. Co., is at the head of the uew Santa Rosalia Co.

The Phelps-Dodge Co. of New York is working on their gold property. A mill will be installed and the ore dump worked. The company is shipping high-grade gold ore. All the rock that goes $100 or less is put on the dump for reduction in their own plant.

The smelter of the Juarez Smelting Co., including the concentrators and machine shops, were destroyed by fire last week, says the Cananea Herald. A company of soldiers from Juarez were taken to the scene of the fire, but could do nothing. The smelter is 2 miles south of Juarez, on the Sierra Madre railway, and was built in 1897–8 and at a cost of $150,000. The works had heen shut down two months, owing to lack of ore.

Yucatan.

Oil fields are reported found on the Yucatan coast by G. F. Dujay et al. of Galveston, Texas. Concessions on 150,000 acres of land have heen ohtained from the Mexican Government and three of the wells drilled have proven the presence of petroleum. Dujay will estahlish a pipe line to the coast and build oil harges to market the product of the field.

NEW ZEALAND.

The total production reported for ninety-six dredgers operating in New Zealand during January, 1904, was 7400 ounces fine gold. Average yield per dredger was 78 ozs. 15 dwt., and average working time of dredgers was three weeks, showing a loss of 25% time.

Personal.

J. H. KEMP has resigned as manager of the Magnolia mill at Magnolia, Colo.

R. B. LAMB is with the North American Copper Co. at Encampment, Wyo.

JACKSON DENNIS, a mine owner of Sutter Creek, Cal., is in San Francisco, Cal.

F. H. HOOD is manager of the copper mine near Fairplay, El Dorado county, Cal.

H. A. LEE has returned to Denver, Colo., from New York and other Eastern cities.

F. M. CLARK is assayer of the Amador County Reduction Works at Sutter Creek, Cal.

J. H. MACKENZIE of San Francisco, Cal., has left Rossland, B. C., for Spokane, Wash.

W. C. HOWARD has returned to San Francisco, Cal., from mine examination in Mariposa Co., Cal.

W. D. PEARCE, general manager of the La Luz G. M. Co. of Chihuahua, Mexico, is in Los Angeles, Cal.

H. W. TURNER, E. M., has returned to San Francisco, Cal., from mine examinations at Tonopah, Nev.

H. DE C. RICHARDS of San Francisco, Cal., has gone to Sonora, Mexico, to examine mining properties.

J. H. BROWN is superintendent of the Kennesaw M. E. & D. Co. at the Georgia Belle mine near Actworth, Ga.

W. F. WENDT, manager of the Buffalo Forge Co., Buffalo, N. Y., has returned there from a trip to California.

W. SHARWOOD, a mine owner and manager of Soulsbyville, Cal., is recovering from an attack of appendicitis.

F. D. SMITH of Sumpter, Or., and manager of the Snow Creek mine, has gone to Mexico City on mining business.

DEW OLIVER, president of the Zubiate, Mexico, M. Co., has returned from Sonora, Mexico, to San Francisco, Cal.

W. F. WARDEN, president and general manager of the Burt Mfg. Co., Akron, Ohio, sailed for Europe on the 15th inst.

JOHN B. FARRISH of Denver, Colo., has returned to San Francisco, Cal., from a professional trip to Sutter Creek, Cal.

A. LUCE, C. BENHAM AND J. HARTIN of Prescott have heen examining mines owned hy the former near Hillside, Arizona.

J. H. CLARK, superintendent of the Interstate M. & M. Co., has returned from Salt Lake, Utah, to the mines near Moab, Utah.

H. C. HOLTHOFF, general manager of the Power & Mining Machinery Co., Cudahy, Wis., has returned there from Denver, Colo.

THOS. CLARK, superintendent of the River Hill mine, near Placerville, Cal., has returned to the mine from San Francisco, Cal.

F. O. WILKINSON, superintendent of the Nevada Copper Co. in Yellow Pine district, Lincoln county, Nev., is in San Francisco, Cal.

M. P. KLAVERWEIDEN, chemist, and G. H. Verloop, E. M., of Amsterdam, Holland, are spending some time in Denver and Colorado.

A. W. TAYLOR of Alameda, Cal., has returned from Corea, where he held the position of a division superintendent for the Oriental M. Co.

JOHN ROSS JR., superintendent of the Wildman-Mahoney mine at Sutter Creek, Cal., has gone to southern Oregon to make mine examinations.

THOS. CLARK, superintendent of the River Hill mines, near Placerville, El Dorado county, Cal., has returned to the mines from San Francisco, Cal.

H. HERFORD of London, Eng., representing an English company, has returned to England from Jerome, Ariz., where he bought copper prospects.

W. H. MCCORD of Guanajuato, Mexico, has returned to San Francisco, Cal., from a visit to Virginia City, Nev., where he went to inspect the large cyanide plants.

R. J. GRANT of Denver, Colo., left San Francisco, Cal., on the 14th en route to Kalgoorlie, West Australia, where he takes a position with Bewick, Moreing & Co.

J. H. FENNESSY, president, and A. H. Seep, vice-president, of the Mine & Smelter Supply Co., Denver, Colo., are in the City of Mexico on business connected with their firm.

G. F. G. SHERMAN of Grass Valley, Cal., who for some time has been assistant superintendent of the North Star mine, has accepted a position as assistant manager of the Copper Queen mine of Bisbee, Ariz.

E. H. NUTTER of Redding, Cal., has been appointed assistant superintendent of the Standard Con. mines at Bodie, Cal. Theodore Hoover, who formerly occupied the position, has heen made superintendent.

Commercial Paragraphs.

THE J. Geo. Leyner Engineering Works of Denver, Colo., contemplates the erection of a $150,000 plant at Littleton, Colo.

FROM the firm of A. Leschen & Sons Rope Co., St. Louis, Mo., is received a celluloid rope caliper, which they are distributing to their customers who use wire rope, and will he furnished on application.

J. O. DIMMICK, Pacific coast manager Dimmick Concentrating Co. of Denver, Colo., has established his office with the Lacy Mfg. Co., at 334 North Main street, Los Angeles, Cal., where he will make his headquarters.

THE Rix Compressed Air & Drill Co., San Francisco, Cal., have a contract with the Utica Mining Co. for a 400 H. P. compressor, to he placed alongside of the other 400 H. P. machine which they furnished the company three years ago.

INCREASING BUSINESS of the National Wood Pipe Co., Los Angeles and San Francisco, Cal., has occasioned the removal of Vice-President W. J. Woodward from Los Angeles to San Francisco, where he has assumed the management of the business at the company's office, 301 Market street.

THE Ore Concentration Syndicate, with offices at room 53 Crocker Building, San Francisco, Cal., has an order for one of its Elmore oil concentrating plants from the Kassandra M. Co., owner of silver-lead properties in Macedonia. The shares of this company are largely held in France. The ore has to he crushed to 60 mesh to separate the ore from the limestone gangue.

A DOUBLING of its capital stock, which has heen $1,000,000, is announced hy the Crocker-Wheeler Co., manufacturers and electrical engineers, Ampere, N. J. The company was organized in 1892 hy Dr. Wheeler and Prof. Crocker on a relatively modest basis. It now has fifteen hranch offices from Boston to San Francisco, and does a large business in electric power apparatus. The capitalization was several times increased, until in 1899 it had become $1,000,000. In view of the rapidly expanding business the stockholders have now decided to increase this amount to $2,000,000.

Trade Treatises.

Illustrated catalogue of mineral collections, Foote Mineral Co., 1307 Arch street, Philadelphia, Pa.; 25 cents.

Corliss engines and high pressure hoilers are the subject of a handsome treatise from the Murray Iron Works, Burlington, Iowa.

The Keller heater is elahorately described in a catalogue sent by the Pacific Steam Economizer Co., 711 Lankershim building, Los Angeles, Cal.

"Wireless Telegraphy and Its Wonderful Possihilities" is the suhject of a treatise from the Thos. E. Clark Wireless Tel.-Tel. Co., Pontiac, Mich.

Hydraulic dredging machinery, air compressors for heavy duty, are among the subjects treated in Catalogue D from the Great Lakes Engineering Works, Detroit, Mich.

Mining machinery catalogue No. 19 from the Jeffrey Manufacturing Co., Columhus, O., is fully up to the high standard of this company's productions, and will be mailed anywhere on request.

Bulletin No. 6, from the Jeffrey Manufacturing Co., Columhus, Ohio, written hy Frank R. Field, graphically illustrates and descrihes one of the Jeffrey electric coal mine installations in Colorado, giving detailed items of cost and operation. Bulletin No. 7, hy C. B. Peck, also shows the value of electric haulage as compared with mule haulage.

Books Received.

"Quantitative Analysis, for Mining Engineers;" Edm. H. Miller, pp. 137; octavo; reprint of a series of practical articles in School of Mines Quarterly in convenient form; $1.50; D. Van Nostrand Co., 23 Murray St., New York City.

Obituary.

EDWARD WALLOWS, a California pioneer, aged 74 years, died at Dutch Flat, Cal., on the 5th inst.

GEO. BLAKE, formerly superintendent of the Star and O. K. mines in Tuolumne county, Cal., died at Silver City, N. M., recently.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING APRIL 5, 1904.

756,311.—PAPER BOX—F. R. Adams, S. F.
756,565.—WRENCH—T. H. Barry, Empire, Or.
756,774.—STAMP MILL—M. P. Boss, S. F.
756,211.—PRECIPITATING METALS—C. Butters, Berkeley, Cal.
756,582.—VALVE—M. J. Chaplin, Seattle, Wash.
756,584.—BOTTLE—Chase & Dole, S. F.
756,328.—RECOVERY OF PRECIOUS METALS—S. B. Christy, Berkeley, Cal.
756,596.—CORSET SPRING—E. M. Dhale, Oakland, Cal.
756,780.—BOWLING ALLEY—E. F. Dreger, Oakland, Cal.
756,350.—HOSE MENDER—F. A. Garhutt, Los Angeles, Cal.
756,620.—NUT LOCK—W. Ghiglieri, Stockton, Cal.
756,627.—INSULATOR—Hanson & Lamhert, Davenport, Wash.
756,360.—MOWING MACHINE—Harrah & Flint, Pendleton, Or.
756,362.—ROTARY ENGINE—R. Hazelrigg, Cottage Grove, Or.
756,370.—ANIMAL EXTERMINATOR—G. R. Jack, Lockeford, Cal.
756,371.—HOUSE—W. C. James, Cucamonga, Cal.
756,508.—TELEPHONE—G. Konigstein, S. F.
756,385.—MOP HOLDER—J. C. Look, Tudor, Cal.
756,514.—GAME—G. W. Maxwell, S. F.
756,701.—CLIP BAND FASTENER—C. L. Pope, Ely, Nev.
756,529.—GAS COMPRESSOR—S. S. Rose, Amador, Cal.
756,531.—SPRING KNOTTING MACHINE—J. H. Ross, S. F.
756,532.—SPRING DOWEL MACHINE—J. H. Ross, S. F.
756,804.—TOILET PAPER HOLDER—A. E. Sexton, Los Angeles, Cal.
756,425.—SAW GAUGE—W. Stephens, Montesano, Wash.
756,438.—BUOY—W. L. Uhlenhart, Portland, Or.
756,548.—DRAPER—J. C. White, Marysville, Cal.
756,758.—DISPLAY STAND—W. G. Winans, Spokane, Wash.
756,765.—FEEDING DEVICE—Z. Xevers, Santa Cruz, Cal.

Notices of Recent Patents.

Among the patents recently ohtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

GAS COMPRESSORS FOR ICE MACHINES.—No. 756,529. April 5, 1904. S. S. Rose, Amador City, Cal. The object of this invention is to provide a compressor acting upon a freezing medium, as ammonia gas, which will he simple of construction, whose parts are easily accessihle, in which the cooler gas is delivered directly into the cylinder from the coils without coming in contact with or heing heated hy the running gear of the compressor, and in which the chances are ohviated of any admixture of gas with the oil in which the gear in such machines usually runs.

SPRING KNOTTING MACHINE.—No. 756,531. April 5, 1904. J. H. Ross, San Francisco, Cal. Assigned to American Steel & Wire Co. of San Francisco, Cal., a corporation. The object of this invention is to provide a machine for automatically tying or "knotting," as it is called, the end of a conical spring after it comes from the colling machine; such springs heing used as coil furniture springs.

TELEPHONE ATTACHMENTS.—No. 756,508. April 5, 1904. Gahor Konigstein of San Francisco, Cal. One-half assigned to Joseph Silverman of San Francisco, Cal. This invention relates especially to desk telephones. It consists in the comhination, with the vertical post or standard, of a desk telephone having a transmitter adjustahly hinged to its top, of a receiver, and an arm upon which the receiver is carried, said arm heing adjustahle with relation to the post or standard and the transmitter, so as to he supported in proper relation with the ear of the user. In conjunction with these parts are the hook upon which the receiver is ordinarily suspended and hy which an open circuit is normally maintained, connections hetween said hook and a vertically guiding slidable rod, an arm or hand piece hy which the hook is raised and the circuit closed preparatory to conversation and a device hy which the parts may be maintained.

Latest Market Reports.

San Francisco, April 15, 1904.

METALS.

Silver.—Per oz., Troy: London, 24⅛d (standard ounce, 925 fine); New York, bar silver, 53¾c, refined (1000 fine): San Francisco, 53¾c; Mexican dollars, 43½ San Francisco, 43c New York.

Copper. — New York: Standard, $13.25; Lake, 1 to 3 casks, $13.50: Electrolytic, 1 to 3 casks, $13.12½; Casting, 1 to 3 casks, $12.87½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £57 15s spot per ton.

Lead. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¼c 1000 to 4000 lbs.; pipo 6½, sheet 7, bar 5¾c; pig, $4.85. London: £12 17s 6d ℔ long ton.

Spelter.—New York, $5.30; St. Louis, $5.00; London, £22 5s ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

Tin.—New York, pig, $27.87½@28.12½; San Francisco, ton lots, 30c: 500 lbs., 30½c; 200 lbs., 31c; less, 32c; bar tin, ℔ lb., 32¼@35c. London, £127 spot.

Platinum. — San Francisco, crude, $18.00 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

Quicksilver. — New York, $45.50@46.50, large lots; London, £8 5s 0d; San Francisco, local, $43@44 ℔ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

Babbitt Metal.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; oxtra, 17½c; gonuine, 31½c; Eclipse, 35c.

Solder. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

Zinc.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

Nickel.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

Aluminum.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

Iron.—Pittsburg, Bessemer pig, $14.20 @14.35; gray forge, $13.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

Steel. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@14 75
Northern 2	14 00@14 25
Northern 3	13 50@13 75
Southern 1	14 35@14 85
Southern 2	13 85@14 35
Southern 3	13 35@13 85
Forge	12 60@13 10
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 50@ 1 55
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 36@ 2 41
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	13 00@13 50
No. 1 cast, net ton	12 00@12 50
Iron rails	16 50@17 00
Car wheels	14 50@15 00
Cast borings	4 50@ 5 00
Turnings	8 50@ 9 00

Lumber. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher: redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

Nails.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wiro, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

Lime.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

GENERAL SUPPLIES.

Antimony. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

Powder.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

Caps.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

Fuse. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tapo, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

Candles.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

Chemicals. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphito of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrato of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdored sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California rofined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75: sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

Bone Ash.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

Coal. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

Oils.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c: 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, puro, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

White Lead.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

Red Lead.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7¼c.

Litharge.—Pure, in 25-lb. bags, 8@9c ℔ lb.

Borax.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

Manganese.—Pure, ℔ lb., 60c.

Sodium.—Metal, ℔ lb., $1.00.

Bismuth.—Subnitrate, ℔ lb., $2.00.

Mercury.—Bichloride, ℔ lb., 77c.

Molybdenum.—$2.00 ℔ lb.

Chromium.—90% and over, ℔ lb., $1.00.

Phosphorus.—American, ℔ lb., 75c.

Silver.—Chloride, ℔ oz., 90c@$1.00: nitrate, 55c.

Aluminum.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

Uranium.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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Experienced assayer and chemist desires change of position by May 1st, preferably with smelting company. At present employed in Mexico. Best of references. Address E.T.A., care this office.

Experienced superintendent, engineer, Metallurgist; technically and liberally educated; 15 years handling men and machinery of smelters, mills and mines. See testimonials. Address Prof. Stickney, Mountain View, Cal.

Expert assayer with practical working knowledge of cyanide and chlorination processes, desires situation. Correspondence solicited. Best of references. Address B., care of this office.

Man with twenty years' experience quarrying sandstone and slate would like to take a quarry on contract. Address G. D., care of this office.

Mill and cyanide superintendent wants position. Thoroughly understands milling of gold ores and the cyaniding of same. Good assayer. Address D. A., this office.

Mine superintendent is open to engagement with a live company. Thoroughly understands his business. Address B. R., this office.

Miner with fifteen years' experience and fair knowledge of Spanish wishes employment as shift boss in some Mexican mine. Address N. B , this office.

Superintendent of construction, up to date on design and erection of mining and smelting equipment, open for immediate engagement. Address L.A.H., Mining and Scientific Press.

Superintendent, fully competent and experienced, desires position. Assayer, chemist, surveyor and mill man. Address J. C., care of this office.

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Wanted, by a first-class mining company, a good energetic all around machinist as repair man, to take charge of gyratory crusher and general mill repairs. None but competent, sober men need apply. Address M. R., this office.

Wanted—Competent assayer who also understands bookkeeping. Address R., care of Mining and Scientific Press.

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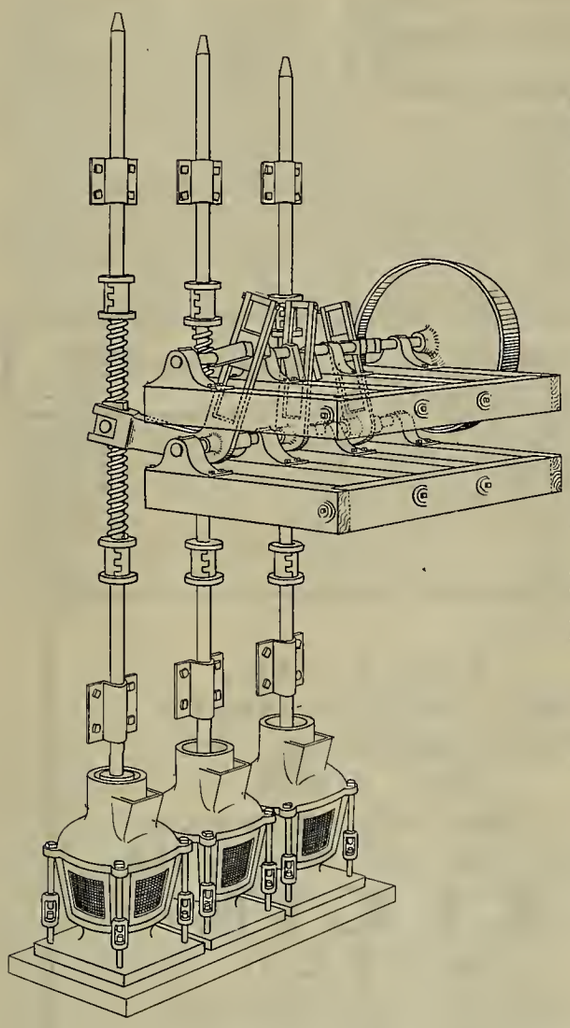

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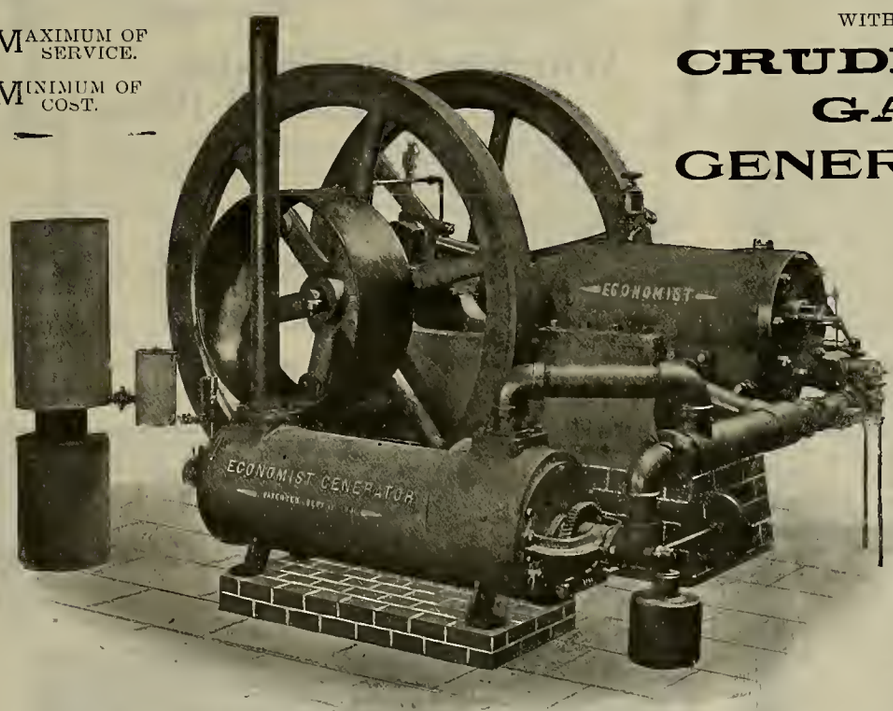

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(ESTABLISHED 1860.)

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Whole No. 2283.—VOLUME LXXXVIII. Number 17. SAN FRANCISCO, CAL., SATURDAY, APRIL 23, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Spheroidal Weathering.

The accompanying engraving illustrates a phenomenon often observed in regions of massive eruptive or intrusive rocks. On first sight one might think the numerous boulders were the result of stream erosion and deposited by such. They, however, are "in situ" and rest on large masses of the same material, and are the result of spheroidal weathering. This property is particularly exhibited by some granites (the case illustrated is of granodiorite at Nevada City, Cal.), but it is also observed in greenstone, various porphyries, andesite, etc. When the more or less angular fragments of the rock are attacked by atmospheric or other decomposing agencies, the corners are first softened and removed or replaced, and the action continuing inward develops a rounded exterior if the boulder is on the surface so that the decomposition products can fall away from the main portion. If, however, the altered portion remains in place, as when the rock fragments are below the surface, on cutting through it a succession of concentric shells are seen around an unaltered core. Sometimes these shells are replaced by other minerals, occasionally ore bearing as in the Bassick mine at Rosita, Custer county, Colo., and described by S. F. Emmons, Trans. Amer. Inst. Min. Engrs., Vol. XVI, p. 833. Where this phenomenon occurs at depth, due to the chemical action of circulating waters, it is known as concentric decomposition. Concerning the occurrence at the Bassick mine, Mr. Emmons says: "The deposit of the Bassick mine is a nearly vertical chimney. It occurs in an andesitic breccia, composed of angular fragments of various sizes and forms cemented together by material of essentially the same composition as the fragments, the cementing material being more readily attackable than the fragments, for the ore has replaced it, forming concentric layers around the latter, whose angles have become rounded during the process of deposition. Here the fragments were original and were necessarily produced by dynamic movements, which probably resulted in a simple fracturing of the rock without much displacement."

In the cut may be seen fragments and shells which have dropped off from the boulders, and also disintegrated, incoherent material. On the left is a boulder resting on a sort of pinnacle or cone-shaped mound, the decomposed products having fallen away from underneath of a large portion of it. Probably the fine material was partly washed away by rain waters. At Nevada City, the surface of the main masses of the grauo-diorite, often many feet across, have a dome-shaped appearance, showing that the action goes on in the main mass as well as the fragmental portions.

There are hundreds of granite boulders in the neighborhood of Prescott, Ariz., which have been produced in this manner, and at the Catoctin silver mine, 15 miles southwest of Prescott, the porphyry dike accompanying the vein shows a beautiful illustration of concentric decomposition. A similar condition may be observed in greenstone tuff near the German mine, El Dorado county, California.

Spheroidal Weathering of Grano-diorite at Nevada City, Cal.

In some instances where spheroidal weathering has occurred the phenomenon has been considered due to stream erosion, and miners have been led to prospect for placer in such deposits, in the belief that gold might be found. In the instance at the German mine above referred to gold was actually discovered, constituting a placer in fact, but the gold came from pockets which had been disintegrated a short distance above on the hillside, as evidenced by the rough and crystal form of the pieces of gold found. There was no evidence whatever of a stream having ever beeu there.

In some way mines and courts seem to have something in common, but it is not always questions of mining law that involves mines and mine owners in litigation. Occasionally it is found necessary to appeal to the courts to adjust other questions than those bearing upon such abstruse problems as those connected with the extra-lateral right. And in these cases in which the technicalities of mining law find no place, the rulings of the court are sometimes quite as surprising as they are occasionally in the more intricate cases. An instance occurred not long since in Australia where a man was accused of stealing a bucket of rich telluride ore found at his back door. The defendant denied the charge and said it was his opinion that some personal enemy had placed the ore where it was found to make a case against him. The court admitted the plausibility of this defense and declared defendant not guilty. Upon acquittal the former defendant applied for an order of court demanding that the ore in question be turned over to him and the order was accordingly made, there apparently being no other claimant who could legally establish ownership to the ore. This is an instance in which the law gives a man that which he cannot rightfully claim.

The Mount Morgan Mine, Queensland, Australia.—(See page 281).

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, APRIL 23, 1904.

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THE difficulties of obtaining sufficient unskilled laborers for the mines of the Transvaal appear to be increasing with the spread of a disease which is locally called the plague. It affects Asiatics, natives and white men alike. Numerous deaths have occurred among the several nationalities. Petitions for and against the free importation of Chinese coolies continue to be circulated among the mines of the Rand. Mine managers and mine officers generally, as well as the white men who are employed, sign "for" the Chinese, and the unemployed sign "against" them. It is not improbable, however, that the experiment of Chinese in the mines will be tried, as the General Government sanctions the scheme.

THE department of mines of Queensland, Australia, recently decided that all official mining returns, monthly aud annual, shall be made in fiue ounces, which is a good idea, as by its use all who are interested may figure the value in whatever coinage they please. In Western Australia a similar rule has been made, but unfortunately the officials of the Goverument have complicated matters by requiring that these returus shall be per ton of 2240 pounds, which is indeed a step backward. There should always be an endeavor to simplify public documents and reports, and in such a decimal system is desirable, but if the metric system is not popular, the ton of 2000 pounds is standard and easier of computation than the long ton of 2240 pounds.

THE Vindicator mine at Cripple Creek, Colo., furnishes an interesting object lesson on the distribution of ore bodies and the uncertainty which always exists in ground not thoroughly prospected. The mine has been vigorously and successfully operated to a depth of 1200 feet and a large amount of valuable ore removed. Last August the mine was closed at the beginning of the strike and the pumps removed from the bottom of the mine. In a few weeks the water rose in the workings to the water line about the 1000-foot level. Since resuming work the company has been exploring the ground above the drainage level and has found several large and rich shoots of ore in the undeveloped territory, which, in the haste to reach depth, were passed by. These new ore bodies will now permit a large output from ground previously considered of uncertain value. It indicates the possibilities that lie in other properties of the district, at points above drainage level. This is not the first experience of the kind in Cripple Creek district, and it should be suggestive of the great possibilities which lie near the surface, at least above the 1000-foot level. In the haste to get great depth much promising territory remains undeveloped.

The One Mine Camp.

For some reason there is found among many miners a prejudice against a "one-mine camp." The camp where there is but one mine is looked upon by some men with suspicion, and to be avoided, ofttimes by men who should have better aud broader ideas. It should be remembered that, in all probability, if it were not for that one mine there would be no camp there at all. The arguments against the one-mine camp are: The miners are compelled to board at the company's boarding house and to patronize the company's store. They must buy all they require—clothing, boots, shoes, tobacco, etc., at this one store. In some instances it is claimed the men innocently patronize the company's store and at the end of the month find they have nothing coming, or worse still are in debt to the company. This does seem to be unfair and unnecessary, but does analysis of the situation show this to be a fact? In the first place, mining companies as a rule are not organized and run for the purpose of building up a village or town about the works. The primary object of the company is to make money upon the capital invested, and this the greater number strive to do legitimately. When an isolated mine is opened and worked a new village springs up about it, and if there be but one company operating there the management must do something to accommodate the miners. At no mine are the men all single or all married. They who are single must have a place to sleep. and as the greater number prefer boarding to "batching," necessarily the company must supply these wants. This means the investment of several thousand dollars more in bunk houses, and boarding house and their equipment. It is only just that the boarding house should not be run at a loss, consequently the management must make a rule that all employes shall patronize the boarding house. Often exception is made in the case of married men, with whom the matter is optional. Where the proposition is left to the miners, the boarding house becomes a "nightmare" to the manager. One week there will be more than can be accommodated, the next there will be less than half the former number, and the arrangement cannot always be regulated to meet the requirements of the miners. Of necessity the company insists on the men making use of the accommodations afforded, as this is a portion of the organization, though only an incidental part. As to the company store, of which there is so much said in its disparagement, that too is usually a necessity when the mine is remote from the nearest town, and hundreds of men will candidly admit that the store is often a great convenience. Prices are usually higher than in towns more easy of access, but it should be remembered that there are additioual freight charges. Mines are not philanthropic institutions couducted for the benefit of a community which may spring up about it, but are operated for the purpose of making money, the same as any other industrial enterprise.

The miuer who at the end of the month finds himself in debt to the company would in many cases find himself broke at the end of each month in cities like Cripple Creek, Leadville, or Butte.

There are places where the company boarding house and the company store are "made to pay," and the men do not receive the treatment or fair play they deserve, but good workmen will not usually remain in such a camp longer than necessary to get away. The company which treats its men with the greatest fairness, pays the going wages, supplies good food and comfortable accommodations, and runs its store on honest business principles will be found to have the best men obtainable in the country, for good men seek such places and are able to hold them against inferior workmen. It pays the company to give men fair treatment and to supply them with good accommodations, for the men in return are both able and willing to respond with more and better work. It pays to treat men well, even at a one-mine camp.

Cyanide Poisoning.

The use of cyanide of potassium in the treatment of gold and silver ores has spread throughout the world within the past twelve years. Twenty years ago the cyanide process was commercially unknown in the treatment of ores. Its first large application to the extraction of gold from its ores was made in New Zealand in 1888. Its possibilities were at once realized, and other cyanide plants were built. Gradually they extended and increased in number—slowly at first—until the chemistry of the process was better understood, and later the construction of cyanide plants became as common as the building of stamp mills or smelters. There are hundreds of plants treating from less than 5 tons daily to those which handle upwards of 2000 tons in twenty-four hours. Tons of cyanide of potassium are consumed in this branch of metallurgy annually, and notwithstanding the fact that cyanide is one of the most deadly chemicals known to science, and so prompt in its effects that medical aid is almost always futile, yet there have been very few cases of cyanide poisoning of men working in these plants reported, and until within the past few days no cases have been noted, or, at least, become generally known, wherein animals and fowls have died from drinking the waters of streams to which the discharge of cyanide works is tributary. The single exception is that of the Exposed Treasure cyanide mill in Kern county, California, where, a few miles from the village of Mojave, the mill of the Exposed Treasure Mining Co. is located in a canyon which is dry except when heavy rains fall. The water for the mill is pumped to it and the wash water, containing a very low percentage of cyanide of potassium, is allowed to run to waste down the desert canyon to the sand flats in the valley beyond, where it soon sinks from sight. A State deputy game warden was informed that all the game in that part of the county was being killed from drinking the deadly waters coming from the Exposed Treasure mill. The investigation is said to have shown that numerous doves were found lying along the banks or near the stream. At a distance of 3 miles from the mill it is said the sand in the tailings has settled and the water has become comparatively clear, and from that point onward until the water is absorbed by the desert sand the stream is lined with the bodies of dead birds, rabbits, and even cattle which have drank of the waters.

As previously stated, this is the first instance of importance of the kind ever reported, and the reason may probably be found in the fact that the canyon in which the Exposed Treasure mill is located docs not contain a living stream, and the water discharged from the mill is dangerous and even deadly, though containing a minimum of cyanide of potassium—for managers of cyanide mills do not permit strong solutions—0.25%—to escape if it can be helped, solutions of that strength being pumped back for reuse, but the water employed in washing out the pulp from the treatment vats must flow away, and if impounded it would be useless unless it be discharged into a reservoir of so large a superficial area that the evaporation would equal the amount of water running from the mill into the basin. It would seem, however, that possibly the amount of water flowing down the canyon might be lessened by pumping it back from a settling reservoir, thus reducing the quantity of water required from the original source, if this has not already been doue. If, as in most other places, the canyon contained a living stream, the deadly solution would probably become sufficiently reduced in strength to be innocuous, but as nature has not generally provided living streams iu the desert mountains it remains for the company to render the situation as harmless as possible, by one of the methods suggested or by fencing the stream along that portion known to be dangerous.

CONCENTRATES.

AN analysis of coal should show the percentages of: Water, volatile carbon, fixed carbon, ash and sulphur.

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TO FILL a tank having a capacity of 100 cubic feet at a pressuro of 200 pounds per square inch would require 1400 cubic feet of freo air.

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"FIVE VOLTS DROP" on a machino means that that voltage is used in the machine itself, and must be provided for. To amalgamate a zinc in a battery cell, clean the zinc with acid and coat it with mercury.

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WHERE the land in question has not been patonted, the discovery of mineral thereon would except it from the State or federal grant to the railway company, the latter in that case having no jurisdiction over it.

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AN ordinary charge in pyritic smelting would be about as follows: Pyrites, 15%; quartz ores, 45% (containing lime and pyrites); lime ores, 20%; low grade matte, 10%; slag, 5%; coke, 3% to 5%; from 1% to 2% charcoal; the charge of fuel to be about 5% of the total.

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AN undershot water wheel to develop 2 H. P. in a 6-mile-an-hour current tho area of each bucket should be 4 feet, with an immersion of 1¾ feet above the periphery; the wheel should be 8 feot diameter; have twelve buckets and make about ten revolutions per minute.

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EMERY is a mechanical admixture of corundum and magnetite or hematite. It is the presence of corundum in the emery that gives to it its abrasive qualities and makes it of commercial value. The abrasive efficiency of emeries varies according to the percentage of corundum they contain.

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TO CONVERT Centigrade thermometer readings to Fahrenheit, multiply by 9, divide by 5 and add 32. To convert Fahrenheit readings to Centigrade, subtract 32, multiply by 5 and divide by 9. On a Centigrade thermometer 0° is freezing point of water and 100° boiling point; while on a Fahrenheit thermometer the corresponding points are 32° and 212°.

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A "TENTADURA" is defined as a sort of assay made in a horn spoon, in an earthen saucer, in a wide and sballow vessel of any kind, for the purpose of ascertaining the amount of amalgam present in a sample of argentiferous mud from an amalgamating patio; any assay made by washing, so as to concentrate the metallic portions of any mineral and to cause the earthy portions to be floated off.

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THERE has been no change in California law and there is no such thing as "non-assessable stock" under the laws of that State. The stock in a California corporation of any kind, mining or any other business, is subject to assessments, and stockholders are responsible for the amount of assessment legally levied upon corporate stock held by them, any agreement or statement to the contrary notwithstanding.

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THE "critical temperature" of a gas is that temperature above which, no matter how great pressure it may be under, it will not condense and become a liquid—i. e., when above the critical temperature no amount of pressure can liquefy the gas. For hydrogen this temperature is 242° below 0° C., while for carbon dioxide (CO_2) and some others it is above the ordinary temperature, so that pressure alone will liquefy them.

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GENERALLY there are two ways of igniting the explosive mixture of gas and air in gas engines—one by use of an incandescent tube or wire; the other by the electric spark. The latter is considered preferable. There are two methods of electric lighting—that simply using a spark coil, where the spark of the electric current is utilized, and that employing a Ruhmkorff coil or open core transformer. The latter method often gives better results.

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IT is probable that zinc in slag from a lead blast furnace exists chiefly as silicate, a small percentage possibly as sulphide, partly free and partly combined with other sulphides. Lead occurs as metal, as silicate and as sulphide. Oxidation of the sulphide produces some sulphate, which gives rise to the white fume so commonly noticed. Silver exists in the slag as a constituent of the entrained matte. Silver can not exist in slag in the form of silicate.

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EYE BARS for bridge work were formerly made by hammering, but in doing so the metal crystallized and this proved detrimental to their strength. They are now pressed into shape by special machinery. The head of the bar is built up with plates of the proper size, care being taken to keep these apart so as to let the heat permeate the whole mass of metal. After it is heated into a semi-fluid or good welding heat the whole is placed under the press, and the pressure welds the whole into a solid piece, at the same time facing it.

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IN the electric generating plant of the Bay Counties Power Co. at Colgate, Cal., the dynamos are direct-connected to impulse wheels that operate under a head of 700 feet. The three 2500-kilowatt dynamos are each mounted on a wheel shaft operating at 285 revolutions per minute: each of the four 1125-kilowatt dynamos is direct-driven by an impulso wheel at 400 revolutions per minuto. In such plants threo-phase machines are usually employed. High voltage is transmitted 143 miles between Colgate and Oakland, Cal.

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IT has been and is the pleasure and the privilege of the publisher to receive warm encomiums and cordial endorsement of this journal from all parts of the world, and their receipt constitutes an ever present source of satisfaction. One of the strongest and at the same time one of the most unusually worded comes from an Idaho mining camp where all the concomitants of modern jurisprudence are not yet existent, but where the reputation of this journal is evidently appreciated. The writer says: "In the absence of a Bible we swear a witness on a file of the MINING AND SCIENTIFIC PRESS."

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A PIECE of timber 6x6 inches at one end and 18x18 inches at the other and 12 feet in length contains 156 feet board measure. The most logical way is first to find the cubic contents of the piece of timber, and, multiplying that by 12, changes it to board measure. The area of the large end is (in feet) 1.5x1.5, or 2.25 square feet; the area of the small end, .5x.5, or .25 square foot; the mean proportional is the square root of 2.25x.25, or .75 square foot. Adding these three gives 3.25 square feet. This volume multiplied by $\frac{1}{3}$ equals 13 cubic feet. That multiplied by 12 gives 156 feet board measure in the stick.

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AN applicant for a patent has the right to unite in one application claims for a process and claims for an apparatus where the inventions are related and dependent: an order of the primary examiner twice made denying that right and requiring a division between the claims for a process and those for an apparatus is equivalent to a rejection of the application, and entitles the applicant to an appeal to the board of examiners-in-chief under Section 4909 of the United States Revised Statutes. It was so held by the Supreme Court of the United States in the case of the United States ex rel. Steinmetz vs. Allen, Comm'r.

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EXPERIMENTS and experience in attempts to burn pulverized coal go far toward demonstrating that it is difficult to obtain combustion of such fuel with as small an amount of air per pound of fuel as can be obtained in the best practice with coal fired on an ordinary grate, and this has always tended to make the economy lower than with the usual method. Besides, the power required to operate the coal pulverizer and feeder has counted against the efficiency of the plant, as a whole, and there is usually some difficulty from the collection of ashes and unconsumed particles of coal in the back connections of the boilers.

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TO FIND the capacity of a duplex pump, multiply the area of the water end by the stroke; that will give the number of cubic inches of one side, per single stroke. Multiply that product by the number of strokes per minute and by 2. Then divide by 231, the number of cubic inches in a gallon, which will give theoretical capacity. Multiply that product by the efficiency to get the true capacity. Example: Find the capacity of a duplex pump with a diameter of 3½ inches, stroke 6 inches, number of strokes 75, efficiency 70. Operation: Area = 9.62 square inches × 6 inches = 57.72 × 75 = 43,290 × 2 = 86,580 ÷ 231 = 374.8 gallons; 374.8 × .70 = 264.36 gallons, true capacity.

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ANY manufacturer will send a catalogue or trade publication that he issues to any address designated, in the idea that the asker wants what is therein described and is a possible customer. The privilege certainly is abused, and many manufacturers seriously contemplate charging a nominal sum for the catalogues that are expensive, with a view to checking indiscriminate and unprofitable demand from those prompted only by curiosity. Meanwhile our inquirer need feel no hesitancy in writing for any catalogue reviewed or noted on the usual page of each issue of this journal, or similarly in its contemporaries, though it were well to enclose a few cents in each case—say 6 or 8—for necessary postage thereon.

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A LARGE VARIETY of combinations of iron and carbon with tungsten, chromium, manganese, nickel, silicon or molybdenum characterize the special steels now on the market. Every maker furnishes, besides his regular carbon steel, a self-hardening steel, and an intermediate grade, which may be called a semi-self-hardening. The latter is capable of being hardened in water without cracking and is suited for extremely hard cutting. The self-hardening steels cannot be brought in contact with water while hot on account of the danger of cracking. Some of the milder grades rely on the assistance of an air blast after forging to give them the proper degree of hardness for their work, and are called "air hardening steels."

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GRAPHITE makes a good lubricant. A fine machine lubricant is made by taking 100 parts of mineral oil, 75 of linseed oil, 50 of rapeseed oil, 100 of spirits of turpentine, and 25 of lime slaked in five times its weight of water. The liquid thus obtained by slaking is boiled, and the linseed oil, the rape seed oil, the spirits of turpentine and the mineral oil are in succession added to it. Tho mixture is to be boiled for six or eight hours and used only when cold. Should it prove too hard it is because too much lime has been put in. To tell if the lubricant is pure put a sample of it, the size of a pea, in a glass of water. If it floats or only sinks very slowly the lubricant is pure; if it falls quickly to the bottom it has heavy substances mixed with it and is not fit for fine uses.

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A MINING ENGINEER can be too scientific as well as not scientific enough. No matter what the amount of "science" one may carry he must have commercial efficiency to make it count, and the business ond of any thing undertaken must at least be as well understood as the scientific or technical end of it. If a mine shaft is to be sunk or a mill built, the man that is putting up the money wants an engineer that can not only do the work well, but also do it economically, and so that it can be made to pay. The man furnishing the money is usually not so much interested in how the shaft or mill looks as a finished and fine product, as in the profits resulting from the operation of the shaft or mill. The most successful engineers are men in whom the commercial instinct is well developed.

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THE new department in the United States Cabinet of Commerce and Labor when first prepared had a provision in it for the establishment of a bureau of mines and mining, and the idea at the time was to transfer the Geological Survey from the Interior Departmont to the new department. Upon its passage by Congress, however, that was all stricken out, and the bill as passed simply enumerates mines and mining as one of the industries to be fostered by the new department. The only apparent good that that can do would seem to be that in the preparation of statistics the magnitude of the mining industry as a great national matter will finally become so apparent to even the federal legislators that the long deferred cabinet department of mines and mining will be advanced on the calendar of statesmanship.

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REGARDING the old slag dumps at Eureka, Nev., they could be undoubtedly utilized, as suggested by our correspondent, in the manufacture of Portland cement, but transportation would interfere with the commercial side of tbe idea. Any big "deposit" or accumulation of furnace slag, the same as at Eureka, is susceptible of similar disposition. But the materials for manufacture of Portland cement are so plentiful, cheap and widespread that it is doubtful if the Eureka slag dumps, though rich in lime, iron and manganese, which take the place of silicate of alumina, could be brought in successful competition with more centrally located sources of supply. "Concentrates" suggests, however, that a more probable source of profit would suggest itself in such cases as that cited by our Eureka correspondent in making what is sometimes called "mineral wool" out of those slag dumps—blowing it into long, fine strings of substance having sale in a variety of ways in industrial arts.

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REGARDING the assaying or analyzing of coal to determine its coking powers, in case of any doubt, and in order to determine the power of the coke to withstand a crushing burden, tbe coking of a large quantity of coal in heaps would be advisable, rather than to risk the erection of costly coke ovens before it is known whether the coal will or will not coke. As the amount and composition of the ash in a coke is of the first importance, analysis of smelter samples of large lots are preferable to grab samples, which may vary so much as to be worthless. The ordinary way of sampling coal for assaying is similar to that used in metal mines, viz., right across the whole coal vein. The ingredients bearing upon the commercial value of coke are the water, sulpbur, volatile combustible, ash and fixed carbon. Of these, the latter only is valuable, the first four vary to a greater or less extent and are detrimental. Ash should be as low as possible in a good coke. The volatile combustible would, if present at all in large quantities, cause the coke to shatter in a blast furnace. Sulphur in coke is due mainly to the presence of iron pyrites in the coal. While detrimental in iron smelting, it is not present in sufficient quantity to make much difference in lead, silver or copper-silver smelting. The constituent which cuts a real and considerable figure in many cokes is the ash, which throughout this west half of America is usually high. When the ash of a coal or coke is only such as would result from the condensation of the plant ash of the coal-bearing flora it should rarely exceed 6% in the coal or 10% in tbe coke. A lower ash than this is called normal, and in metallurgical work is considered self-fluxing. Where the ash exceeds this it is generally siliceous and may result from a failure to sort out the slate cleanly or from bone or sandy impurities in the coal at the time of its deposition. This sand or clay is highly siliceous and its presence in a coke makes it far less desirable to the smelters than a coke with a normal self-fluxing ash. An example will make this clear. Taking a normal coke with ash at 9% as a standard, a coke with 19% ash would have the excess of 10% mainly made up of sand or silica and clay or silicate of alumina. As ore of this class, which it replaces on the furnace, has to be heavily fluxed, and would be given about a $15 smelting charge, the 10% ash would cost the lead-silver smelters $1.50 per ton of coke, in addition to the fact that they are paying for 10% of dead weight instead of fuel. The furnaces would also work poorly with such a coke.

Ore Delivery From Stopes.

Written for the MINING AND SCIENTIFIC PRESS by E. L. LEFEVRE.

The economical disposal of ore after it is broken down in the stopes is a problem of great importance and frequently demands displays of higb technical knowledge from managers in order to bring the various items of timber cost, labor and repairs within a certain limit of cost per ton of ore, beyond which prudence demauds a halt. It is a matter of surprise, too, at the perfunctory way in which some managers give directions for mill hole coustruction at variance with all rules of economic mining. As soon as the ore body is opened up the problem of its economical handling at once becomes paramount, and while it is true that a haphazard selection of a method of ore delivery will, and frequently does, answer the purpose, yet instances of injudicious adoption of faulty systems are too common. The executive head of a mine, intent on producing results iu the best way at least cost, has a large field before him when he takes up the study of the timber problem of a big mine, located usually at a place where timber is a scarce article. The practical, expeditious and cheap delivery of ore may be placed at the head of the subdivisions of timbering and a uumber of otber tbings considered before a general scbeme of mill hole construction is finally adopted. Size of the ore body, dip of the vein and character of the walls are the major items upon which to base a decision. Physical properties of ore, distance between levels viewed with reference to the probable wear of the timbers, proper spacing in order to facilitate shoveling, and an exact comparison of relative costs of the various systems are other things that influence the adoption or rejection of a general plan of ore delivery.

There are six meritorious systems of mill hole construction in general use, and these, with slight modifications to fit individual cases, furnish a diversity of plans sufficient to meet the requirements of any kind of an ore body. These are:

1. The crib of tenoned mill timbers.
2. The stulled mill hole.
3. The stull and block mill hole.
4. The all-block mill hole.
5. The stoue-faced mill bole.
6. The lined, square-set mill hole.

The first and most generally used is the crib built of tenoned timbers of fixed pattern dimensions.

This form is to be recommended for all veins having rotten walls, where it is not necessary to use the square set and where the stopes are filled with waste, as it furnishes the cheapest and most practical method of sustaining bad ground and affording an outlet for ore at the same time. It is well to state that, uo matter how great the dip of the vein up to that angle where the ore ceases to mechanically deliver into the hopper, the cribbed mill hole is by far the best sustainer of rotten ground we have, where a filled stope is used.

A number of things are to be cousidered even after physical conditions suggest the crib form of construction. The distance between levels, amount of ore, character and size of broken ore and average dip of vein are all determining factors in deciding upon the size and quality of timbers used. For example, it would be injudicious and wasteful to build a mill hole 3 feet in the clear for a narrow vein with levels 100 feet apart, unless the dip was excessive and tbe ore wet enough to block the hole by sticking to the sides. Not only would the timber cost be excessive, but a large unnecessary expense would be incurred in shooting out the walls in order to secure the space to properly set the timbers. On the other hand, I have known levels to be run 400 feet apart, using 3-foot mill holes spaced 60 feet apart. The dip of tbe vein was slight and free from abrupt variation, with a stoping width averaging 5 feet and fairly stable walls. In this particular instance timber was an expensive item, and the atmospheric conditions were such that two years represented the life of a first quality drift set. A careful scrutiny of the expeuse items convinced the management that it was cheaper to line the mill holes with first class 2-inch plank than to stand the staggering cost of drift timbers for intermediate levels. The mill timbers were sawed in a mill, thus furnishing a good face for the plank lining. The mill holes were raised 50 feet, then lined; a second 50 feet was added, lined, and the first lining repaired. By the time the third 50 feet was up the first was usually ready for relining. At places where the vein deflected from normal dip, exposing the timbers unduly, a double lining was put on when the hole was built. While this was an exceptional case, nevertheless it is a striking illustration of the possibilities of mill hole construction with cribbed timbers on a vein with a slight dip. Where the delivery distance is short, and spruce or other tough timber expensive, balsam fir or "quaking aspen" may be used with perfect safety, if the stopes are not to be withdrawn at some indefiuite time in the futurc. In that case first class timber is to be recommended, as the extra expense is more thau counterbalanced by the increased durability.

In framing mill-hole timbers patterus with varyiug tenon widths are used, and care should be taken that tbe tenons are of exact size, thus insuring a perfect fit and obviating trimming in the stope. The shoulder should not be less than 2 inches, and in holes having much dip more is advisable. The use of nails at the joints is a pernicious practice to cover up slovenly framing which may prove expensive in case it is necessary to replace timbers. Abrupt bends in the crib should by all means be avoided. An intelligent observance of the general contour of the vein vertically will show where a shot or two into the wall is advisable to avoid these and conserve the timbers at that point. It is better to line mill holes with 2-inch plank when first built at those places where falling ore strikes, for two reasons: First, the destructive effect of a falling mass of ore is much less when the fiber of the wood is parallel with the line of descent; and, second, the cost of replacing a timber cut in two would pay for several linings. Exact comparison will establish the fact that first-class 2-inch plank is by far the best material for lining mill holes. "T" rails and boiler plate are expensive fads that never fail to bring disaster and annoyance with their use. The reason for this is plain, as a lump of heavy ore dropping on a rivet head or track spike held tightly against a metallic face will snap off unless made of an unreasonable size and strength. The use of this form of lining tends also to take away one of the chief virtues of the crib—its mobility or the facility with which it may be bent. Where cribbed mill holes are to be kept filled or partly filled, they should be made large enough to prevent "hanging up" and carefully lined as built. The stulled mill hole is admissible in veins of auy size up to the point where the timbers become too cumbrous to handle, presupposing that the walls are stable, and are in general use on those veins of appropriate size where the stopes are to be filled with the broken ore reserves. It is a very expensive method of timbering, as the labor expense entailed in cutting the seats or hitches and properly setting the stulls is frequently prohibitive. As before stated, points like these should be carefully gone over before the final adoption of this system. Stulled mill holes are usually made 5 feet from ceuters of stulls, with retaining faces of split lagging and a 2-inch plank or slab liuing. It will be readily seen tbat it is desirable to have the hanging wall hitch cut, so that the upper and lower angles made by the stull and wall are 100° and 80° respectively. It is false economy to use stulled holes without lining, as the cost of repairing or replacing timbers cut by falling ore is very great and far exceeds the cost of a plank protection from the time it is put into use.

The third class, or stull and block system, is really a composite of the second and fourth forms of construction, aud furnishes a very durable form of mill hole without entailing a big lumber bill for lining. On tbe other hand, the amount of timber required renders its use unwise in many places. The adoption of this form of construction is therefore restricted to those mines where lumber is dear and timber cheap, and to those veins where the physical conditions are propitious. Its adoption is not to be recommended where the stoping width exceeds 5 feet unless exceptionally favorable conditions exist. A great saving in this system over the stulled form is the absence of a labor bill for cutting hitches which frequently amounts to a large sum. The writer is personally cognizant of several instances where the cost of hitch cutting amounts to $3 per linear foot of mill hole. The stull-and-block hole is constructed by first tightly wedging a stull in place between the walls, then filling in behind the stull with fine stuff level with the top. On top of this foundation and projecting over the stull 3 to 6 inches a course of blocks is laid, theu another stull, more fine stuff, then blocks, and so on. The distance which the blocks project over the stulls depends upon the size of the blocks and durability of the timber, as well as tbe probable wear to which the timber is likely to undergo without endangering the stability of the hole, for it must be understood that the block-and-stull mill hole is built to last the life of the stope without repairing. It can be repaired, of course, but it is slow, tedious work. The timbers used as blocking should be cut not less than 2 feet long and carefully graded as to diameter when laying. In this system of construction all the refuse timber of a mine can be utilized to advantage. Where this method is employed on small veius of rich ore, and where more or less waste rock must be moved from the stope in order to secure working space, it is uecessary to clean the hole down after using it for ore, as a surprisingly large amount will hang on the projecting blocks. For this reason it is well to have the projection as little as is compatible with safety. Yet if the stopes are properly handled this expense of dressing down should amount to practically nothing, as the miner can make the trip down, using a rope to prevent accidents, in a short time.

The fourth, or all block system, presents commendable features that makes it by far the most desirable one in certain places where the cost of timber of proper size is not too great. It is true that it costs a lot to build a mill bole 2 feet square with three sides composed of first-class timbers 18 incbes to 2 feet long. Yet, in cases where the vein is large and the ore hard and heavy, with an extreme delivery distance, in the long run it is ecouomical to build the block mill hole. The judgmeut of a foreman will tell him whether the foot wall is sound enough to be used for the principal wearing side of the hole. If it isn't don't build a block hole. There are a few points to remember, though, in order to secure satisfactory results from the heavy initial expense. The timbers should be sound and, if possible, air dried; they should be of sufficient length to remain in place in spite of the natural wear and strain incidental to hard usage; they should be laid by a thoroughly capable, conscieutious workman, and the orifice should be large enough to permit the passage of a man's body easily in case the ore hangs up, or a job of repairing presents itself. The straighter the line of ascent the greater the life of the mill hole, hence it pays to trim the foot wall to a reasonable extent to secure this evenness. A block mill hole properly constructed will last a long time subjected to the hardest usage unless some mucker tries to avoid breaking large lumps of ore and blocks the bole. The resulting necessity of shooting out the obstruction with dynamite or hoisting it out with a windlass should result in two things: Firing the culprit and seeing that a minimum charge of powder is used if shot. Repairing a powder shattered block mill hole is one of the slowest, most disagreeable and expensive tasks a mine timberman has. Besides, the patched place rarely holds when subjected to hard pounding.

The fifth, or rock faced mill hole, is one made feasible only in rare instances where the miueral may adhere to either or both walls with a central or adjacent dike of tough, hard blocky rock not subject to atmospheric disintegration. Where such a physical condition exists very efficient and durable mill holes may be constructed by using the rock, tying the courses every 3 or 4 feet by laying a split lagging back a little from the edge of the rock face, and spiking a split lagging to each end of this cross piece, then filling the whole over with fine stuff. Tbis system of tying makes it possible to carry rock mill holes to great heights without the danger of losing the hole in case a cave starts, which would happen in the event a straight rock face was used.

The lined square set, or the use of a foot wall with three sides of a square set is an old standby that will never be supplanted where the square set system of timbering is in vogue.

In mines worked through tunnels, and where a number of levels are run above the tunnel, it is good policy to put up raises for ore and waste in the solid rock adjacent the vein, provided, of course, the country rock is sufficiently stable. Raising is a cheap form of excavation, and wheu once done in hard rock the expense stops for all time.

Cyaniding Sulphurets Direct.

To THE EDITOR:—I have read the very valuable contribution of Prof. Christy in the late issues of the MINING AND SCIENTIFIC PRESS regarding the treatment of concentrates and the detrimental effect of metallic iron on the extractions, as well as on the consumption of cyanide, and this remiuded me of some experiments made several years ago that coufirm his conclusions very decidedly. Am sending you herewith the details of one experiment.

I had been making many tests by agitation in an old iron cleanup pan and was very much surprised at the extremely poor results obtained, and after considerable striving for the solution of the problem I concluded they might be due to the iron, and therefore put up a wooden agitator and ran it alongside of the iron one under precisely the same conditions. I was simply astonished at the results, which clearly showed that extractions were not only greater in the case of the wooden tank, but that an actual precipitation occurred in the iron one. The material worked on (the Bullionville slimes tailings) had been treated by pan amalgamation two or three times and contained, beside about 10% lead and a little copper, considerable acid salts that were added during the amalgamation treatment. The muller in the iron tank ground slightly on the bottom and some metallic iron doubtless got in the sludge in this way.

After discovering the very bad effect of the iron on the Bullionville material I took the same tanks to Pioche, Nev. (an adjoining mining camp, where we were about to treat the ore from the Yuba mine by agitation leaching), to determine if the same bad effects would be noticeable on the Yuba ore. Tests were conducted side by side under precisely the same conditions with the result that the wooden agitator extracted just 20% more values than the iron agitator did in eight hours. Therefore, in constructing the Yuba mill, wooden agitators were installed and no more iron than was absolutely necessary was used in the agitators. The Yuba ore contained 3% lead, mostly in the form of carbonate, and about 85% of the silver and gold was extracted after concentration, with a consumption of about one pound per ton of cyanide. So it could not be considered a very "base" ore.

Following is a summary of the agitation cyanide tests on Bullionville slimes made in wood and iron agitators at Bullionville, Nev., August 15, 1897:

The following conditions were the same in both cases: The iron agitator used was an all iron cleanup pan, while the wood tank was composed entirely of wood; thirty-five pounds of ore to sixty-five pounds of water; twenty-five pounds of lime added per ton of ore and agitated one hour. Then cyanide was

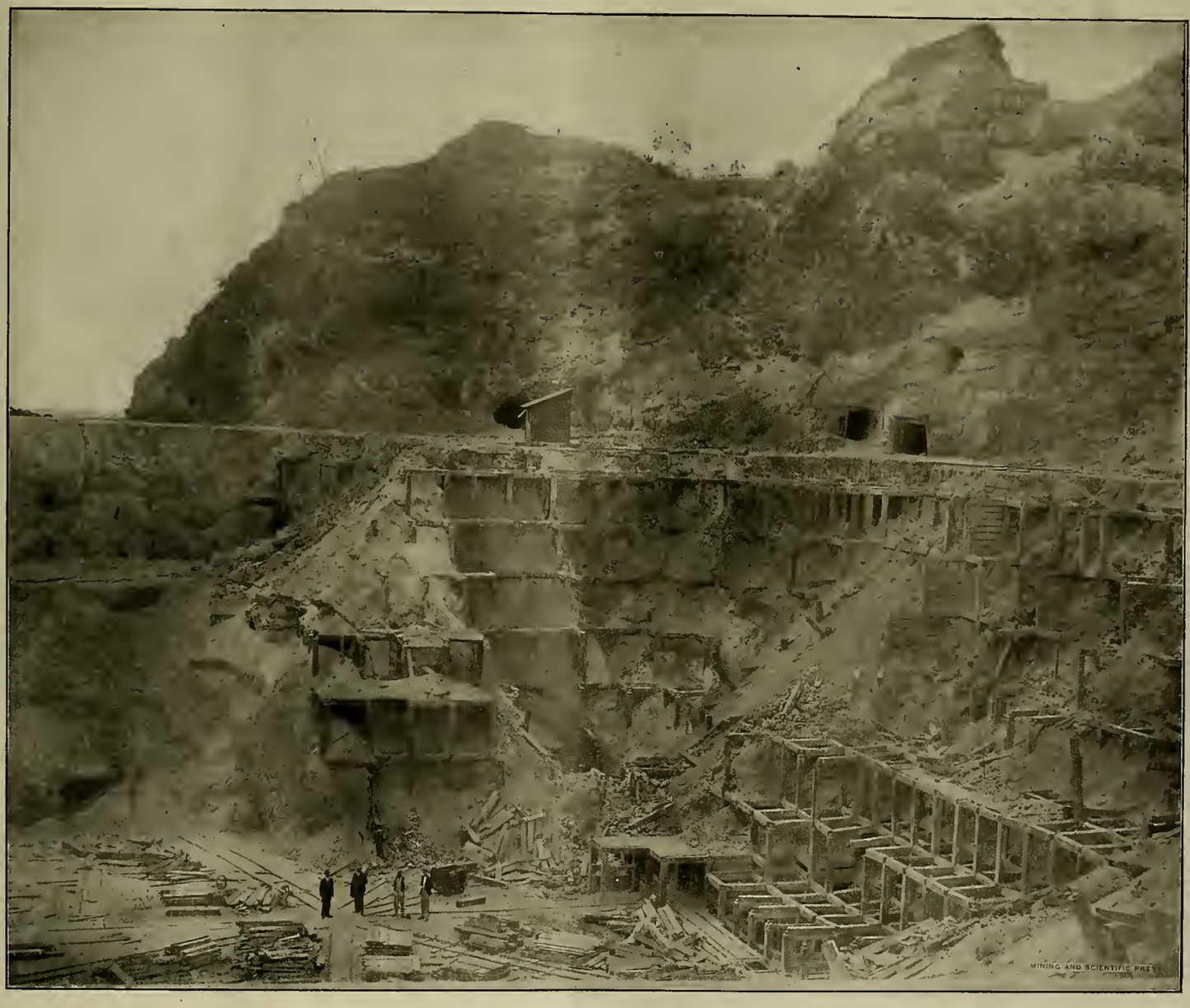
added to bring the water up to .05% solution, or a solution containing one pound of cyanide per ton of water. This material containing a considerable quantity of "cyanicides," enough cyanide was added to maintain a solution of from .025% to .05%.

	Wood Tank.	Iron Tank.
Additional cyanide added at start, lbs. per ton of ore	1 34	1 34
Additional cyanide added end 1 hour, lbs. per ton of ore	1.0	1 0
Additional cyanide added end 3 hours, lbs. per ton of ore	1.0	1 0
Additional cyanide added end 4 hours, lbs. per ton of ore	1.0	1 0
Additional cyanide added end 6 hours, lbs. per ton of ore	1.0	1.0
Assay of heads, ounces silver per ton	17.40	17 40
Assay of tails at end 4 hours, ounces silver per ton	11 70	13 80
Assay of tails at end 6 hours, ounces silver per ton	11.20	14 20
Assay of tails at end 8 hours, ounces silver per ton	11.00	15.00
Per cent extraction at end of 4 hours	32.7	20.1
Per cent extraction at end of 6 hours	35.7	18.4
Per cent extraction at end of 8 hours	36.8	15.0
Cyanide consumption at end of 8 hours	5.0	5.5

Salt Lake City, Utah, April 15. E. L. Godbe.

The Mount Morgan Mine.

One of the most noted mines of the world is the Mount Morgan, situated 26 miles southwest of Rockhampton, in Central Queensland, Australia. The mine is located on a rounded eminence in a range of low hills. It was taken up in 1873 for grazing land, with no thought of its value for mineral. The outcrop of siliceous iron-stone, bearing gold, attracted the attention of a man named Gordon, who sold it to the Morgan Bros. at £1 per acre, the tract comprising 1 mile—640 acres. Some of the ore showed gold, and assays proved the rock to be even richer than the visible gold would indicate. A corporation was formed in 1886 to operate the property. It was capitalized at $5,000,000, but so great was the output that the market value of the shares rose in 1888 to $86,250,000—a figure far above its actual value, but not an infrequent occurrence in connection with rich mines. For several years following its complete equipment the mine paid dividends approximating $5,000,000 annually. The mine occupies, as stated, the summit of a hill, which rises about 500 feet above the neighboring gulches. The surrounding country is hilly and broken. Originally tunnels were run into the hill and underground mining was carried on, but subsequently this method gave place to benching in a series of terraces. One of the accompanying engravings shows the appearance of the hill from the outside with its great dumps of waste, and the other is that of one of the large open cuts, in the side walls of which may be seen the timbers used in supporting the underground workings when operated under the old system. The crest of the hill has entirely disappeared, having been removed by the extensive quarrying operations. The mine furnishes a great variety of ore—dark heavy ore colored by many hued oxides; white porous ore, from which the sulphides have been leached; brown iron stone, ocher-colored earthy material, and in the lowest working abundant sulphides. Recently copper has become an important factor in the output of this noted gold mine. The ore deposit occurs in sedimentary rocks, much altered. Quartzite, graywhacke and slate are the most abundant in the vicinity. The hill on which the mine is situated is cut by several large dikes, and numerous smaller ones are associated with the ore. At one time it was supposed to be a deposit from a geyser, but there has been nothing found in the extensive exploration of the mine to substantiate this theory. The rocks were fractured by the intrusion of the dikes along planes of weakness previously existing, and the mineral solutions permeated the zone of fractured rocks, silicifying them and depositing in the favored places the sulphides, chiefly iron and copper, together with gold. Oxidation produced the rich coloring of the oxides, and leached some of the ore to a porous mass so light that some of it would float upon water, due to the occurrence of air in the honey-combed mass. During the later eighties the mine produced about 75,000 tons of ore annually, from which were derived over four ounces of fine gold per ton. In comparison with the yield of those earlier days the statement of the manager for the month of January, 1904, shows that during that month 19,370 tons of ore produced 9524 ounces 16 dwts., or about 0.5 ounce per ton. In addition to this 1300 ounces were obtained from the treatment of 6705 tons of old tailings, and 21 tons 6 cwt. of copper were obtained as a by-product, containing 81% copper. It is expected the mine will soon produce 15,000 tons of copper ore monthly, which contains 3% copper and 6 dwt. of gold per ton. The monthly output from this source, it is estimated, will reach £40,000 per month. Although the Mount Morgan mine is no longer like the mine of its early history, it is still a large, valuable and interesting property, and its output will still annually approximate that of earlier days, though a far greater tonnage is necessary to attain this result, about 400,000 tons now as against about 75,000 tons in 1889–90. The net returns will not be as great, for though cost of treatment has been greatly reduced, the grade of ore has fallen off in greater ratio.



Open Cut Mount Morgan Mine, Queensland, Australia, Showing Timber in Old Stopes.

Acetylene Flame for Welding.

The process for welding metals by using a blowpipe or burner of acetylene has been developed by a Paris company, says the American Acetylene Journal. The chief difficulty up to the present has been to regulate the proportions of oxygen and acetylene. According to the relative quantities of these gases, an oxidizing or reducing effect is produced.

It is announced that experiments with a mixture of acetyleue aud ether vapor have been successful. The acetylene apparently is passed through ether, by which means it absorbs a considerable amount of the vapor. On igniting the mixed vapors a green flame as small as a pencil point is produced. It is stated that the heat produced exceeds that of the electric arc; this seems rather an exaggeration, but at any rate it very rapidly melts refractory materials. A hole can be made in a bar of iron in a few seconds. In employing it for welding purposes, a file is first passed over the edges to be joined; then a weld is made at the middle and at two other points at the end of the line of contact. Finally, the flame is passed right along this line. With thick plates, the

edges are filed in a particular shape, and then a bar of iron melted by the flame is passed along them to act like solder. The new method is successful with wrought iron and steel, but so far has not been so with cast iron.

Gold Dredging in New Zealand.*

Written by GILBERT WINSLOW.

The method of dredging for gold in "alluvial wash" in New Zealand is the result of thirty to forty years' experiment and improvement. As now carried on, it may be said to be entirely "bucket dredging," for although suction pumps have been tried they have always been discarded.

The essential parts of a working dredger are the pontoons, which form the barge on which all the machinery is placed in position; the ladder frame, including the buckets by means of which the wash to be treated is raised; the revolving cylindrical screen and tables, or an ordinary sluice box, in which the wash is treated; the elevator, not always necessary, for returning the treated wash into the river, behind the dredger, in such position as not to inconvenience dredging operations; and the winches, for altering the position of the dredger by means of ropes fastened to the sbore.

THE PONTOONS.—The pontoons are built of wood or iron. They are always double, with a well about 5 feet in width between them, extending fully half their length, through which the ladder can be lowered.

THE LADDER FRAME.—The ladder frame, of iron or steel, is so arranged that a chain of buckets can travel continuously round its length. The midship, or upper, end of the ladder frame is held at a height of 15 feet to 25 feet above the deck of the pontoons by a strong framing, but the lower end can be lowered through the well to tbe depth required by means of blocks and ropes attached to a bridge-like framing, called the "gantry," on the end of the well. The gantry is so built that the ladder can be hauled entirely out of the water. The buckets discharge their conteuts, when they have passed their highest point, onto a chute which directs the wash to the revolving screen or to the sluice box.

The revolving screen is open at both ends, revolves slowly on its axis, the end which receives the wash being higher than the other end by 1 foot to 2 feet, dependent on the length of the screen. As the screen revolves, material put in at the higher end will be delivered at the lower eud. Water plays on tbe wash in the screen from end to end. The screen is perforated with holes as close together as possible, consistent with strength, and varying in diameter between ¼ inch and 1¼ inch, according to the coarseness of the gold which it is expected to catch. The larger material is delivered from the lower end of the screen into the elevator. All the gold and smaller particles of the wash are washed through the holes, and fall directly onto the tables which have a width equal to the length of the screen, aud a length of about 8 feet or more, if space allows. The tables are covered with plush or felt, having a protection of "expanded metal" laid over it. The fall of the tables may be 1½ inch in 1 foot, and the water frequently flows over the tables with a depth of ½ inch. When once the gold and finer products are on the tables, the separation of the gold is effected by gravitation. The water disintegrates the product on the tables and at the first opportunity the particles of high specific gravity, such as gold and heavy black sand, fall through the expanded metal onto the plusb, where they are caugbt. The lighter particles at the same time are carried away by the water. The stream of water must be so adjusted that it is not sufficiently powerful to move gold particles, and yet is too powerful to allow a mass of fine wash to accumulate on the tables.

DIFFICULTIES IN DREDGING.—It will easily be conceived that gold washed down a river may lodge in a crevice in a rock bottom, and may be absolutely irrecoverable by means of a bucket; for this reason a hard bottom constitutes a serious defect in a dredging claim. Moreover, gold in a face loosened by undermining may fall down and be lost, as far as the dredge is concerned, and thus both the gold on the bottom and that in the higher strata may be lost. Perhaps the most important part of a dredgemaster's work is to see that the bottom is cleaned up, and a few inches of it brought to the surface, for gold appears to work its way into a soft bottom. If the bottom is composed of rock no bucket can clear it effectively.

The presence of too much soft clay, or even of any at all, may prove a source of considerable loss. In general, it has beeu found in New Zealand that in a very clayey ground better results are given by a sluice box than by a revolving screen in the matter of saving gold. It is not difficult to find a reason for this. In a sluice box, any gold in the wash mixed with clay has an opportunity, immediately after the disintegration of the wash uuder the action of a powerful stream of water, to fall to the bottom, between riffles, where the clay lumps cannot reach it. In a screen, however, the gold cannot be expected to go through the first hole it comes to, and that it does not do so in any ground is amply proved by the distribution of the gold across the width of the tables underneath the screen. Until it does find its way through, it will be in constant danger of being picked up by a lump of clay and carried to the elevator and lost.

If a dredge claim happens to be situated in a river into which trees might find their way, and into which much sluicing bas been done, there is a strong probability that there will be a certain amount of buried timber. This, if in large quantities, involves a tremendous loss of dredging time, and may even make a claim undredgable which without dredging timber might be considered ideal dredging ground.

A forest on the land to be dredged must be cleared before the dredger can get to work, and as many as possible of the roots taken out. These frequently are entangled, and may prevent ground which is undermined from falling in, and generally cause great inconvenieuce and loss of time. Nevertheless, a forest does not necessarily condemn a claim, for there are claims in New Zealand with thick virgin bush on them, which are now worked with handsome results. Part of the timber can be burned as firewood.

A dredger working in a flooded river may have its buckets coming up full and be apparently treating a huge quantity of stuff. Yet this may be only river silt, containing almost no gold, which is being continuously washed into the paddock. Sometimes the dredger may even be unable to prevent its paddock from becoming filled up with silt.

If the gold to be caught contains large nuggets, aud a screen be used, some of the nuggets may be too large to pass through the screen, and may become deposited with the tailings. This may be more or less overcome by placing a small sluice box between the screen and the elevator, so that the material delivered from the screen must pass through the sluice box before being elevated. A more likely occurrence, however, is that the gold is too fine to be saved easily and no system of gold saving applicable in the limited space available on a dredger has yet been evolved to meet this case. The device of treating the wash on a separate pontoon has been suggested, but the author has never heard of its beiug carried into practice. Heavy black sand frequently accompanies gold in alluvial ground. On the west coast of the South Island, New Zealand, certain dredging claims exist which are sea deposited and are even only now a few hundred yards from the sea. Here the gold is exceedingly fine, and black sand abounds, so that gold saving operations are rendered exceedingly difficult. Some progress has been made recently, chiefly by using a large spread of tables, a good flow of water, aud a distributing arrangement which makes every part of tbe table do its work. Large quantities of sand might also prevent another difficulty, as sand when run into the paddock behind the dredger might run in underneath it.

Every dredger must be built to suit the requirements of the claim it is intended to work. Many claims have proved apparently valueless when worked by one dredger, which have afterwards given excellent returns when worked by a more suitable dredger. This has beeu due mainly to the fact that the first dredger was either not sufficiently powerful or else was unable to dredge deep enough, and had to leave the best part of the wash on the bottom untouched. In designing a dredge for any claim, it is always necessary to ascertain the greatest depth which it may be required to dredge. If the bottom is so soft that it can be cleaned up easily, it may yet be uneven, or on a regular slope, and so cause difficulty. A ladder of such a length that it will dredge the deeper ground of a claim on being lowered until it approaches a vertical position, has, when in that position, the stresses supported at both ends. If, however, the same ladder be hauled up to dredge much shallower ground, it approaches a horizontal position, and, except for its weight, the principal working stress will be in the direction of its length, and thus the stress will be sideways instead of downwards on the tumbler frame which supports the upper end. In such a position the dredger will frequently "kick" as each bucket impinges against the face. To get rid of this trouble, ladders are sometimes made telescopic, so that they may be lengthened or shortened 4 or 5 feet. The deeper ground may be expected to carry more gold than the shallower ground; it should tberefore not be missed.

Althougb a well designed dredger will probably only need two men per shift, i. e., six men or eight men including the dredgemaster and tbe engineer, yet frequently roads to the grouud must be made, and, if timbered, the timber must be cleared, and possibly cut up for firewood; the cost of labor, therefore, must not be dismissed without thought.

It may be possible to do away with expenditure in fuel by the use of electric power generated by water power. Water power has been used for dredgers with good effect. If, however, steam has to be geuerated, the proximity and cost of coal or wood fuel must be reckoned with. The cost of getting machinery on to the claim must receive as much consideration in dredging as in any other mining proposition.

The wash should not be too coarse, nor should it be excessively hard, due to cement; the proper coarseuess is somewhat difficult to specify. Roughly, however, if the boulders do not exceed 18 incbes in diameter, the grouud is dredgable. Occasionally boulders of 2 feet in diameter may be allowed, and although it has been stated that boulders of ten tons weight have been lifted, they occasion serious inconvenience, and stoppages, if not breakages, will occur. However, it certainly seems that if the wash be coarse the gold has a tendency to be coarse also, and collected in pockets, so that it very frequently pays to move a large boulder, in order to recover what is underneath it.

Prospectiug frequently constitutes a most expensive item, and nearly always an unsatisfactory one. It has been said that the only way to prospect a river is to dredge it.

Bore holes have been put down in a river, but the author does not consider boring tests satisfactory. Wben it is considered that a bore hole of 30 feet in length and 5 inches in diameter contains rather less than one-sixth cubic yard, and that gold nuggets up to one-half ounce in weight may easily be encountered, it is easy to see how misleading a boring test may prove, and no one could expect to get any kind of accurate results. Should the gold be fine and the rods well managed, somewhat more reliable results may be obtained, but even then they cannot be expected to be more than a guide.

The progress made in dredging in New Zealand during the last five years has been due in a measure to the excitement caused by the success attending the efforts in dredging the Molyneaux river. This river has now been found, with the exception of a few miles, to be dredgable for nearly its whole length, or about 100 miles, and as the river flows for about half its length through very rocky gorges, such a result is remarkable. The river flows from Lake Wakatipu, and, to give two instances of its character, its source is a fine waterfall, and about 35 miles below this is a natural bridge of rocks. So rocky is the Molyneaux in parts that one dredger built for convenience on an adjoining claim, was unable to dredge on to the right claim. A large number of claims, which were at their initiation termed "wild cats," are now proved successes. Judging by this, a prospector should not term a gorge undredgable at first sight, for it is not unlikely that it may have a bottom composed of some kind of clayey material, which may prove rich in gold.

Dredging has been accomplished to a depth of 60 feet below water level, and elevating to a height of 60 feet above it. These are extremes, and as the machines to do this work are very costly it is advisable to secure claims somewhat easier to work. At the same time a new type of elevator, working by means of centrifugal force, is now being tried, which, if successful, will greatly reduce the cost of elevators. In general, a depth of 35 feet and an elevation of 30 feet are convenient for a dredger to work.

Claims in New Zealand, which when prospected gave results of 6 grs., over 6 grs., and 1 dwt. to the cubic yard, respectively, have proved failures on dredging; in these cases the prospecting was probably tampered with. The author, without going into details, believes that 3 grs. per cubic yard will give, under good conditions, good results on 100 acres in New Zealand. There, a claim is normally 100 acres, but generally not more than 70 acres of it is dredgable, which may mean a life of about eight years only, and during that time the first cost of the dredger must be paid, as well as a fair rate of interest on the capital expended.

*Abstract Proceedings Inst. C. E.

The Correct Dimensions of Open Flumes.

A matter recently came under my notice regarding the correct dimeusions of open flumes, so as to insure the greatest carrying capacity consistent with using the smallest quantity of material, says T. Cooper in the New Zealand Mines Record. From personal observation and inquiry, I find that this subject receives little attention, and therefore take the liberty of bringing it before your readers' notice.

I find by calculation that by modifying the dimensions of a flume it is possible to materially increase its capacity without any corresponding increase in the quantity of timber used in its construction. The correct relation of sides to bottom appears to be as 1 is to 2.

Taking, for instance, a commonly used flume of 2x2 feet, and, say, 12 feet long, we obtain an area of 4 square feet and a capacity of 48 cubic feet, requiring for its construction 72 square feet of timber. Now, modify the dimensions in accordauce with the proportion above laid down, making the sides to be 1 foot 6 inches and bottom 3 feet. We then obtain an area of 4 feet 6 inches, and with the 12-foot box, a capacity of 54 feet, still using only the same quantity of timber—72 feet.

Other examples work out similarly, e. g.:

Sides.	Bottom.	Length.	Area. Square Ft.	Capacity. Cub. Ft.	Timber Sq. Ft.
3 feet	x 3 feet	x 12 feet.	9	108	108
2 feet 3 inches	x 4 feet 6 inches	x 12 feet.	10.125	121.5	108
2 feet	x 3 feet	x 12 feet.	6	72	84
1 foot 9 inches	x 3 feet 6 inches	x 12 feet.	6.125	73.5	84
3 feet	x 4 feet	x 12 feet.	12	144	120
2 feet 6 inches	x 5 feet	x 12 feet.	12.5	150	120
4 feet	x 4 feet	x 12 feet.	16	192	144
3 feet	x 6 feet	x 12 feet.	18	216	144

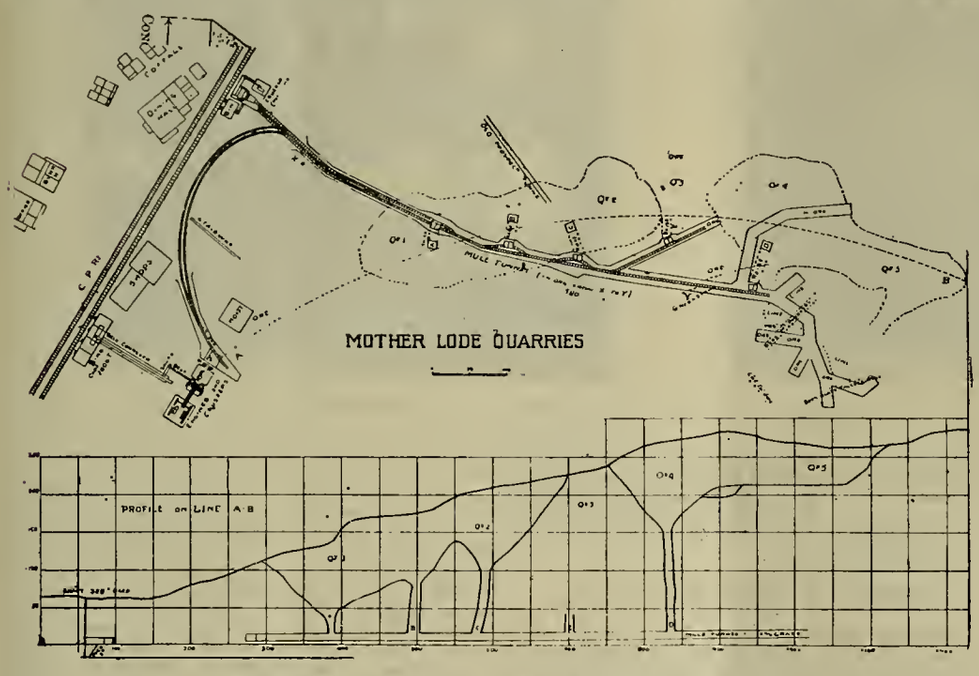
In these examples I have, in order to simplify calculations, taken no account of the loss of timber entailed at the junction of sides and bottom; but this will not affect capacity results.

Mining in Boundary District, B. C.

Written by Fred'k Keffer, M. E.*

Two years ago the writer described the methods employed in mining low-grade ores at the Mother Lode mine, in the Boundary district, B. C. It is the purpose of the present paper to briefly note developments of the system, particularly as regards the quarrying and economical handling of ores, and also to touch upon certain features connected with smelting operations.

At the Mother Lode the series of quarries has been extended and there are at present four raises to the quarries from the main tunnel, with a fifth in course of driving. As far as is possible, the tops of these raises are maintained funnel-shape so as to reduce to a minimum the handling of the ore. While the pits remained shallow it was an easy matter to remove barren or very poor rock by loading it into cars and tramming to waste dumps, but as the funnel system developed it became inadvisable to remove any except large bodies of waste, for the cost of removal had become greater than the cost of smelting. Experience has shown, however, that the detrimental effects of these smaller bodies of waste have been more than offset by the improvement in the general run of the ore body, due to lesser quantities of partially leached surface rock being included; so that the average copper contents of the 137,800 tons mined in 1903 were appreciably higher per ton than those of the 135,500 tons mined in 1902. In places, however, large dikes of epidote, and alkali porphyry, and occasionally isolated bodies of limestone, occur, which are removed by blasting into the raises, all the ore having been previously withdrawn.



Plan and Section of Mother Lode Mine, Boundary District, B C.

The crusher plant located at the entrance to the quarry tunnel has dealt with the quarry ore alone, that from the stopes having been crushed by a Gates machine installed at head of shaft. Work is now being carried forward to consolidate the crushing plants and do away with the machine, which is inadequate to the demands now made upon it. To this end a tunnel is being driven to intersect the main shaft on the same level as the quarry tunnel. At the shaft will be placed a large pocket, and this will discharge the ore into 5-ton skips which will replace the cages now used. The skips will empty into a bin at the head of the shaft, ore passing thence to either one or two crushers, each crusher having a jaw opening 2 feet by 3 feet. These crushers will be driven by a pair of 100 H. P. engines so arranged that either engine can drive either crusher, this arrangement to eliminate all chance of stoppages through breakdowns in either engines or crushers—stoppages which past experience has shown to be inevitable as well as costly. The crushed ore will be conveyed by a Robins belt to the main ore bins. All car dumping and opening of bin and pocket gates will be done by means of compressed air. The same skips and crushers will, of course, serve all levels in the mine.

Although the ore will have to be hauled farther under the new arrangement, crushing costs will be lowered, for the reason that, aside from stoppages for repairs to machinery, the provision of capacious pockets and shaft bins insures steady operation of crusher, which machine, if constantly supplied with ore, can crush a furnace day's run in a single shift, instead of this work taking a shift and a half as at present. Jamming of elevator buckets, constant repairs to them, and their clogging with frozen fine ore in winter, all serious drawbacks to rapid work, will be avoided. The short tunnel to shaft will become the general entrance to mine, both for men (whose houses are all on this level) and for materials from shops and store houses. The main features of this work are shown in the reproduced photograph of map of the mine.

In the matter of power, the cost of this item at the mine has been greatly reduced through the consolidation of power plant, and the driving of all machinery by compressed air. The 100 H. P. crusher engine, formerly steam driven from boilers located near by, now uses compressed air, which is heated to a considerable degree just before entering engine. This expedient has effected a direct saving in labor and fuel to the amount of from 5 to 7 cents per ton of ore crushed. Air is furnished by a cross compound condensing compressor, capacity 3200 feet free air per minute. Two boilers situate near the crushers and hoist will be available to furnish steam on short notice should the compressor machinery break down, thus guarding against stoppages from this cause.

From a smelting standpoint, the ores of the larger Boundary properties have, as a rule, grown less basic as the works have been extended and deepened. That is to say, the proportion of iron oxide ores to the whole ore body has sensibly diminished, there being no great change in the amount of other base. Whether or not this reduced proportion of base to acid ore is to be permanent, it is (at any rate in the case of the Mother Lode mine) impossible to predict. Long experience in mining these deposits has shown that it is not possible to make safe predictions as to occurrence of zones of mineralization, new ore bodies frequently having been found in unexpected places. On the 200 foot level of this mine there has been found considerable less oxide of iron ore than in either the quarries or the 300-foot level. The iron oxides of this latter level are uniformly of higher grade than those of the quarries, carrying more copper and gold, and they do not appear to be directly connected with the upper deposits, although this is not absolutely proven. No exploratory work has yet been done beneath the 300-foot level (which is about 500 feet under the highest outcropping of the ore). A large body of iron oxide ore occurs at the mouth of the main tunnel, but no work has yet been done on it owing to close proximity of the crusher plant, which would be damaged by flying rocks were the requisite blasting to be done.

The change in the basic character of the ore is illustrated by the following average slag analyses, taken over corresponding periods of 1901, 1902 and 1903. The small tonnage of foreign ores treated affects the assays somewhat, but not materially:

Year—	Silica.	Iron.	Lime.	Total.
1901	33.3%	28.5%	20.6%	82.3%
1902	40.5	22.2	20.2	82.9
1903	42.7	20.4	20.2	83.3

With slags running in silica from 40% to 43%, and with matte at 40% to 45% copper, it is found that the furnaces can be maintained in good running condition, and slag losses kept within proper limits. To guard against possible scarcity of iron fluxes it has, therefore, become the general practice to conserve the iron ores of the mines, using only sufficient to keep slags within bounds above indicated.

* B. C. Mining Record.

Cyaniding Gold-Bearing Sulphurets.*

NUMBER IV.—CONCLUDED.

Written by S. B. Christy.

I frequently find that in extracting those ores such a thing as this happens: First, the gold comes out abundantly and very little silver. After a while the solution contains more silver than gold. That goes to show that the gold being more accessible at first is removed, and then, being covered up by the silver, only the silver is touched. I have always found these ores very difficult to treat. I will mention one case of an ore containing about thirty ounces of silver and about two or three ounces of gold. It contained a lot of arseuide of iron, antimonide of iron, lead, copper, zinc and several other minerals. The best I could do on it was about 40%. So do not attempt to apply this on a large scale until you have tried it on a small scale, and then only if it works on the small scale is it wise to attempt it on the large scale.

As to cost, it is rather difficult to make an estimate. It depends in the first place upon the number of tons of ore you treat in a day. One of the difficulties in California is that our mines are located mostly widely separated from each other, and it is extremely difficult to get any one point easily accessible to a large number of mines, where the ore from a large number of mines can be treated. There are only a few places in the State where that is possible, and it therefore results that there are small batches of sulphurets produced at isolated points, where perhaps a mine produces only one or two tons a day, and it is very difficult to put up a plant to handle that small amount economically, but where you have five or ten tons of sulphurets a day, and you have cheap water available for grinding, I see no reason why these sulphurets cannot be treated, when they are properly composed for favorable treatment, of at least 90% or 95%, at a cost of $5 a ton or less, and under favorable conditions $25 material which now does not pay in many cases, might yield a profit of at least $15 a ton, and probably more.

At the present time a great deal of attention is being paid to this subject all over the world. In Australia they are making very earnest attempts to solve the problem, and recently in South Africa they have attacked it there, and I am glad to say, for the first time in years along rational lines. I have recently read a number of papers in the transactions of the South African Mining Association, which showed they were beginning to realize the importance of fine grinding and plenty of water, though they had not yet fully realized, apparently, the importance of getting rid of the metallic iron. But it is along the lines I have indicated here that the problem is to be solved. I feel very sure, if this subject is given the right kind of attention, close and persistent it must be, that it will be easily practicable to add to the annual output of our California mines from $5,000,000 to $6,000,000 a year, because it will mean that a large number of mines which now lie idle because they just contain free gold enough to pay expenses, will become producers, and profitable producers as well.

There is another thing I should have mentioned; that is, the treatment of the iron removed by the magnetic separator. You will see if you remove from 1% to 2% of magnetic material from the sulphurets, you have left a material which contains some gold that has not been treated. So far I have not found any satisfactory way of treating that except to roast it. You may say that will bring us back to chlorination. I don't believe so, because a very small roasting furnace would do. You roast the iron and convert it to the red oxide of iron; then it may be ground fine, either alone or mixed with the rest of the ore, as it is now perfectly harmless to the cyanide solution. Thus you only have to roast a few per cent of what you would if you chlorinated it.

As to the removal of the magnetic material from the sulphides, which should be done before roasting, I had to do it dry. I used a little machine on the plan of the Wetherill magnetic concentrator. The Wetherill people have a concentrator which works under water on wet pulp, and though I have not tried that I feel sure it will work. There is a powerful electric magnet on two sides of a moving belt, and the ore pulp fed into a stream through the field of either magnet, and the non-magnetic part falls into a hopper. A belt with brushes travels around between the maguet poles and sweeps the magnetic part off and dumps it off into a separate hopper. It is a very simple apparatus, which can be easily used. I will say, also, in some cases where the ore is very soft and very little iron produced, you might not need to separate the iron at all, and in any case you would not need to separate it if you are willing to put up with a great loss of cyanide, but that affects the cost. Of course, it is advantageous to circulate the solution so as to use it over again repeatedly, as is done in leaching, but as this is so familiar to cyanide men I did not think it necessary to mention it. But by utilizing the principle of opposed currents, as was first done in decantation treatment by Mr. Williams in South Africa, the volume of solution that must be precipitated can be much reduced.

*Abstract Trans. Cal. Min. Ass'n.

A Compressed Air Installation.

Written for the MINING AND SCIENTIFIC PRESS by WALTER W. BRADLEY.

Much is being said and written along scientific as well as practical lines of the various phases of mining installations. Of these, the question of power is receiving its share of attention, as between water, electricity, compressed air or steam. Water is used argely as the prime mover in the production of both electricity and compressed air. The one advantage of electricity which stands out above all others is its susceptibility to long-distance transmission—present installations reaching up to 300 miles. It may be used direct-connected or belted, or it may be used to compress air, which in turn is used direct. In the latter case, however, at many mines it might be cheaper to compress the air directly with the water power, without electricity as an iutermediate stage. Compressed air is of manifest value around a mine, and especially underground, where, after it has done its work as an agent for power, the exhaust serves to aid ventilation. Electricity, too, is being applied to the operation of rock drills. Compressed air is used in pumps, hoists and other engines in lieu of,

Fig. 1.—North Star M. Co. Compressed Air Power Plant, Grass Valley, Cal.

Fig. 2.—Hoist at Central Shaft, North Star M. Co., Grass Valley, Cal.

and as interchangeable witb, steam, as will be observed below.

An important installatiou in the way of compressed air power plants is illustrated herewith in Fig. 1, being that of the North Star mine, near Grass Valley, Nevada county, Cal. At the time the photograph was taken the plant had a capacity for producing 500 H. P., but this bas since been increased to 800 H. P. One of the compressors therein is driven by a tangential water wheel, 30 feet in diameter, using a single jet under pressure of 775 feet head. A speed of 65 revolutions per minute is maintained and the compressor has automatically operated governors, which (set at 90 pounds pressure per square inch) cut out (blow off) the excess of air not being uscd, down to 15% of the volumetric capacity of the cylinders. This 30-foot water wheel was designed to withstand up to 200 revolutions a minute (a peripheral speed of about 20,000 feet per minute). The first wheel put in was of 18½ feet diameter, to run at 110 revolutions per minute, under 750-foot head, developing 300 H. P. The compressor is direct-connected to the 30-foot wheel, and is of four single-acting cylinders—oue low and one high pressure on each side—having a common stroke of 30 inches. The low pressure cylinders are 30 inches in diameter aud compress the air to 25 pounds per square inch. The high pressure cylinders are 18½ inches in diameter and raise the pressure to 90 pounds per square inch. Between the high and low pressure cylinders the air passes through a series of cooling pipes set in the waterway of the wheel pit.

The compressed air is conveyed by pipe lines to the several workings of the company, the principal one of which is the Central shaft and its connections. The hoist used there is shown in Fig. 2. It is of double-drum, direct-connected, with both post and band brakes, and bas a capacity for raising 2400 tons per day from 1625 feet depth. Allowing 2 minutes for a round trip, hoisting in balance, with 3 tons of rock per skip, this would require 13⅓ hours, leaving 10⅔ hours for handling tools, timber and men and hoisting water. The compressed air before use in the engines of the hoist is reheated by crude oil in a furnace placed in a separate room to the rear of the engineer.

The Central shaft at a depth of 600 feet cut the New York Hill vein, and at a depth of 1625 feet the main North Star fissure was struck, being about 4000 feet on the dip of the vein. A 50-foot sump was sunk and stations cut for ore bins and pumps. From there a raise of 1600 feet was driven in the vein most of the way, and cutting the bottom of the old workings. That the ore values are well maintained throughout this entire depth is shown in the annual report of President Hague of the North Star Co. (see MINING AND SCIENTIFIC PRESS, March 26, 1904, p. 217). Of the values, 90% is in free gold, and the ore carries 3% auriferous sulphides, principally pyrite, but with some galena. The Central shaft is sunk in grano-diorite and in diabase, the contact crossing the shaft irregularly and sometimes following down the center line. However, the two formations were found so tightly "frozen" that the contact never showed any "let go."

Two triple expansion, duplex pumps in the station at the bottom of the shaft raise from 500 to 700 gallons of water per minute a height of 1400 vertical feet in a single lift. These pumps use air at 90 pounds pressure, reheated by crude oil at the pumps. For the rainy period in the spring it is necessary, in addition to the pumps, to use a 3-ton bailing tank. Ventilation in the workings passes down the incline and up the vertical shaft, partly due to the collar of the Central shaft being 50 feet bigher and partly because the gases from the oil combustion in tbe air heaters are discharged up into the vertical shaft. The draught is so stroug as to blow out a lighted candle. To provide milling facilities for the increased ore reserves opened up by these developments, the 40-stamp mill at the North Star (incline) shaft is being remodeled and a new 40-stamp mill is being built at the Central shaft.

Interlocking Metal Sheet Piling.

The advantages to be gained by the use of interlocking steel sheet piling for use in construction of cofferdams, for placer mining, sinking of mine shafts in running ground, and all kinds of earth excavation, particularly where quicksand is encountered, are becoming manifest. The primary object is to provide a metal sheet piling, in which standard rolled beams and plates are used in such a way as to have their adjoining edges interlocked during tbe process of driving. In most cases, the sizes of the beams and plates will be 4-inch Z-bars, 6-inch by 3½-incb angles, and 15-inch wide plates, all of ⅜-inch thick metal. The rolled sections can now be obtained up to 60 feet in leugth, and it is therefore possible to use this piling in one length without splicing the same, if this is deemed advisable. The shapes and plates are put together with Z-bar riveted at one edge of the plate and an angle spaced from tbe plate and extending around the other edge of the plate, thereby forming grooves or channels to receive the adjoining section. One of the interesting features in this construction is the method of caulking the joints. To render the structure water tight, when the same is driven in clear water, a wood strip is provided, and held in the angle where the piles join by means of Z-bar clips and bolts. Slotted holes are provided in the flanges of the Z-bar which permit of the adjustment of the Z-bar closely around the wooden strip. The wooden strip will swell in such situations and present a good joint which requires no further calking. Local leakage can be readily calked when it arises. In running ground or sand, the wooden strip can be omitted, as the joint will readily calk itself by the accumulation of sand, etc. The piling cau be pulled and redriven any number of times, and when it is to be put to no further use, it can be discarded at scrap value. The piling is driven with the ordinary pile driver; it is the iuvention of H. Wittekind, of Chicago. The piling is manufactured by the H. Wittekind Interlocking Metal Piling Co., with offices 611 Cable Building, Chicago, Ill.

Water Consumption in Ore Treatment at Kalgoorlie, W. A.

TO THE EDITOR:—The accompanying tabulated statement shows the water consumption for the principal mines of Kalgoorlie. Some of your readers are no doubt interested in knowing just how far a limited supply of water will go in general mining and milling operations, and it is very seldom that such reliable data as this can be obtained. The tons treated per month can be relied upon as being accurate, as the mines are required by law to render monthly statements. The mines are all under contract to purchase the whole of the water consumed from the Government; and in consideration of the exclusive use of the Government supply they enjoy a rate of 5 shillings per 1000 gallons, and at this rate the mines are obliged to turn tbeir mine water to waste. These quantities include water for all purposes of mining, as well as an allowance of two gallons per day for each employe, and the household supply for tbe staff employes living on the leases.

All the mines of the group have their own steam power, which is used for hoisting, pumping and milling, and the quantities include tbat used for cooling and condensing, and it is principally owing to the character of this apparatus that the variation in consumption is due.

Some modification of the cyanide process is used in every instance; and those using the dry process, roasting the entire ore, would of course have a higher consumption than those using the wet process, owing to the fact that the ore of the district contains a considerable quantity of carbonates which are converted by roasting into sulphates, and these absorb a large amount of water in the subsequent cyauide treatment. The average consumption in the dry process plants is made lower than would otherwise be owing to the fact that the Great Boulder Persevcrance plant is equipped with Fouche condensers, aerial type, while other mines almost exclusively are supplied with water cooling and condeusing plants.

The mines all use filter presses, and the discharged residues vary in moisture from 10% to 25%.

The table is based on the long ton of 2240 pounds and the imperial gallon of 10 pounds.

WATER CONSUMPTION FOR MONTH OF DECEMBER, 1903.

Dry Processes.	Tons Treated for Month.	Gallons Per Ton.
Associated Gold Mines	5,840	256
Associated Northern	2,152	382
Great Boulder Main Reef	2,023	242
Great Boulder Perseverance	11,112	158
Great Boulder Proprietary	9,324	280
Kalgurli	4,571	323
Average consumption per ton, dry processes		234.4
Wet Processes.		
Golden Horseshoe	13,170	234
Rainault	2,205	247
Ivanhoe	12,470	195
Lake View Consols	7,362	208
Oroya-Brownhill	7,009	199
Hannan's Star	1,566	243
Average consumption per ton, wet processes		209.7

Boulder, W. A., Feb. 26. D. E. BIGELOW.

THE local members of the American Institute of Mining Engineers, including the State of Missouri and the adjoining Illinois territory, met on the 9th inst. at the rooms of the chief of the department of mines and metallurgy to prepare for entertaining the mining engineers and metallurgists during the World's Fair. The meeting organized by clecting Arthur Thacher, president of the Central Lead Co., as chairman; F. E. Drake, manager of the Lanyon Zinc Co., as treasurer, and H. A. Wheeler, superintendent of the mining reservation at the World's Fair, as secretary. It is the intention to appoint about twelve vice-chairmen, each of whom will be

prominently identified with the different mining, metallurgical or technical industries of St. Louis and vicinity. Their names will be announced later. The headquarters of the local committee will be in the Mining and Metallurgy Building at the World's Fair, where an attractive space has been allotted to the Institute of Mining Engineers. Affiliated interests are invited to correspond with the secretary, H. A. Wheeler, Mines Building, World's Fair, who desire to co-operate or wish further information.

Scale in Steam Boilers.

Written by V. O. LAWRENCE.

That nearly all water used for the production of steam contains solids, which upon evaporation of the water form boiler scale, is well known to engineers generally, but it does not appear to be so well knowu in what manner that scale is formed, or what chemical reaction takes place to cause the formation.

These solids may be classed separately as sulphates and carbonates. The carbonates consist of the calcium carbonate and magnesium carbonate, both of which are held in solution by reason of their excess of carbonic acid.

From a temperature of about 180° F. to the boiling point and above, this excess of carbonic acid is driven off, and the carbonate of lime, or of magnesia, robbed of its solvent, deposits. An exceptionally high temperature is not necessary to effect this separation, and it is for this reason that we find carbonates to deposit in feed-water heaters and economizers, as well as at the point in the boiler where the feed-water enters.

The carbonates when existing in water without any calcium sulphate being present form a porous accumulatiou, varying from a crystalline to amorphous formation, and even occurring as a fine powder. The latter is more often the case when the feed-water coutains in solution a considerable quantity of sodium chloride (common salt).

Calcium sulphate, which is held in solution by nearly every natural feed-water, is not precipitated at the comparatively low temperature mentioned. In an experiment made in the laboratory a water heavily saturated with calcium sulphate was heated to a temperature produciug ten pounds of pressure, but no precipitation of the calcium sulphate was caused.

Some authorities claim that the separation, or the change of the calcium sulphate from solution to suspension, takes place on the surface of the water in the boiler. If this were a fact the calcium sulphate scale would accumulate in those parts of a boiler nearest the water surface. The contrary, however, is the case, as scale of this nature invariably forms at the parts of the boiler which are exposed to the highest temperature.

It is for this reason we claim that the actual separation, from a certain quantity of water. takes place the moment that quantity of water is changed into steam, and we claim that this change takes place at the point where the heat is transmitted through the iron of thc boiler into the water.

When an atom of water reaches a sufficiently high temperature to become steam it forms a miuute globule, rises through the water to the surface, where the slight coating of water covering the globule breaks. At the point where this globule is formed, that is, at the heating surface, there being nothing to hold the calcium sulphate either in suspension or solution, it must separate, and forms a very small crystal.

If the ebullition of the water is not sufficieut to dislodge it, it will adhere to the iron at the point where it had its origin, or it may be carried by the circulation until it finds something to which it can adhere.

The scale which is formed of calcium sulphate alone is very hard, but a formation of this kind is rare, the great majority of scales consisting of the three substances mentioned, as well as other mineral and vegetable substances.

These latter substances, which are held in suspension by water, instead of solution, become part of a body of scale only mechanically. That is, they become part of a scale, like sand becomes part of mortar, when mixed with cement, the cementing substance in scale being first of all calcium sulphate, magnesium and calcium carbonate being secondary.

Calcium sulphate is the substance commonly known as plaster of Paris. Calcium carbonate exists in nature as marble, while magnesium carbonate is the material often used for covering steam pipes, to prevent the loss of heat.

From the very nature of scale-forming substances their accumulation is a source of trouble to the engineer and expense to owuers of plants. There are, no doubt, many cases where additional expense does not worry the engineer, but there are also, doubtless, more cases where the additional trouble to the engineer does not worry the owner of the plant. There is no question, however, but that both would be benefited if the accumulation of the scale could be prevented and taken care of.

The problem is a difficult one, as not only does each source of water vary greatly in the scale forming solids, but each individual source varies from time to time. One can readily see, therefore, that the analysis of a single gallon of water does not give a great deal of information, as each sample of scale represents the residue left after the evaporation of large quantities of water. We, therefore, contend that if a sample of scale is divided and separated into its various ingredients, chemical treatment can be undertaken successfully. Without such determination, however, it is an impossibility to provide reagents which on the average can be assured to give satisfactory results.

If it were possible to compute the loss in fuel alone from this cause the results would reach an enormous total, and would call the attention of the owners and engineers of plants to the great importance of the subject.

Concrete in Mining and Metallurgical Engineering.*

Written by H. W. EDWARDS.

Concrete is not a new, nor even a modern, substance. Important structures built by the old Romans before the commencement of the Christian era are to-day sound and solid—for example, the dome of the Pantheon in Rome, 142 feet in diameter. I do not propose to discuss the durability of the material, as in the mining and metallurgical business structures, as a ruie, are not calculated to endure for 2000 years. I wish to urge, however, that much of the stone masonry around mines and smelters would have given better results if concrete had been used in place of stone. Concrete looks better, is stronger, cheaper, more durable, more quickly built, and, above all, requires no skilled labor except the carpenter.

Concrete, having well-proportioned ingredients, may be safely relied upon to withstand a compressive or crushing strength of 50 tons per square foot. In most American cities, however, the building laws limit it to the absurdly low figure of 16 tons.

The weight of good concrete, dry, is from 130 to 160 pounds per cubic foot.

INGREDIENTS OF CONCRETE.—Concrete is composed of four ingredieuts, i. e., crushed stone, sand, cement and water.

CRUSHED STONE.—The stone is usually crushed to a size that will pass through a ring of from 2 to 2.5 inches in diameter. It is not necessary nor even beneficial to screen the material. Soft rocks, as sandstone or soft porphyry, are not to be recommended unless the concrete is to bear either no load or an insignificant one. Slag roughly broken to from 2 to 2.5-inch size is suitable. The only objectionable ingredient in slag is calcium sulphide.

COARSE, GRAVELLY SAND.—Jig tailings, both coarse and fine (7 millimeters and under), give good results, especially the 2.5-millimeter size. A mixture of all sizes, with the from 1.5 to 2.5-millimeter sizes predominating, is perhaps the best form in which to use jig tailings. Vanner tailings and stamp battery tailings are not so advantageous, being usually too fine in size. Granulated slag is excellent.

CEMENT.—Cement is essentially a combination of lime with aluminum silicate. A few deposits of rock are known in which limestone and clay occur in about the proper proportions to form cement, and in these cases it is only necessary to calcine and pulverize such material to obtain the so-called "natural cement." Louisville, Milwaukee and Akrou are well-known points supplying such a product. The calcination has to be skillfully conducted at a low heat. If burnt at too high a temperature, it fuses to a slag, which, when ground, exhibits no cement qualities. Moreover, the rock seldom contains the true proportion of lime and alumina, and contains, as well, other

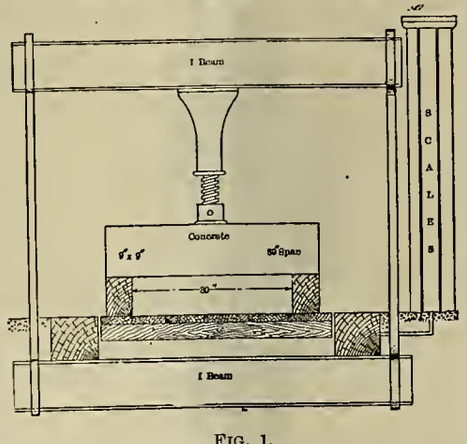


FIG. 1.

substances of an undesirable nature, as, for instance, magnesia. For these reasons the natural cement, while much cheaper in first cost, is usually much less effective than the artificial cement. If any doubt exists as to whether any particular sample of cement is natural or artificial, a test for magnesia will usually settle the matter. In Portland cement magnesia is only a slight accidental impurity (2% or so), while in natural cement it sometimes exceeds 10%. Portland cement only is referred to in the following mixtures.

*Abstract Trans. Am. Inst. Min. Engs.

The tensile strength of a block of concrete may be tested with an ordinary 5-ton platform scales and a jackscrew. Fig. 1 shows the method, and the details are sufficieutly plain without detailed description—the pressure exerted by the jackscrew being read off on the scale beam at the moment the cracks appear on either of the visible sides of the test piece.

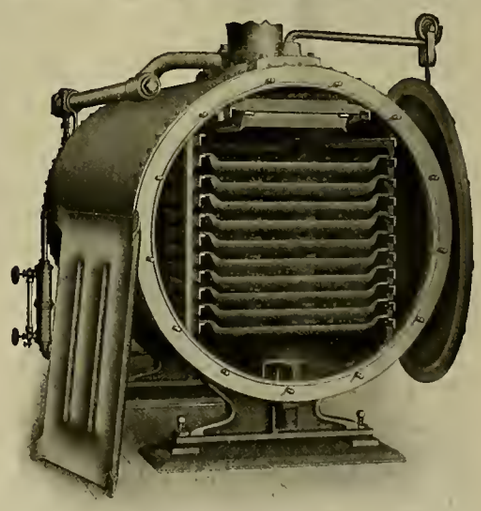
Several prelimiuary series of mixtures of the various ingredients in various proportions should be made—a series with each brand of cement. The mixtures should be rammed in a wooden box, 9 inches square and 30 inches long, inside measuremeut, and left therein for several days or weeks until set. Several batches should be mixed, varying both with the nature and the proportious of the ingredieuts obtainable, and several casts made of each batch. A series of mixtures is suggested as follows:

Cement, Parts.	Sand, Fine Gravel or Tailings, Parts.	Crushed, Unscreened Rock, Parts.
1	0.5	7
1	1	6
1	2	5
1	3	4
1	4	3

(TO BE CONTINUED.)

Exhaust Steam Feed Water Heater.

Herewith is illustrated a feed water heater designed to secure efficiency from the use of exhaust steam, obtained by bringing the water in direct contact with the steam on its passage through the heater, especial provision being made for catching and retaining the solids which separate at the temperature obtained, which is about 210°. Prevention of oil from the exhaust steam becomiug mixed with the feed water is also designed to be provided for; automatic regulation of the water to the heater is secured by float and balanced valve. The heater shell top is of sheet steel, the bottom to a point well above the water line, of cast iron. The heads are cast iron, the front or removable head being swung on a crane as shown, when it is desired to open the heater for cleaning. The trays or pans are of gray



Hoppes Exhaust Steam Feed Water Heater.

iron castings, the form is made up of a series of trough-shaped sections in such manner that the water will flow over the sides and euds, also through the slots, and follow the under side of the pans to the lowest point, from which it drops into the uext pan below. The water in flowing over the edges and along the under side of the pans is brought in direct contact with the exhaust steam and then heated to the maximum temperature obtainable.

When the heater is ready to be cleaned the upper pans will often be found coated with lime and other solids an inch thick, the lower pans being but slightly coated. To clean the heater the head is removed and the pans drawn out when the lime can be scraped off, the pans washed and returned to the heater. The lime will not form on thc shell or other parts of the heater as the water does not come into contact with it until it reaches the chamber at the bottom, and when the pans are cleaned the process of cleaning is complete.

A large oil catcher is located at the back end of the heater through which the exhaust steam passes, and which eliminates the oil and grease from the exhaust steam. The heater is built with especial reference to being non-corrosive from the action of acids in the feed water. All parts of the heater which come into contact with the water are made of cast iron.

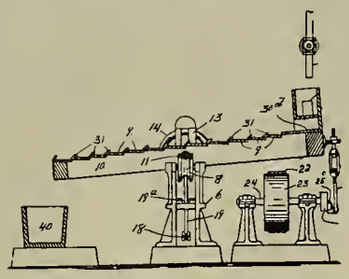
This heater is manufactured by the Hoppes Manufacturing Co., No. 39 James street, Springfield, Ohio.

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 12, 1904.

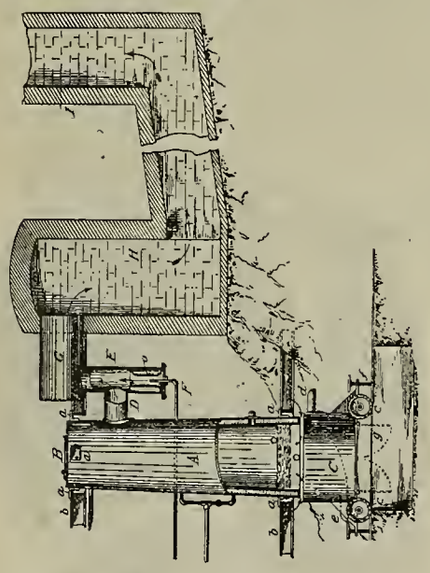
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

CONCENTRATOR.—No. 757,350; J. Ruedy, Denver, Colo.



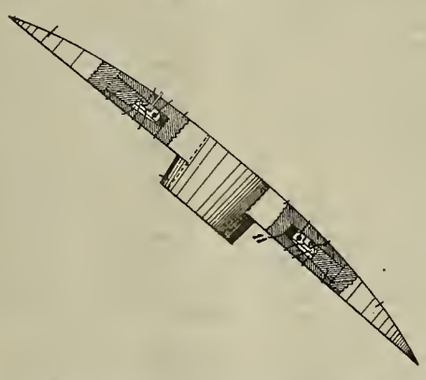
Concentrating table composed of number of longitudinal pans widest at center of table and diminishing in width toward opposite edges thereof arranged to have transverse intermittent discharge from one to other, discharge being completely interrupted during rocking stroke of table in one direction, pans or shelves being provided with riffles projecting above discharge edge and shaped to hold concentrates on pan, and means for simultaneously imparting to table longitudinal reciprocation and rocking or oscillating movement.

PROCESS OF SMELTING ORES.—No. 757,220; A. R. Partridge, San Francisco, Cal.



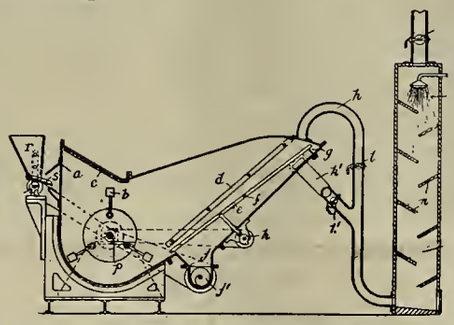
Method smelting ores consisting in admitting air freely at atmospheric pressure to bottom of smelter, and producing suction at top of smelter by injecting jet of steam or air through relatively narrow passage, causing steam or air to pass transversely an outlet from upper end of smelter and to then expand to fill relatively wider passage beyond outlet.

PICK AND POINT.—No. 757,206; L. Kovacs and M. Kovacs, San Francisco, Cal.



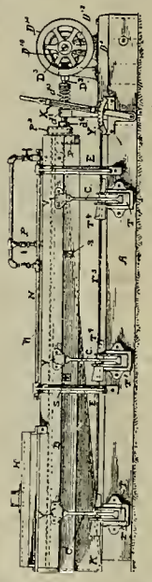
Combination in pick of body portion having handle socket and extensions at each side, extensions having tapering rectangular sockets leading inwardly from center of outer ends, pick points having centrally located shanks adapted to fit sockets, shanks being provided with engaging catches and corresponding latches pivoted within and protected by walls of sockets and adapted to engage with catches of pick point shanks.

IMPACT ORE PULVERIZER.—No. 757,069; J. Thame, London, England.



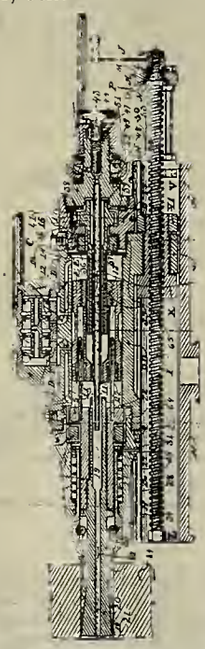
In pulverizing mill, combination with casing, rotary beaters mounted therein and means for feeding material to beaters, of screen within casing, delivery outlets in casing at front and back of screen for dust and delivery receptacle beneath screen adapted to receive and deliver graded material.

ORE CONCENTRATOR.—No. 757,008; G. E. Woodbury, San Francisco, Cal.



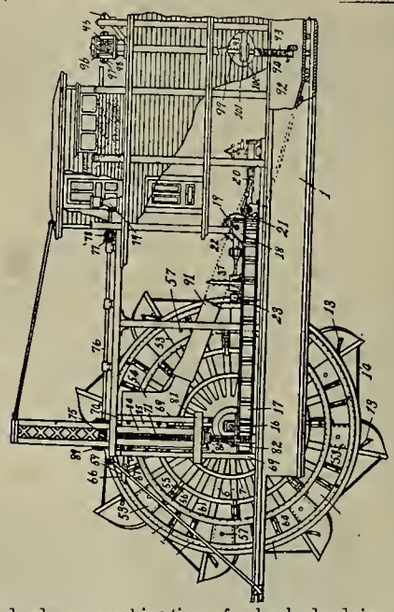
In ore concentrator, reciprocating table, wooden strips thereon disposed in parallel rows, and extending from one end of table surface for portion of length thereof, and relatively thin metal strip of metal of same width as wooden strip and fastened on top of wooden strip, metal strip extending beyond wooden strip and being fastened directly on surface of table beyond terminal end of strip, extension forming continuation of riffle.

METHOD OF EJECTING ROCK CUTTINGS FROM HOLES IN ROCK WHILE DRILLING THEM.—No. 756,972; J. G. Leyner, Denver, Colo.



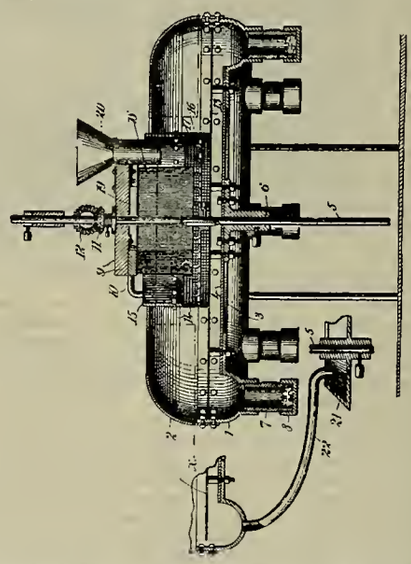
Method of expelling rock cuttings from holes in rock during process of drilling holes, by simultaneously supplying to holes during drilling operation water and air under pressure at the drilling point during drilling operation.

DREDGER.—No. 757,173; A. Boschke, San Francisco, Cal.



In dredger, combination of wheel, dredging buckets secured on periphery thereof, wheel having annular plate, pair of friction rollers engaging sides of plate, shafts carrying rollers, bearings for shafts, transverse slideway for bearings, and means for exerting yielding pressure toward each other upon bearings.

GOLD SEPARATOR.—No. 757,205; J. W. Korfhage, Denver, Colo.



Gold separator comprising annular trough, rotary shaft on which trough is mounted, riffle plate extended upward from outer wall of trough and curved inward, screen arranged horizontally in separator and having imperforate portion extended partly across trough, and mercury containers communicating with trough or trap.

Method of Assaying Tellurides.

TO THE EDITOR:—The scorification assay of tellurides is something of the past, or should be, on account of the small sample necessarily used and the inaccuracies due to volatilization of values. The following crucible charge has given very good results on telluride ores running in value from $5 to $400 per ton:

Ore	½ A. T.
Sodium bicarbonate	½ A. T.
Litharge	3 to 4 A. T.
Borax glass	10 gms.
Reducing agent	Sufficient to give 20 gm. button.

The fusion to be run at a low heat, this being made possible by the large amount of litharge used, which gives a very fusible charge.

The large quantity of litharge has another advantage in that it oxidizes the tellurium, which is the trouble giving element. The amount of litharge used varies with the tellurium content of the ore.

E. J. HALL.

Columbia University, Dept. of Chemistry, New York.

W. E. PASSMORE, secretary of the Colorado Mine Operators' Association, has issued a call for their third annual meeting to be held at the Brown Palace Hotel in Denver, May 2, 1904. Election of officers and other important matters will come before the meeting.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

Geological Survey statistics just issued place the world's production of petroleum in 1902 at 185,151,089 barrels. Of this the United States and Russia produced 91 44%. For years Russia has led in production, but an increase of 19,377,722 barrels in the production of the United States in 1902 and a decreaso amounting to 4,628,515 barrels in the production of Russia caused these two countries to change places and put the United States at the head of the list. More than double the quantity of the higher grades of refined products is obtained from the average crude petroleum produced in the United States than is obtained from Russian oil. The United States produced nearly 2.6 barrels of refined products in 1902 for every barrel produced in the rest of the world.

ALASKA.

(Special Correspondence).—A San Francisco, Cal., company having placer and lode mines near Teller, 80 miles northwest of Nome, it is reported will do a large amount of development the coming season, including the construction of a 20-mile ditch to bring in water under pressure for hydraulicking. It is also the intention to develop the tin-bearing lodes owned by the company in the vicinity of American river. Fifty horses will be sent to Teller in the spring to be used in plowing on the ditch line. G. Gibson of Teller is manager.

Seattle, Wash., April 18.

Superintendent MacDonald, of the Treadwell mine at Juneau, has the pyramid representing each year's production of gold at the Treadwell about completed, says the Juneau Record. It is composed of twenty-one bricks, the first year's production (about $2000) being the small brick on top. Each brick toward the base is larger than that above to the last, which is almost 12 feet in length. The value represented by this pyramid is $22,000,000, or more than three times the purchase price of Alaska. When completed the pyramid will be packed and shipped to the St. Louis Exposition and be placed in the Alaska building.

By decision of the board of Arbitration in the matter of the title and proceeds of placer mining claim No. 9 Above, on Anvil creek, Cape Nome, N. O. Hultberg, assignee for the Swedish Evangelical Mission Covenant of America, recovers from the White Star M. Co. of Illinois, C. W. Johnson and P. H. Anderson, the mining claim in dispute and proceeds to the amount of $263,686. The case grew out of Alaska gold mines staked out by Covenant missionaries in 1898. Mr. Hultberg staked the first claim for his society, and when he returned to the States Mr. Anderson and others continued the work. They declared, however, that the mines were their property, not the mission society's. Not wishing to have the church organization appear as a litigant in court, private arbitration was decided on, the hearings beginning in secret February 28. Two of the disputed claims were at one time held by Eskimos, and this necessitated the presence in Chicago of Gabriel and Constantine Uparaczuck, natives of Alaska. A number of other witnesses were brought to Chicago from Alaska. The ownership of mine No. 9 was the only one passed on by the arbitrators. The opinion of Arbitrators Gilbert and Lane recites that "Anderson himself did not either directly or indirectly make any contribution, either by way of labor or money, toward the acquisition of the title to the claim in question. He never saw it until some time after the legal title to it became vested in him."

ARIZONA.

Cochise County.

The three furnaces of the Copper Queen Co. at Douglas are about to be blown in, says the Bisbee Miner.

The Spray is putting in foundations for a new "dinkey" on the spot formerly occupied by the old geared hoist.

Preparations are in progress at the Gardner, where the foundation for the new hoist is completed. The collar of the shaft will be elevated several feet to bring it up even with the floor of the hoist. The engine will be the finest and most powerful hoist in Arizona.

Maricopa County.

(Special Correspondence).—R. H. Laudermilk, near Agua Caliente, has a shaft down 72 feet and a drift in 28 feet. The ledge is 5 feet in width and the ore is free milling. Value of ore is $20 per ton.

J. V. Creath is making preparations to resume work on his claims in the Phœnix mountains. Work will be continued for a year, when a cyanide plant will be installed.

The Gila Gold Lode Co. are working men on their property in the White Tank mountains, north of Buckeye. The ore is free milling, and when the property is developed further, a mill will be built.

A number of properties in the vicinity of Cave Creek are being worked. A. S. Mills is developing a promising copper property; E. Howard is working on a gold property and W. Channel is working on a gold property in the vicinity of Cave Creek.

The Wickenburg smelter, which changed hands some time ago, will be blown in on April 20th, as a sufficient quantity of ore, fuel and flux have been obtained for a continued run.

Phœnix, Ariz., April 11.

(Special Correspondence).—A. Ford has left Phœnix for the Eagle Tail mountains to work on a copper-gold property.

W. H. Black and J. S. Spencer are working on a gold property east of Morristown, which they located some weeks ago.

Morristown, April 18.

Mohave County.

Randall & Forden closed an option on the Billy Mack mine for $51,000. The first payment on the property was forwarded to W. H. Mack and the purchasers have taken possession of the property. The Mack mine is on the Arizona side of the Colorado river near Empire Flats, 50 miles below The Needles. Mack is reported to have taken out a large quantity of rich ore. Single-handed and alone he sunk the shaft to a depth of 300 feet and exposed a large body of free-gold ore. For years he has refused to sell or work his property. Mack gave several options on the property at various times. Randall & Forden say they have bought the property for themselves and intend to develop it systematically with modern machinery. They are also interested with T. M. Drennan in the Colonel Davis and Osborne group of claims in that district, and it is their purpose to erect a custom smelter.

Yavapai County.

(Special Correspondence).—The Black Canyon C. Co. have disposed of their entire holdings in this county to a new corporation known as the American Mineral Exploration Co.

Mayer, April 18.

(Special Correspondence).—F. Williams is securing patent to several mining claims on Mount Union known as the Storm Cloud group. The property consists of 208 acres, in which there are several veins which have been developed by shafts and tunnels. The property adjoins the Cash mine on one side and the Senator property on the other. The ore contains gold, silver, copper, zinc and lead.

Prescott, April 18.

The Pittsburg-Jerome C. Co. will develop a group of mines near Jerome which they have recently bought of G. Avery and J. Larsen, who will have charge of the development work for the company.

At the Iron King mine at Blanchard a large number of men are at work at the mill installing the stamps, says the Miner. The new stamps weigh 1300 pounds each. The mill has been running steadily for several weeks and the results attained have been satisfactory. The plant has been hampered for tank capacity. Men are at work putting together the six steel tanks, which will have a capacity of sixty tons each. This will give the cyaniding plant a capacity of nearly 800 tons and will allow the mill to run full capacity day and night. It is expected to have the new stamps and the new tanks ready by May 1st. From 50 to 100 miners are to be put on in May.

F. M. Sentenney, of Prescott, is reported to have struck a ledge on Wolf creek, 8 miles south of Prescott, with both walls of porphyry. The ore runs $600 per ton. It is a new discovery and only a few feet have been cut into from the bottom of the gulch. The vein crosses the Benedict ledge, from which rich ore was shipped out years before railroads were built in this section.

Two large boilers are being put in by the Arizona-Michigan M. Co. in the Hassayampa district, south of Prescott. E. E. Greenwood is in charge.

D. M. Timmons, of Prescott, has commenced work on the properties of the Gold King Co. in Bradshaw mountains.

Stratton & Son have begun work on their property on Lynx creek, south of the Hudson.——Lucase & Fields are sinking on their claims on Lynx creek and have two shafts down 130 feet and one tunnel in 235 feet in ore. Assays average $15 in gold to the ton, with copper and lead.——F. Giger has struck a 12-inch vein on Lynx creek, says the Courier, that shows ore running well in gold and 10% to 20% copper. This property is north and joining the Hudson group. Considerable placer gold is being washed out daily on Lynx creek.

Yuma County.

Hodges Bros. have sold their mining claims, in Hodges district, 60 miles up the river from Yuma, says the Sentinel. G. Hodges retains his interest and is a member of the new company, which has been incorporated as the American Flag G. M. Co. A stamp mill will soon be on the ground.

CALIFORNIA.

Amador County.

At the Fremont Con., near Amador City, forty stamps are dropping steadily. The ore is said to be good grade. It is mostly coming from the foot wall vein in the Fremont. At the Bunker Hill, south of the Fremont, twenty stamps are running. The ore reserves are being increased by development.

Butte County.

(Special Correspondence).—On March 31st the latest dredger built by the Risdon Iron Works for J. H. Loggett of Oroville began work. The buckets are of 5 cubic feet each; the dredger will dig 35 feet below the water level and stack the tailings 30 feet above; it has a monthly capacity of 60,000 yards, bank measurement. There are five Westinghouse electric motors on board, taking a 3-phase current at 500 volts, the current being brought on board at 4000 in —Y— and transformed to 500 in delta. The main bucket line is driven by a variable speed motor of 75 H. P.; the main pumps are direct connected to 50 H. P. constant speed type C motor, one pump delivering a high-pressure supply into the screen and the other a low-pressure supply on to the tables. The main winch is driven by a 15 H. P. variable speed motor. This winch is of the Risdon design, but with heavier head line shaft and large brake surfaces. It consists of four side line barrels, each operated by friction clutch, one head line barrel operated by jaw clutch, and one derrick line barrel, also operated by jaw clutch. All the levers are brought to a convenient platform, so that the winchman has all the levers close to his hand. The ladder winch is self-contained and operated by a 20 H. P. variable speed motor; this winch raises and lowers the ladder independently of the main winch. The revolving screen or trommel is driven by a constant speed 10 H. P. motor. This trommel is made so that any part is renewable and is fitted inside with spiral steel bars and special jets in the spray pipe to disintegrate the material passing through it. The elevator is driven by a 10 H. P. constant speed motor. This motor is placed close to the top of the elevator. The whole of the machinery is erected on a substantial hull, 90 feet long, 30 feet wide by 7 feet deep, and is housed over.

Oroville, April 18.

Calaveras County.

(Special Correspondence).—At Mokelumne Hill several rich finds are reported in the ancient river beds which underlie the village. In early days the channels were worked vigorously with rich returns. There are several of these channels on either side of the town and some of these run under the principal streets and buildings. In early days the claims were small —16 feet square at one time—too small to be worked to advantage where shafts had to be sunk. In most instances a number of these claims were consolidated by the several owners and the consolidation worked as a single claim. In the haste to work out the ground in a few instances fragments of ground were overlooked or a pay streak was lost by being cut out by a later channel, and it is on one of these latter that the new find was recently made. It has resulted in a revival of prospecting on many lots and long abandoned claims. The ancient rivers are covered with volcanic debris, mostly tuff, to a depth ranging from 20 to over 250 feet. Further down Stockton ridge to the westward of the town the deep channels have been worked by means of tunnels. On the top of the ridge are circular shafts sunk in 1850. They are 250 feet in depth and have not a stick of timber from top to bottom and never had. The shafts are open from top to water level, which is near hedrock.

Mokelumne Hill, April 18.

It is reported that good ore has been struck in the Red Gold mine, near Murphys.

A pocket of gold was found on German hill, 4 miles north of Angels a few days since, by a man who has been working there for three weeks. The amount taken out is stated to be $8000, and was found a few feet below the surface. The man who found the pocket worked around here years ago. A short time ago he returned and went to the owner of the ground and told him he knew where there was a pocket and offered to work it. He secured permission, he gave to the owner 10%, and the results show that his judgment was not at fault. He is now at work searching for another pocket.

The Metropolitan G. M. Co. has been organized to operate the Jones mine (Carson Creek mine), which was recently bonded by T. Kerns and J. A. Cameron of Spokane, Wash., who transferred one-third interest to Walters & Mausner of Spokane, says the Angels Record. Mr. Walters said, while looking over the Allison and Carson Creek properties, that he had never seen a better outlook on Carson creek, but owing to the bad condition of the mill the company is compelled to close down for repairs. J. A. Cameron is in full charge.

Inyo County.

S. R. Phail of Snow's canyon says that the Golden Argus mine, near Ballarat, will start up soon. J. Cyty has out a large amount of high-grade ore and is running his mill. J. C. Cross is also running on ore from his mine. Mr. Phail has had four runs of ore in the Golden Argus mill from his mines.

Kern County.

The Minnehaha has had ore treated at Snow's mill.——Jones & Sumers, leasing on the King Solomon, have had a crushing.——The Red Dog mill is milling ore from White's camp.——The Red Rock G. M. Co. have a well drillor on their property in Red Rock canyon, says the Randsburg Miner, and will prospect the ground under the direction of J. A. Atkins.

Atkinson Bros., operating the Sunshine mine, near Randsburg, have commenced milling. Development work in this mine has opened it up to such an extent that the operators are contemplating installing compressed air drills and a steam hoist.

Including the 1,000,000 barrel reservoir to be built by the Associated Oil Co., says the Oil Reporter, it is estimated that the reservoirs planned and being built will add 2,500,000 barrels storage to the present private storage in the Kern field. Whether the different companies will store their oil in these reservoirs or sell, will depend on the price that can be obtained for oil during the next six months. If the prices range 20 cents or better it is likely all the oil produced will be sold at once; if less than this figure, the oil will be stored for a better market.

Los Angeles County.

The known extent of the Los Angeles oil field is being extended by drilling bore holes in the area west of the city of Los Angeles. There is said to be a probability of finding good oil territory in that direction. The monthly output of oil for the Los Angeles district is increasing.

In the Whittier oil field the Oil Reporter thus summarizes the situation:

Wells drilling	16
Wells suspended	0
Wells pumping	80
Wells abandoned	0
Wells completed	0

Twenty acres of oil land near Whittier were recently bought by the Home Oil Co. for $400 per acre. A well will be sunk on this tract.

Madera County.

(Special Correspondence).—The work of repairing the Gambetta shaft at Grub Gulch is completed. It is reported that a long drift is to be run from one of the lower levels toward the Josephine vein, also owned by the company, as it is thought a large ore body will be found there. The Josephine vein is on or near a contact of granite and slate, and the Gambetta is a fissure cutting slates and schists in both strike and dip. The Gambetta vein, though smaller than the Josephine, is rich. A characteristic is the occurrence of arsenical iron sulphide rich in gold, both free and combined. The mill, it is expected, will be able to treat 100 tons of ore daily.

At the Texas Flat mine, near Coarse Gold, the new 20-stamp mill is treating four tons per stamp daily. The ore is granular quartz, carrying gold and auriferous pyrite.

Near Fresno river are several veins in the Grub Gulch district, which cut the formation and in some instances are accompanied by aplite or granite dikes. These veins resemble the Gambetta and carry arsenical pyrite, some of which is rich in gold. Thus far not much development work has been done on these veins.

Grub Gulch, April 18.

Mono County.

The Lundy Cyanide & Development Co. intend digging a canal to drain the upper end of Lundy Lake this spring, says the Yerington, Nev., Times. This will lay bare the tailings now beneath the water, and they will be worked. The trench will be about a quarter of a mile in length.

Nevada County.

It is reported at Grass Valley that the Idaho-Maryland mine is to be reopened. Mr. Dorsey, the owner, who is negotiating with the Eastern men, says that nothing

definite will be known until Mr. Wilkins returns to Boston. It is thought the deal will be made and that the mine will be pumped out for examination. There remains much undeveloped territory in the lower workings, and there are known to be parallel veins carrying good gold values. The main shoot produced $25,000,000 from the surface to the present bottom of the mine. When the ore shoot pinched out little development work was done, and the mine was closed and has since filled with water. If the property is reopened it is expected a new vertical shaft will be sunk near the present south limits of the ore body.

Mr. Rosenfeld of San Francisco, who recently bought the Lamarque and Inkerman mines, near Grass Valley, says a double-compartment shaft will be sunk. The site for the shaft is about 1000 feet from the west line of the Lamarque, almost on the lode line, and the prospect shaft at that point taps a strong ledge of promising appearance, 1 foot in width. This is some distance back of the old workings, which have been ascertained to have been off the main ledge. Orders have already been placed for machinery. Cornish pumps will be used. A 6-drill compressor is to be installed, with hoisting and pumping plant. Work on the buildings to house the machinery has commenced. C. Brockington is superintendent. The mines are 2 miles south of Grass Valley. The vein has a low dip—about 18°—between slate walls. The sulphurets are high grade. The Lamarque has been developed to a depth of about 350 feet.

Superintendent Graham of the Shady Creek placers reports that in two weeks he will have things running full blast. A string of flume and pipe line is being constructed which will furnish water for the elevator.——At the Brophy claim Superintendent Miller is installing a centrifugal pump.

Placer County.

R. Jeffrey, a few days ago at the Gold Blossom mine, near Grass Valley, put in a blast after clearing out debris. The shot was fired and broke into a pocket of specimen ore. The mine had been idle for some time.

Plumas County.

W. H. Corbiere has bonded the quartz mine owned by J. Freeborough, of Poker Flat. From this mine Mr. Freeborough has taken out several thousand dollars with a hand mortar. The ledge is large.

San Diego County.

(Special Correspondence). — C. W. Pauly has been allowed $500 per month as receiver of the Free Gold M. Co., S. M. Shortridge of San Francisco has been allowed $14,500 for legal services by Judge Torrance of San Diego, and J. Chandler was also allowed $15,000 for similar services. Some of the stockholders object and will petition the State Supreme Court for stay of proceedings.

Picacho, April 16.

An oil well is being drilled at Chula Vista, southeast of San Diego. It is expected that sand and clay will be found until 600 feet is reached, when gas or oil may be found. Holes, sunk some time ago, developed gas at from 400 to 600 feet. The depth of the deepest was 700 feet. The intention of the present enterprise is to go down 1500 feet.

The Encinitas copper mine, 18 miles north of San Diego, which is being developed, demonstrates the existence of good copper ore in large quantities in this section. Superintendent H. MacKinnon says: There is one 400-foot shaft, another 225 feet, and a third 180 feet; with three 100-foot drifts and two 50-foot drifts. The work of sinking, drifting and stoping is going on. The mine is equipped with ore crusher, 6-foot mill and two concentrators. The power is supplied by three large gasoline engines. Two hundred and fifty tons of ore have been milled. The water pumped from the mine is used for milling purposes.

Shasta County.

It is reported that the Midas M. Co. at Harrison Gulch will resume work in the Midas mine. The Midas employs 100 men when in operation. A lockout occurred on February 19th last, since which only two watchmen have been employed. The lockout affected both union and non-union men. The Miners' Union has maintained its organization during the lockout, but it is understood that when the mine opens up it will be with non-union men, who will be brought in from the outside.

Sierra County.

(Special Correspondence).—The Sierra Buttes mine is reported sold to Hayes Bros. of San Jose, Cal., togother with the Butte Saddle and the Bigelow mines adjoining. It is proposed to work the group through the Sierra Buttes tunnels which hold the topographical key to the situation. The Sierra Buttes mines were worked extensively and profitably for years under English ownership. It is believed that under improved modern methods these mines will now again become profitable. W. D. Pinkston is superintendent. At present there is 12 feet of snow at the mines. The surrounding county is very rugged and the difficulties of transportation are numerous, but the property is equipped with machinery which only requires overhauling. Development will begin as soon as practicable.

It is also reported that R. J. Anderson has bought the Hilda and Klondike drift mines, near Sierra City, which property will be consolidated and worked by the Pliocene M. Co. of San Francisco, Cal.

Sierra City, April 18.

It is reported that negotiations for the purchase of the Maple Grove drift mine, between Alleghany and Forest City, are pending. The claim contains 2000 feet of the lowest known part of the Ruby channel, which has yielded $500,000. One nugget from this place sold for $3000. If the Maple Grove is taken over, a tunnel will be started above Cumberland to work the channel.

Siskiyou County.

J. Johnston of Yreka has made arrangements for working the Headwaters quartz mines on Humbug creek, with intention of putting up a smelter, near Yreka.

A. C. Brokaw of Yreka found a $30 nugget with a little quartz attached, while piping down the bank. His hydraulic claim in Quartz valley is one of the most extensive in the State. He intends laying pipe in another year for a distance of a mile, in saving several miles of ditch, and gain 400 feet pressure for the hydraulic elevators and giants. This change will also save a great amouut of water.

J. B. Scott reports doing well at the New York quartz mine on Indian creek. A. C. Brokaw has the extension of the New York mine, known as the Golden Eagle, which shows rich quartz, with ledge 4 feet wide. He intends putting up a mill at the mine during the summer.

The Wright & Fletcher hydraulic mine at Oro Fino has been kept in steady operation all winter with an abundance of water. While other mines in the vicinity suffered damage from the heavy storms, this claim escaped threatened danger from the waters.

It is said the management of the Carlock & Morrison mine of Quartz valley is going to install new machinery, consisting of air compressor, five stamps to the mill, making in all ten stamps, and machine drills.

L. Hill and B. Carter have begun to open up their property on Eddy's gulch, adjacent to the Ball mine.

Trinity County.

A rich gold strike is reported made in Ferry gulch by E. B. Channel, of Minersville, and his partner, A. S. Thomas, who after prospecting a few days uncovered a rich body of ore, 2 miles east of the Fairview mine. During the first day they mortared out $400 in gold in a hand mortar. Tracing their ledge up the mountain they uncovered another pocket from which they mortared out $400 more. Ferry gulch has been mined for fifty years.

Tuolumne County.

(Special Correspondence).—The Mount Jefferson mill at Groveland is to resume crushing, it having been idle pending development work.——At Big Oak Flat the Moody mine has been unwatered for investigation.——The custom mill on Big creek, east of Groveland, is running on ore from various mines of the vicinity. The Cosmopolite mine on Cosmopolite hill, between Big Oak Flat and Groveland, is being unwatered. This mine has been extensively worked and has produced a large amount of gold, mostly from pockets. In the vicinity of Groveland, Big Oak Flat and Priests considerable prospecting is going on with encouraging results. There are a number of pocket claims near Big Oak Flat and Priests, which seem to warrant more systematic development, as the indications are that the gold-bearing zone will pay to mill, as a whole, as is done at the Jumper, near Stent.

Big Oak Flat, April 18.

Connally & Summers have been milling ore from the Side Wiper mine, near Arrastraville, in the Pennsylvania mill at Cherokee Flat.——It is reported that the Soulshy mine is to add five stamps to the mill at Soulsbyville. —— The Seminole mine, 1 mile southwest of Tuolumne, has been unwatered for examination and it is reported an ore shoot 100 feet long has been found which carries a good percentage of high-grade sulphurets. The vein is 3 to 6 feet wide. The mine is equipped with machinery.

At the Black Oak mine, near Soulshyville, forty stamps are again dropping, and the plant is in full operation.

Forty-eight mining companies of Tuolumne county have contributed to the display to be made at the World's Fair at St. Louis, says the Sonora Union-Democrat.——It is reported the Harvard mine at Whisky Hill, near Jamestown, will resume work in May.——It is said the Golden Gate mine, near Sonora, will be worked under new owners. The property has been idle the past year. The Golden Gate is down 700 feet.

Yuba County.

Bids for the construction of a pile and concrete harrier on the Yuha river will be opened hy the California Debris Commission at San Francisco, Cal., May 4th. The work will be hegun within thirty days after the bids are accepted by the War Department at Washington.

COLORADO.

(Special Correspondence). — Business conditions throughout the State are improving. Good strikes continue to he reported from several mining camps, which is encouraging. Articles of incorporation have recently hsen filed with the Secretary of State of the Gray's Peak Railroad Co. It is the intention of this company to build an electric line from Silver Plume, in Clear Creek county, around the slope of Leavenworth mountain into East Argentine mining district, for the purpose of hauling ore, as well as passengers.

Denver, April 18.

Boulder County.

The Terror mine, on Spencer mountain, has been bonded and leased from the Terror M. & M. Co. by W. M. Williams of Boulder, vice-president of the Jenny Creek M. & M. Co. The Terror has 1000 feet of development work done and in all of its workings large bodies of low-grade ore are found. It is equipped with hoist and station and sinking pumps, and as soon as unwatered drifting will hegin.

The United States G. Co. is driving its tunnel into Arapahoe mountain to cut the Monroe, Arapahoe and Klondyke veins. One vein has been cut with assays reported of $65 per ton. The vein has no surface indications.

H. H. Mund, of Denver, has started work on the Caribou silver mine. For the present work will be confined between the tunnel level and the surface, opening new territory that had not been explored by the old company. The tunnel level is 300 feet helow the surface. Should he he successful, he will make arrangements with the company to unwater the lower workings. Caribou was once the largest city in Boulder county, and the mines produced more ore from 1870 to 1880 than all the mining districts in the county. It is believed that the mines of Caribou district, if properly developed, can be made to pay even at the present low price of silver.

Clear Creek County.

The Clift property, on Democrat mountain, at Georgetown, has been sold to the Saxon Mountain M. Co., says the Courier, for $15,000. The Clift in recent years has produced $120,000. It has been owned for a number of years by A. Ford and associates, hut of late hut little work has been done. The Clift is surrounded hy producers, among them the Fred Rogers, Government, Junction, Little Emma, Polar Star and Silver Glance. The Clift is supposed to be an extension of the Silver Glance, which has been a heavy producer. The upper level has been driven 75 feet, and it is thought by driving another 100 feet the veins of the Silver Glance and Rogers will he cut. Level No. 2 is in 700 feet. Level No. 3 has been driven 500 feet. No. 4 is in 706 feet. This level will have to be driven ahead some distance hefore the main ore hody is reached. The lower level is in 800 feet, but no stoping was ever done. There is a large body of quartz in the hreast, carrying an occasional streak of high-grade ore. It is the intention of the company to drive the lower level ahead. The Saxon Mountain M. Co. own a group of claims on Saxon mountain and the Clift has been consolidated with these holdings. The offices of the company are in St. Paul, Minn. D. W. Shepard of Georgetown is manager.

Arrangements have been completed for heginning work on the railway to he built by the Hazleton Con. Co. This road will be 5 miles long and is for the purpose of transporting ore from the Santiago mine to the mouth of the Baltimore tunnel above Silver Plume. It is the intention to build a mill of large capacity, says Manager Rogers.

N. Gregg of the Gregg Investment Co. of Denver states that work will he under way on the tramway in a few weeks.

Good reports come from the Vidler tunnel, heing driven by the Transcontinental M. Co., says the Georgetown Courier. It is expected a vein will he cut in a few days. The tunnel, when completed, will be utilized for railroad purposes as well as for mining. With the machinery in operation which will be installed shortly, the Vidler tunnel will make more rapid headway.

A 4-foot vein carrying streaks of gold, copper and silver was cut in the Grass Valley tunnel on Soda creek this week, says the Denver News. The hreast of the tunnel is in 120 feet, and nearing the Gomez vein. The property is in the control of the Rocky Mountain Securities Co. of Denver and the work is being done hy contract by W. B. Lowery.

The Chicago Mountain M. & T. Co.'s Three Friends tunnel, near Idaho Springs, is being driven under contract hy E. A. Adams. There is now about 3 feet of low-grade ore in the tunnel and they are nearing the junction of the Three Friends vein, which will be cut at a depth of 200 feet.

W. A. Slater, E. S. Giles and E. L. Clarke have organized the Lincoln Co-operative M. & L. Co., which will operate the Muldoon group in Lincoln district. The company has a limited number of members, who each pay into the treasury $10 per month for the purpose of carrying on the development work. They are developing the group by a tunnel and will soon begin shipping to the Bertha mill.

Work is to hegin within a few days on the South Africa claim, in the Freeland section. The claim is the east extension of the Old Stag, and is owned by New York and Montreal parties. It has three veins showing within the side lines, and the shaft is on the center vein. This shaft is down 30 feet and will be sunk to 100 feet, the crosscuts run thence to the other veins. In the hottom of the shaft at present there is from 4 to 5 feet of concentration material of a fair grade.

Indications are that the Yankee, near Idaho Springs, will be producing as soon as the season opens up. The Yankee Con. M., M. & T. Co. is getting ready to start up its new Lombard mill. The mill was finished last fall, but the country was frozen up before it could be started. This mill has a capacity of seventy-five tons per day. H. I. Seemann is president and general manager of the company.

Work on the Central Colorado mine, near Silver Plume, is being prosecuted vigorously, under direction of W. Blantou. Several lodes have recently heen cut by the tunnel, and a shipment of three carloads to Denver brought good returns. This company has been developing this group for a number of years.

The Terrible mill at Silver Plume, which has been idle for eight weeks owing to the pipe line being frozen, is again running. Five machine drills are at work on the different levels on development. Two more drills will be added. Forty men are employed. The creek now has plenty of water for power, and it is possible that no further trouble will be experienced on the pipe line. Two shifts are employed at present and the force will he douhled hefore the first of May. Tbe mill has a capacity of 100 tons of ore daily. In 1870 the Terrible L. M. Co. shipped 99¾ tons of ore to England, which returned $52,462, and 300 tons of ore from the Brown lode, treated at the Brown mill, gave returns of $115,822.60. These two lodes were the largest producers in Clear Creek county in that year.

Fremont County.

The Blaney Oil & Gas Co. have completed the first derrick and have commenced drilling. The well is a few hundred feet from the heaviest producer of the Frazier Oil & Gas Co.——The Victor Oil & Gas Co. has spudded to drill well No. 3 on its leased ground south of Florence.——The first derrick of the National Oil Co. is completed and drilling operations will hegin in a few days. While excavating for the foundation timhers a petrified tree 10 feet long and 18 inches thick was unearthed.

Gilpin County.

The Penohscot M. & M. Co., near Central City, is reported to have struck good ore in the Penobscot tunnel in Gamhle gulch, in Independent district. The tunnel is in 1045 feet and another contract for 100 feet is to he let. The breast shows 5 feet of mineral, of which 18 inches is smelting ore, carrying gold, silver, copper and lead, the balance heing concentrating ore. The company is considering the huilding of a mill. P. J. Hamble is manager.

A steel cahle 1500 feet long has been put on by the Mackey-Burroughs mine on Quartz hill during the past week. Sinking is in progress and this lift of 100 feet will put the shaft down 1000 feet.

The Jenny Creek M. & M. Co., operating in Jenny creek section of the Kansas district, has let another contract for 250 feet on its tunnel to A. E. and W. Scoville, C. Tavaner and E. Miller, and the contractors are reported making good headway.

Operations have been suspended temporarily at the Pleasant View mine on Gunnell hill, near Central City, owing to had air and difficulties in operating through the St. Louis-Gunnell shaft, and it has been decided to sink a new shaft west of the Pleasant View shaft, erect new shaft building and install a plant of

machinery. The Mutual Benefit Co. are owners. W. C. Carnegie is in charge.

Judge Do France has issued an injunction restraining the Roderick Dhu G. M. Co. from taking ore from the Wheal Zor lode. Both mines are in the Nevadaville district, this county.

Tippett & Co., working the Forks mine on Quartz hill under lease, made a shipment of six cords to the Randolph mill during the past week.

Manager J. Lillig of the Golden Rod M. & M. Co., operating in Silver creek, reports that they have reached a depth of 115 feet in the Pet shaft and have opened smelting ore which carries good values.

Leasers on the Speeio Payment mine on Bellevue mountain have shipped a carload of smelting ore from the Black Hawk depot to the Argo plant.

The Gower Mines Syndicate, Ltd., have shipped three cars of concentrating ore from the Running Lode mine to the Alpine mill on South Clear creek.

Richards & Co., leasing on the Old Town mine in Russell district, shipped a car of ore to the Argo smelters last week.

Gunnison County.

The Kimberly group of six claims, between Camps Sherrod and Bowerman on the middle fork of Quartz creek, near Pitkin, is being operated by the Monarch M., M. & Dev. Co., says the Pitkin Miner. The workings consist of an incline 160 feet showing a 2½-foot vein, which has been driven over a hundred feet. An 80-foot tunnel has been driven and an 18-inch vein cut at the breast. The walls are granite and lime and the mineral carries values in gold, silver and lead. There are three carloads of ore on the dump ready for shipment that average $30 per ton. The company contemplates starting a new 500-foot tunnel lower. Manager Givens has sixty acres of placer ground in the gulch that has been platted into town lots and that locality will be known as Camp Givens.

In Mineral Farm basin the Citizens and Maid of Athens have several ore teams on the road hauling ore for shipment. There are a few hundred tons of mineral in their bins which runs from $35 to $100 per ton in gold, silver and lead. The stopes in these mines are looking well. The sulphides carry a good percentage of lead. During the past month or two the Citizens was bothered with water in their shaft, but at present two hours of hoisting per day keeps the mine in good condition.

Samples of ore from a mine recently opened on Pomeroy mountain, near Hancock, assay very high in gold. The mine is near the Alpine tunnel, 13,245 feet above sea level. The ore shows free gold and wire gold, visible to the naked eye, and the mill runs of the free-milling ore are said to he over $300 to the ton.

It is reported that the first shipment of ore from the Camp Bird mine at Bowerman, owned hy Hurley, McShane & Short, has been attached at Pueblo on account of adverse claim of ownership of the property by the Goodwin T. Co.

Development work continues on the North and South Hall's gulch tunnels of the Colorado S. & M. Co. Air drills are used and the tunnels are in between 600 and 700 feet each. These workings will open up the contacts of the Silent Friend and Mineral Farm basin sections.

The Independent G. M. Co., operating the Bowerman group in the Box Canon district, has started a new tunnel between the shaft and lower tunnel. This new workings will be driven on the vein which will be more economical than working on the rich ore by drift in the shaft.

The Iowa Con. M. Co. has been incorporated by F. T. Voris, C. A. Berger, A. W. Hall, A. W. Unger and A. Koehler. The company is operating at the Iowa group of claims in Bertha gulch, Tin Cup district.

G. A. Dewey has begun operations on the Copper King in Box Canon district and will push development work on the property throughout the summer.

Lake County.

(Special Correspondence).—The mineral output of Leadville, after a continuous period of prosperity extending over twenty-six years, still holds its own, but the output would be still greater were treatment charges lower. A number of companies and individuals, owning or controlling large tracts of mineral lands, will neither work the property themselves nor lease to others unless they receive exorbitant royalty. Were this condition different, the output would be materially increased.

In the down-town district considerable activity is manifest among the different properties. The Western M. Co. is operating the Midas, Coronado, Adams and other properties. This company is also running the Adams mill, which is producing 3000 tons of concentrates per month. The ore comes from the Adams shaft, on Carbonate hill. On the Henriotta the Western Co. has recently erected a new shaft house and trestle. Under this trestle ten 50-ton cars can be placed. Both of these properties have been large producers in the past. The Coronado is being worked at present and it is expected the Henrietta will start up later.

Below the Adams mill, in Stray Horse gulch, C. Delker has a small plant treating tailings from the Adams mill. In this mill he has a magnetic separator and other devices of his own conception.

The Caribou Leasing Co. is shipping 100 tons of ore per day to the Salida smelter. This company has recently erected a new head frame over the Wild Cat shaft, which is now down 100 feet, and will take the place of the old Caribou shaft through which they are now working. There is a large body of ore in the Wild Cat.

In California gulch is the California Gulch M. Co.'s property, which is being worked by leasers. They have found some good ore, but not yet in paying quantities.

The A. Y. & Minnie mill is being operated by the Great Western M. Co. This mill is producing about 1000 tons of lead concentrates per month. Just above the mill are the buildings of the Minnie mine.

Across the gulch from the Minnie is the Gilt Edge shaft, operated by the New Leadville G. M. & M. Co., T. S. O'Brien manager. This company is employing twenty-five men and averaging thirty tons of ore per day. The ore is lead and zinc sulphides. The shaft is 500 feet deep. The property is equipped with 200 H. P. boiler, 125 H. P. hoist, 2-drill compressor, 300-gallon compound pump. The ore bins, which are located on the Colorado Midland Railway, have a capacity of 500 tons. The company will increase their boiler capacity later.

A little farther down the gulch is the Moyer property, owned and operated by the Iron Silver M. Co. This company is shipping 10,000 tons of ore per month and is said to he the heaviest shipper in the district. The new ore bins have a capacity of 1500 tons. The building is 82 feet long, 26 feet wide and 55 feet high. The bottom of the ore bins is made of railroad iron. About 30,000 pounds of iron and steel have been used in the construction of the building, besides 125,000 feet of lumber. On this mine they have a 482 H. P. double-drum, counter-halanced hoist, an 8-drill air compressor and boilers.

Leadville, April 15.

San Juan County.

T. J. Hurley of the Ruby Basin M. Co. of Silverton says a new mill will he ordered this month.

C. Dale, contractor, is placing the machinery in the auxiliary mill of the Gold King, near Silverton. Excavations have commenced for foundation of the new power house and for the auxiliary concentrating plant. There are to he installed two marine boilers. It is expected to have the auxiliary mill completed and running by Sept. 1. Concentrate product from the Gold King shipped over the S. G. & N. railroad aggregates 100 tons daily.

In Prospect hasin, near Silverton, the force on the Henrietta mine comprises twenty-five men. Following the blowing in of the smelter the force is to be increased, and before fall will be close to 100 men. —— The Stony Pass M. Co.'s Mammoth tunnel is being pushed ahead. The original size of the tunnel, which was 7x8 in the clear, has been cut down and the 2x4-foot drain discarded. The tunnel is to unwater the Yankee Girl mine at Red Mountain, 2½ miles distant, and has been in operation three years. It is in 475 feet. At 5000 feet from present face it will intersect the Henrietta.

F. Wetzel has started work on his Del Mino group, foot of Prospect basin. There are nine claims in the group, the Del Mino proper being low-grade gold quartz, while the Boycotter and Boycotter Extension show bodies of copper-iron sulphides, which carry gold-silver-copper values of from $11 to $35 per ton.

San Miguel County.

The Mayflower mine in Gray's basin, a tributary of Bridal Veil, has been under development throughout the winter with good results, says the Telluride Journal. The shaft is down 450 feet and shows 4 to 5 feet of ore in which free gold is seen. The third level at 300 feet is also in good ore. At this level the west drift is in 175 feet and the east drift 40 feet, and being driven ahead. The fourth level is being started at the bottom of the shaft. The drift driven in winter on the vein bas reached a depth of 450 feet and is still going forward in 4 feet of ore. There are 5000 tons of ore on the dumps. The company has taken a lease on the Philadelphia mill at the head of Bridal Vail falls. A tramway will be erected connecting the Mayflower with tbe mill. The ore is free milling, says President Marquis.

The Ophir Con. M. Co. at Ophir Loop have had for the past four months as many men as could be employed to advantage on development. For a while ten of the fifty stamps in tho mill were dropping, later twenty, and now there are thirty. C. F. Somers, secretary of the company, says: "In a short time the other twenty will he put in operation. We are crushing our ore to pass a 50-mesh screen, which is considerahly finer than most mills in this district reduce their ore, consequently the fifty stamps in our mill will not dispose of as many tons of ore as the same number of stamps in other plants, but we expect to treat an average of 125 tons in twenty-four hours."

Teller County.

J. W. Hitchcock has leased the Divide claim on Tonderfoot hill. The claim adjoins the Hoosier on the south. A shaft on the property has heen sunk 235 feet. The machinery removed will be replaced by the lessee. The lease covers a period of two years, with a 20% flat royalty. The conditions include 10 feet sinking or 15 feet of drifting a month.

Over $800,000 have been distributed hy Cripple Creek mining companies since January 1, 1904. This is in excess of dividends paid for the same period in 1903. The following companies hy the first of May will have paid dividends as follows:

Portland	$360,000
Stratton's Independence	125,000
Mary McKinney	30,000
El Paso	60,000
Vindicator	33,000
Strong	25,000
C. K. & N.	15,000
Last Dollar	10,000
Lessees and others	150,000
Total	$808,000

The Portland, after the payment of $180,000 on April 15, will have paid dividends of over $5,000,000, and the company's statement shows a surplus of over $700,000 in the treasury.

At Copper mountain, in the north end of Cripple Creek district, the Metallic G. M. Co., which drove the Metallic tunnel in the north side of the mountain, is to resume operations on the south side of the mountain. The company has a lease on the Bill Nye claim, belonging to the Copper Mountain M. Co., where operations will begin. A new shaft is to be sunk and Manager R. Blanchard expects to cut the extension of the Fluorine vein on the dip. A hoist will be erected there.

It is reported the Free Coinage mine on Bull hill at Cripple Creek is ahout to be sold. This change will result from the purchase of a large block of Free Coinage stock by J. A. O. Carper. Mr. Carper has a lease on this property for five years, which requires the sinking of a new shaft 1000 feet.

A number of new ore bodies have been discovered on the Vindicator on Bull hill the last few months, says the Gazette. Ore shoots have heen opened previously and followed down 1200 feet. New ore bodies have been opened in the 600, 700, 800 and 900-foot levels of the property and in various other parts of tbe company's territory. The find in the 600 level has been opened for a distance of 1000 feet, of which the screenings are returning on an average of about 3½ ounces to the ton. This is the average grade of ore opened in the new discoveries. In the 900 level the new ore is returning values of two ounces to the ton. When the strike occurred last August the management of the Vindicator pulled the pumps from the bottom of the shaft and the water rose from the 1200-foot point to the 1000-foot level and remained ever since. The water rising to this point forced the company to confine its work to that portion of the mine above the water level, with the results mentioned.

Lessee Chrisman, operating on the fifth level of the Gold Coin property at Victor, has sent out its initial shipment of twelve tons, which will return values of 1½ ounce to the ton. This shipment was made as the rock was broken. Hereafter the ore will be sorted and shipped in grades. The lessee is breaking ore on what is known as the Little Montana dike. There are ten sets of lessees now operating different portions of this property and all are reported to have ore.

A. J. Wharton, of Cripple Creek, says he will erect a 100-ton cyanide plant on his property this summer. He says that he has 35 feet of ore that assays from $3 to $15 a ton, and he is confident that he can treat it and mine it at a cost not to exceed $2 a ton.

Another shipment of sixty tons has beeu sent from tbe Julia V., on the west slope of Beacon hill. A new plant of machinery is being installed and an engine house, 28x40 feet, is also being erected. Mr. Burke says: "We had assays on 7 feet of ore running $100."

The work on the new cyanide plant on the Wild Horse, owned by the United Mines Co., is progressing rapidly. The lessees on this territory believe that the entire dump of several hundred thousand tons of ore can be bandled at a profit.

W. G. Kilpatrick, who recently secured the Acacia company's ground, under a $50,000 bond and leasc, will commence working two shifts in a few days.

Four sets of lessees are working in the main shaft of the Independence Con., or Hull City placer, and all of them are taking out ore, tho grade of which is said to he hetter than $40 a ton. A 3 foot vein on the 500-foot level runs $70 per ton.

S. Warren, superintendent of the White City G. M. Co., working the Friday, adjoining the Hoosier, on Tenderfoot hill, is getting small streaks of ore that run $780 to the ton.

IDAHO.

Boise County.

R. Winter, owner of 8 miles of placer ground on Moore's creek, beginning 6 miles from Idaho City and extending two miles beyond, has two dredgers on the creek, one of which he started on the 13th inst. and the other will be put in operation as soon as repairs have been made. The dredger now in operation is working 900 cubic yards of dirt a day. Mr. Winter says there is 6000 inches of water in the creek at present. The snow is about 2 feet deep in Atlanta, hut on the summit, 16 miles beyond Idaho City, it is fully 18 feet deep.

Idahn County.

L. Abbott, superintendent of the Belle of Thunder Mountain M. Co., says the company owns thirty-seven claims, the hest known of which are the Sunnyside and Belle of Thunder Mountain. A new shoot was opened in the latter during the winter. Drifts were run in ore over 200 feet without finding ends or sides of the ore body. Enough ore has been opened in this claim to keep a 50-stamp mill running three years. The ore averages $9 a ton. The Burr Oak tunnel, which will cut the ore bodies of a number of claims in the group, has heen driven 1200 feet. In 100 feet farther it will be in ore, at a depth of 600 feet. This company employs twenty-nine men and in a few months will have 100 on the pay roll. The lower tunnel of the Dewey is reported to be in good ore. The mill has been running all winter and bullion has been sent out regularly. About 150 men have been at Thunder Mountain during the winter. Snow at the Sunnyside is 8 feet deep, and in Pen Basin 12 feet.

At a meeting of the stockholders of the Twentieth Century M. & P. Co. of Roosevelt, Idaho, and Cleveland, Ohio, held at Cleveland, it was recently decided to put in a 10-stamp mill, says the Boise News. The mill will have to be shipped in sections so as to he packed on animals. This mill will be used until such time as a wagon road is completed, when a larger mill will be placed on the property.

Owyhee County.

J. Sullivan, who is developing his Jacob gulch property, reports having cut the vein in the Shamrock claim 300 feet from the mouth of the tunnel and has drifted 100 feet on the vein, crosscutting at intervals to ascertain the average width, which is 15 feet. Tbe average value is $15 per ton. The tunnel cuts the vein at a depth of 300 feet. There are four claims in the group, with four veins running through their entire length. A shipment last season taken from the surface of these claims netted $700.

Shnshone County.

The rush from Hamilton, Mont., to the Owl Creek gold district is in full swing, says the Butte Intermountain, and 7 feet of snow covering the heart of the district. Men are leaving here and other places near by every day for the new gold fields. A numher of New York men who left last week took along 6000 pounds of supplies, which were hauled to Mineral Hill and from there transported on toboggans to the new camp at Boulder crossing, a distance of 10 miles.

The Silver King will treat the ore from the Wyoming mine, near Wardner, which is being worked under lease by O. R. Young of Wallace, says the Press. Hauling from the mine to the mill was begun, but tbe condition of the road has prevented the transportation of large loads. About twenty tons a day are being hauled, which will be increased to forty tons when the condition of the roads improves.

At the Standard mill, at Wallace, Superintendent G. Ruggles has completed the installation of the fourteen slime tables wbich bave supplanted the canvas plant that had been in operation at the mill for a number of years. There are eight Frue vanners and six standard Wilfleys. The former were the first installed and they have been treating the slimes for some time, while the Wilfley slimers have been made ready for operation.

Washington County.

The Idaho M. Co., Ltd., organized in Buffalo, N. Y., will prosecute developments on the California group of six claims on Camp creek, about 2 miles above Landore. The officers of this new company are: C. F. Macey, president and

general manager; A. H. Beckham of Omaha, vice-president; F. Macey, treasurer; J. C. Sutherland, secretary; F. Powell, superintendent. The company will begin the erection of a boarding and bunk house, blacksmith shop, etc., and operations will be confined to sinking the shaft now down 100 feet.

Another new mill will be built in the Rapid River district this season for the Weyant Milling Co., which is operating near Pollock, says E. L. Hollingshead, manager. Mr. Hollingshead says the mines are showing up well.

The Seven Devils copper district is to be reopened, says the Weiser Signal, by F. Powell and J. C. Sutherland.

MONTANA.

Carbon County.

As a result of disagreement between the Miners' Union and officials of the Northwestern Improvement Co. at Red Lodge over the selection of a weighman, 600 men are out on strike. While the real matter at issue is not great, the miners maintain that a principle is at stake, and that their rights have been invaded. The company claims that under existing conditions they have no way of protecting themselves. The weighman, an official who weighs the coal as it comes up out of the mines, is elected by the union from among its members. The company asked that a regular employe of the company be selected, and when N. Smethurst was elected by the miners Manager Pettigrew objected to his serving and ordered him to leave. The miners refused a suggestion made by the officials that the matter be referred to the higher officials before action was taken and the strike declared. The Northwestern Improvement Co. is controlled by the Northern Pacific Railway, and the officers of that railway have been notified of the trouble.

Fergus County.

In the Judith mountains, near Lewiston, the Townsend M. Co., of which L. H. Mershon is president, owns the Big Horn mine. The Big Horn tunnel is being driven into the northern base of Crystal mountain and is in 300 feet, and has cut a vein of ore 40 feet in width which carries values in gold, and it is estimated that there is enough ore now in sight to justify the erection of a mill. The ore is one adapted to treatment by the cyanide process.

Flathead County.

Operations at the Snowshoe mine are well under way, says the Libby News. Twelve carpenters are making the necessary alterations and additions to the mill, getting ready for the additional machinery which will be installed. There are two carloads of additional machinery for the mill. This car consisted of a Huntington mill, a crusher, much larger than the old one, and a compressed air receiver. The latter will be placed in the 200 level of the mine and from this the air drills will be supplied. With the proposed additions the management anticipates a large increase in production.

Granite County.

The Heverin-Houle M. Co. is moving a 56-ton steam shovel from Bearmouth to its properties on Harvey creek. The shovel grades its own way up the gulch, the track on which it runs being moved forward as the machine progresses. Two and a half miles were covered in the first two weeks, and within a week or more it will reach its destination.

Jefferson County.

Men have been at work on the Rose Gold properties at the head of Golconda creek, near Jefferson City, all winter and a large amount of ore has been extracted. The crosscut is still being run across the large vein of the Yellow Jacket, and it is said that the vein is solid ore for 95 feet. The company is preparing to erect a large mill the coming season, using electric power from the lines of the Missouri River P. Co., which runs near the property.

The Copper Mountain & Milling Co. owns forty claims in the Wickes-Corbin district, upon which development work has been progressing for several months, says the Basin Progress.

J. H. McCabe of Corbin has started work on the Robert Emmet group, 6 miles north of Boulder. The group has been a large producer of high-grade silver ore, which was shipped by ox team and river to Swansea, Wales, for treatment. The old shaft has been retimbered and the property will be developed. It has only been worked to a depth of 200 feet. The shaft will be sunk another 100 feet.

Mulvahill & Ely have put a number of men at work to develop the Daly properties at Wickes, which they have bonded. The shaft is down 350 feet and will be sunk to 500, with levels each 100 feet. They have a large amount of good ore on the dump.

The development work commenced recently at the Big Indian, in the northern part of the county, is progressing. Several hundred feet of tunnel have been run. In the south tunnel a new vein of ore has been crosscut for 30 feet and no sign of the opposite wall. In the west tunnel a number of small rich veins have been struck, all leading in the direction of the main workings. It is the intention of the company to thoroughly develop this property. In the regular working of the mine they are taking out and milling 300 tons a day.

Lewis and Clarke County.

The crosscut on the vein in the Copper Hill mine of the Red Bird Co. at Austin has been run 25 feet, and there is no opposite wall. The ore is copper and iron and the company has a contract for a car a day as soon as the spur from the railway at Austin is completed. The company has placed steam hoisting machinery at its Reliance group in High Ore gulch, and is taking out a large amount of high-grade smelting ore from development work. New and improved machinery is being placed on the Red Bird, near Austin, and the production will be increased.

The Liverpool, in Lump gulch, continues shipments from development work, shipping six cars in March to the East Helena smelter, which netted several hundred dollars to the ton, principally in silver. Assays of the new vein in the 700 level run from 224 to 1230 ounces of silver per ton from large samples of 125 pounds.

President Winscott of the Gold Bond Co., owning the Good Cheer group in Maupin gulch, and the Tunnel property, 4 miles from Helena, says preparations are being made to start development on the Good Cheer group, 15 miles from Helena. There is a 60-foot shaft, which will be sunk to 200 feet and levels run, and stoping commenced. A tunnel will also be run on the vein, which carries 6 feet of ore at the surface, and this will give a depth of 1000 feet before reaching the shaft. The tunnel will be run 700 feet. The ore runs a smelter average of $30 per ton. A new vein has been discovered in the White Pine properties, owned by Schmidt and associates of Helena. The claims are in Warm Springs gulch, 9 miles from Helena. The new strike is the richest that has been made in these properties.

Ravalli County.

The Wood Placer Co. has taken possession of the diggings at Hughes creek, near Hamilton, which were operated last year by J. A. Nelson of Indianapolis, under contract with the Wood Co. The Wood Co. will resume operations soon, employing fifty men.

Silver Bow County.

The annual report of the Alice G. & S. M. Co. of Butte has been published, in which President M. H. Walker shows that expenditures exceeded receipts during the past year to the amount of $5303.03. The report of Superintendent Buzzo states that considerable attention was given during the past three years to the treatment of the complex zinciferous ores in the Alice and other mines belonging to the company. These ores commence at about 300 feet from the surface and on the 400 level of the Alice mine average 17% zinc, 8% lead, 9% iron, 1% copper, 30.4% silica, 8 ounces silver and $1.60 per ton in gold. Various methods of treatment have been tried, particularly wet concentration and magnetic separation, but the losses attending thereto have thus far interfered with satisfactory results. In addition to the working tests, 200 tons were sent to the mills in Colorado and Utah, where it was treated with care. From all tests made it is manifest that if the ore carried a higher percentage of lead the outcome would have shown a profit. Recent prospecting on the 600 level of the Alice mine shows the average per cent of lead in the vein to be 13½, as against 8%, and zinc 20%, as against 17% on the 400 level. When desirable the 60-stamp mill, which has remained intact since closing down, October 1, 1899, can be used for a concentration plant, and the White-Howell roasters brought into service to aid in extracting the iron from the zinc. Superintendent Buzzo further says that it is evident that at depth the ores of lead-zinc, bearing also copper, silver and gold, will be susceptible to treatment by concentration and magnetic separation, requiring only to be worked upon a generous scale to pay.

Attorneys for the Amalgamated C. Co. have filed in the State Supreme Court an appeal from the order of Judge Clancy, denying a new trial in the Minnie Healy mine case, which had been adjudged the property of F. A. Heinze. It is reported the Amalgamated Co. will ask in connection with the appeal that the Minnie Healy mine be closed pending a decision on the appeal. Unless the case is advanced on the calendar, it will not be argued for a year or more.

NEVADA.

Esmeralda County.

The discovery of coal is reported 30 miles southeast of Sodaville, near the railroad building to Tonopah. The vein is said to be 12 feet thick, at a depth of 150 feet.

Lincoln County.

(Special Correspondence).—Work was commenced April 6th on the new crosscut tunnel of the Empire Con. M. Co.'s property at Empire Camp. It will be 488 feet in length and will crosscut the Empire lead at a depth of 500 feet, or about 700 feet on dip of vein. Drifts will be run east and west 2000 feet each way. The mill will be erected on the millsite adjoining this tunnel.

The Searchlight M. & M. Co. at a depth of 250 feet have encountered a 15-foot body of quartz, averaging from $20 to $25 in gold. They have a good milling ore all the way down.

One of the near and interesting probabilities of this section is a railroad from Ibex, on the Santa Fe, to a connection with the new Salt Lake road, via Searchlight.

Searchlight, April 16.

F. Gardner reports a new find in the Pioche-Nevada Con. mine, near Pioche, in the shaft at depth of 45 feet. The entire bottom of the shaft is in ore.

Nye County.

(Special Correspondence).—The Goldfield M. Co., at Goldfield, represented by J. R. Duffield, is the owner among six others of the January claim, which is one of the important producers in the camp. This claim was leased to Patrick, Kendall, Jones & Reilly on February 5th, and the first shipment made February 16th of 100 sacks of ore. Since that time there has been shipped by the lessees 275 tons of ore which will net $150 per ton. There is also on the dump from 1200 to 1500 tons of mill ore which will average $30. There are two shafts on the property, one an incline to a depth of 112 feet and the other a vertical 100 feet deep about 75 feet west of the inclined shaft. These are connected at the 50-foot level and drifts are being run in the bottom to connect. The vein has been crosscut at the bottom, showing 35 feet of ore, with the foot wall not yet in sight. The Combination claim, adjoining the January on the east, which is also a large producer, has another ledge at 165 feet in depth, showing high values.

Goldfield, April 18.

The ore in the shaft of the Combination, at Goldfield, is changing from oxides to sulphides. The values of the sulphides in the Combination assay $300 per ton.

J. P. Harvey, local representative of P. Clark, started to develop two springs and a few days ago struck a flow of 3 to 5 miner's inches. The shaft on the Combination is down 170 feet and they are drifting both ways on the 130-foot level. Stoping has been started on a 4-foot streak of ore in the 80-foot level. This is the first stoping done in the Combination, the ore heretofore coming from development work.

A gold discovery was made on Gold reef 2½ miles southeast of Gold mountain, says the Tonopah Bonanza. The discoverers are G. Gordon and T. Ahern. They came upon the top of a ledge carrying mineral 2 feet from the surface.

The rock has the appearance of porphyry and carries a black mineral resembling manganese oxide. Samples of the rock have been assayed. The highest return given is $370 in gold, and other assays running from $8 to $40, all in gold. Neither wall of the ledge has been found. The gold belt, according to Mr. Gordon, is 3600 feet wide by 6000 feet long as far as prospected.

It is out on the open desert. Back of it some distance is a range of mountains. By the wagon road it is 9 miles from Tonopah, but on a bee line not over 6 miles. The group is known as the Rattler. The claims are Rattler, Montana, Compromise and Dawn. The owners are G. Gordon, T. Ahern, J. Hall, F. M. Field and R. Wampler. The first strike in that locality was made a month ago in the Conglomerate group by Kielhofer, Graham and Campbell.

They have a ledge of the same rock as the Rattler, but is colored with red and brown iron. Otherwise the characteristics are much the same. The Conglomerate lies about 2000 feet to the northward of Rattler. Hall and Campbell have another group in that district. This ledge is large and of the same character as the others.

Washoe County.

It is reported that W. C. Williams has sold his Cabin and Cabin No. 2 mines in Olinghouse canyon to I. Miller, president of the Springfield M. Co. of Reno. Twenty-five thousand dollars is the consideration stated. The Cabin and Cabin No. 2 have been producers for several years. There is a millsite that goes with the mines, also a water right.

The Forlorn Hope mine in Olinghouse canyon is drifting south to connect the new shaft with the old at the 100-foot level. The new shaft is down 50 feet and shows 16 inches of $20 ore. In the drift a better grade is found. At the Crown Point a drift is being run north on an ore shoot in which values are $10 per ton free milling.

NEW MEXICO.

Sierra County.

The Richmond group, owned by the Gold Mines Co., is near Hillsboro. The company owns a millsite and water right on Percher creek, which gives water sufficient for all uses and an ample water power for operating a 100-ton mill during the entire year. The erection of a 50-ton mill is contemplated. Formerly the ore was shipped to the smelters at El Paso, Texas. All the lower grades were piled on the dump and some left in the stopes. The values of these ores averaged from $4 to $20.

NORTH CAROLINA.

Mecklenburg County.

(Special Correspondence).—The Capps mine, 5½ miles northwest of Charlotte, has passed into the control of the Capps M. Co., who are making preparations to resume operations on a large scale and to add a chlorination plant to their 10-stamp mill and concentrators. This property is one of the oldest and best known mines in the southern district, having a record of about $2,000,000. The property is well equipped with machinery for extensive operations, and has three working shafts —90, 160 and 180 feet deep—and over 2000 feet of underground levels. The company is considering an offer from English ore buyers to take its entire output for export to the English smelters.

Charlotte, April 16.

OHIO.

The Pollock bill, indorsed by the Ohio Mine Workers, was passed by the senate last week. The bill requires the operators of coal mines to employ one man, whose duty it shall be to have full charge of the firing of all blasts. No blast is to be exploded until after the miners have left the shaft or slope at the end of the day's work. It is claimed by the author that this will result in the saving of many lives.

OREGON.

Baker County.

G. Carter, consulting engineer for the I. X. L. and now in charge of the cyanide plant near Baker City, says that the additional battery of stamps has been set up and the boiler is being placed. The extra stamps will be ready to go into commission within a week. This will double the capacity of the plant, making about twenty tons of ore a day.

M. Sullivan, one of the owners of the Lucy group in the Greenhorn mountains, says work at that property is progressing. The Lucy ledge, cut recently, shows 18 feet of ore, with values from $6 to $50. The crosscut will be continued for the O. K. ledge, a distance of 250 feet. This is the main lead of the group. The outcrop, Mr. Sullivan says, has given assays as high as $150, while the Lucy ledge never showed such surface values.

Jackson County.

It is reported that the Millionaire mine has been sold for $40,000. The property is 25 miles from Grants Pass. M. P. Ward will begin work at once and buy the necessary machinery, pumps and hoists.

SOUTH DAKOTA.

(Special Correspondence).—The outlook for mining in the Black Hills the coming summer is good. There is much activity in all of the old districts and considerable in new fields, as well as in some that have been idle for several years. In Rochford district and Hornblende district, near it, the ores are mostly gold. Numerous rich deposits were found at and near the surface in early days of these districts, but, after mining them, operations were in many cases suspended. It is now found that the auriferous pyrite can be concentrated and treated at a profit. Some of the veins are of large size and will justify big mills At Galena, east of Deadwood, the Branch Mint Co. intend to build a cyanide plant this spring, and the Ruby Co., in this district, also contemplate building a 100-ton plant. At Lead City 100 stamps are being added to the Amicus mill, and it is reported that sixty more will be added, which will make a total in this mill of 300 stamps, with a capacity of 1200 tons daily. The Deadwood-Standard Co. is to increase their cyanide plant by addition of more tanks. At the Clover Leaf, near Perry, the shaft is to be sunk to 1000 feet, and it is reported that the

lower workings show an improvement in the vein, which is there more regular. South from Perry a good deal of prospecting is going on, particularly on upper Box Elder. In this district the formation is identical with that at Lead City, excepting that there are no intrusive porphyry dikes. West of this section and about the head of Silver creek are promising copper prospects in black slate and quartzite. On upper Box Elder is found conglomerate containing copper. About Custer there is a great deal of prospecting for gold. In this district the formation is mostly mica schist with granite dikes, and some very rich ore has been found; but the rich spots do not hold out and the low-grade ores seem by comparison worthless; but some of the veins are large and carry enough gold to make the property profitable, if properly equipped and managed. Timber and water are plentiful almost everywhere. The coming summer promises to be a prosperous one for the Hills.

Rochford, April 16.

Lawrence County.

The Lucky Strike mine, 2½ miles south of the Uncle Sam mine and owned by the Clover Leaf Co. at Perry, is sinking the shaft with a horse whim. When the shaft gets somewhat deeper a steam hoist will be put in.

A new mill is projected by the Gilt Edge-Maid M. Co. in Strawberry gulch, Bear Butte mining district, near Galena. It is to be a cyanide plant for the treatment of ore from the Gilt Edge and Dakota Maid properties. G. A. Duncan and O. P. Ankeny of Deadwood and others are at work on the enterprise.

The Puritan M. Co. has recently bought the 10-stamp mill of the North Star M. Co. and will move it from the North Star mine, near Custer, to the Puritan in Strawberry gulch. The company has also bought the North Star hoist and will move it at the same time.

Another shoot of ore has been found at the Penobscot mine, at Garden City, east of the main shaft. It is one of the strongest yet found in the mine. Of late this company has been prospecting beyond the line of actual mining and preparing the way for future years. A new compressor has been ordered, capable of driving twenty-four drills.

Pennington County.

The Lucile G. M. Co. was organized recently to develop and operate a group of mines near the head of Irish gulch, 1 mile north of Rochford, and near the Montezuma mines.

TEXAS.

Matagordo County.

An oil gusher was struck last week in the Big Hill oil field, at a depth of 870 feet. This is the first gusher in that field. The oil spouted 50 feet above the derrick.

UTAH.

Box Elder County.

The Utah C. Co. of Bingham is forwarding big consignments of concentrates to the smelter.

The Utah C. Co., owning the large concentrating plant at Bingham, contemplates the installation of concentrating tables, says Manager Jackling. The mill has a capacity of 1000 tons per day.

Juab County.

It is reported at Eureka that the Sioux and Utah mines are to be included in the proposed amalgamation of the La Reine and Beck Tunnel, the Cyrus Oliver and Salvator. R. D. Grant, owner of the Sioux and Utah mines, says while such a consolidation of interests would be of advantage, the Salvator, owned and operated by J. Knight, is developing a body of argentiferous-gold ore, showing fifty-four ounces silver, with $14 gold, the lessees of the Sioux have ore containing silver, lead and gold.

Manager Joseph of the Carisa, Tintic district, says now that the road between the mines and the leading station has improved shipments will increase. At the mine arrangements are being made to sink the shaft to 900 feet. Lessees are taking out ore, while the company is raising the usual tonnage.

The directors of the Tesora of Tintic district have arranged to have the mill moved to Bingham for the Bingham Con. M. Co., where it will be used in connection with the Dalton & Lark mines to concentrate the second-class silver-lead ore.

Salt Lake County.

In Alta district the winter is broken and claim owners have comenced work. The superintendent of the Alta-Quincy reports a strike at that property where the tunnel has cut 8 feet of copper ore.

A strike is reported made at the Continental-Alta mine at Alta, in the winze sunk from the lower Grizzly tunnel. Manager H. M. Crowther says the ore is of milling grade and will concentrate about 8 to 1. The ore carries gold, silver and copper. The vein is 10 feet in width and is on the contact between lime and porphyry.

The South Columbus will cut the Alta-Quincy, which it adjoins on the east. The tunnel will open an ore body at a vertical depth of 1000 feet, which was worked on the surface.

Summit County.

The Ontario's new concentrator at Park City is handling an average of 100 tons of ore per day.

A new station pump has been ordered by the New York Bonanza Co. Manager Wilson says it has a capacity of 300 gallons of water per minute.

Ore shipments from Park City for week ending April 15 were as follows:

	Pounds.
Ontario	816,000
Daly-West	2,523,000
Kearns-Keith	31,000
	3,400,000
Total	5,108,060

Tooele County.

The Black Diamond M. Co., at Stockton, is preparing to sink an incline to connect with the Honorine tunnel, for the purpose of transportation and ventilation.

WASHINGTON.

Ferry County.

C. M. Fassett of Spokane is at the Bedie mine, west of Republic, accompanied by F. H. Flood, who will install and manage the cyanide plant at the new mill. The frame for the plant is up and the mill should be running by July 1.

King County.

The discovery of gold in the suburbs of Seattle is reported. The gold is said to occur in black and ruby sand, and is apparently an old beach, on which layers of heavy sand and gold have been concentrated by the waves.

Stevens County.

W. E. Harris, manager of the Review M. Co., reports a strike in the 140-foot crosscut tunnel. The ore shows galena mixed with gray copper, iron and zinc. This property consists of five claims and lies on the west side of the Columbia river, 2½ miles from Northport. It is an old property, first located in 1892, before the reservation was opened, and again in 1896 by the present owners, after the reservation was opened. The latter location brought on a legal battle that ended in the United States Supreme Court in favor of the present owners, G. Reith of Holly, Mason, Marks & Co., H. Baer of Spokane and W. E. Harris of Northport. The title is now clear. The place where the ledge was tapped is 130 feet in depth. The surface showing is quartz 100 feet in width and has been prospected for nearly 1200 feet.

FOREIGN.

AFRICA.

Transvaal.

The mining department of the Transvaal has published its report showing the trade returns of the colony for the fiscal year ending June 30, 1903. The imports relating to the mining industry exclusively are valued at $22,739,187 as against $8,966,840 in the fiscal year preceding. Of this amount 93.03% represented the value of stores consumed in the gold mines, 5.45% the value of stores consumed in the coal mines, 0.51% that intended for the diamond mines, and the remaining 1.01% for the chemical and metallurgical plants. The value of stores consumed in the gold mines averaged $7.668 per effective stamp. In 1898-99, the year before the Boer war, these imports averaged $5.03 per stamp.

AUSTRALIA.

Queensland.

The gold returns of Queensland for the month of March are reported by the London Mining Journal as follows:

	Tons Crushed.	Yield, Ounces.
Charters Towers	23,100	24,600
Croydon	3,700	2,300
Gympie	20,200	12,900
Mount Morgan	20,900	8,900
Ravenswood	2,200	2,500
Other Fields	5,800	3,600
Alluvial		900
Total yield		55,700

The yield for the March quarter was 145,000 ounces. The following calls were made and dividends paid in March:

	Calls.	Dividends.
Charters Towers	£8,600	£30,100
Croydon	500	3,000
Gympie	6,400	43,500
Mount Morgan	Nil	12,500
Ravenswood	1,300	Nil

BRITISH COLUMBIA.

Boundary District.

Ore shipments from the mines of the Boundary district for the week ending April 16 ran over 15,480 tons.

Rossland District.

As a result of a conference between Superintendent R. C. Morgan of the S. F. & N. R. R., Manager Wilson of the Northport S. & R. Co., and Acting Manager J. H. MacKenzie of the Le Roi, held at Rossland, the ore train and local switching crews have been put to work. The Le Roi is again hoisting ore and will resume shipments to the Northport smelter.

At the Le Roi mine, Rossland, fifty men have been added in the last few days, says the Miner. Others will be put to work from day to day. Seventeen machines are at work in the mine. It is expected that within a short time the full crew of 425 men will be restored to the Le Roi.

The Le Roi No. 2's concentrator at Rossland is running steadily, though the oil feature is not operated.

MEXICO.

Chihuahua.

S. G. Burn of Tom's River, New Jersey, is in the city of Chihuahua to commence work on the Josefina mine in Santa Eulalia for the company recently organized by J. H. Furman to exploit the property. Mr. Burn is accompanied by C. J. Burnup of London, England. The company is composed of English and New York people.

There are fourteen diamond drills in the Santa Eulalia camp, all of which are in operation on nine different properties. It is diamond drills that have brought the Santa Eulalia district into prominence within the last two years, says the Chihuahua Enterprise. Their use has done more to locate and develop the ore deposits in the lime mountain than anything else. The camp has a record of $600,000,000 in production and stands a good show to repeat itself, and the diamond drill will henceforth be a leading factor. There is a large area of Santa Eulalia that has not been scratched.

The Terrenates Con. M. Co., operating in Parral, has been reorganized as the United States M. Co., with J. P. Elkin of Pennsylvania as president and J. W. Marshall as manager. The 600 H. P. electric plant is installed and said to be working well. The power is used for lighting and hoisting and later will be applied to the pumps. The station pumps are at the mine and the others are to arrive.

NEW ZEALAND.

At Waikine the management has been experimenting with the new grinding plant, and, so far as experiments have progressed (with sands only), the results obtained have exceeded expectations, says the London Mining Journal. The working of this mill is about to make a radical change in dealing with the residues from the whole of the company's mills. This mill will serve the great purpose of effecting a further percentage of bullion extraction, not only from the sands, but the importance of being able to deal with their own concentrates right from the stamps. It is reported that the working costs have been reduced and that fully 2s 6d per ton has been saved during the past year. Taking the quantity of ore treated during 1903, namely, 231,000 tons, the actual saving effected is £24,000.

RUSSIA.

St. Petersburg advices say that since the commencement of the war in East Asia the Amur gold miners have stopped work, all Chinese laborers giving up their places. Many orders for gold dredgers given by the Siberian miners have been cancelled. It is said that several miners have got into difficulties and that the Government intends to make arrangements which would enable the miners to enlarge the production. In the iron districts the mines are working hard to fill the demand arising through the war. At the River Jenissei, not far from Krasnojarsk, large coal mines have been bought by the Government. Twelve to fourteen million puds are wanted every year by the Krasnojarsk district railway.

SOUTH AMERICA.

Argentine.

F. D. Harford of Buenos Ayres reports great development taking place in gold mining in the north of the Argentine Republic, especially on the Bolivian frontier, says the London Mining Journal. The gold dredging system is likely to be tried to some extent, under the advice of practical New Zealand and Australian mining engineers. The Argentine mining code, however, is said to compare unfavorably with the Bolivian mining code. Very high fees, too, have to be paid in Argentina for mining licenses to prospect and work new districts.

Dutch West Indies

The Aruba Gold Concession report, March 28, the return of 202 ounces of gold from 432 tons of ore treated.

Personal.

J. M. Lynch, a mining man of Ely, Nev., is in Salt Lake City, Utah.

Thos. J. Barbour left London on the 20th on his return to San Francisco, Cal.

T. Jacobson, president of the Columbus Con. M. Co. of Utah, is in Chicago, Ill.

W. L. Cobb of San Francisco, Cal., is putting up a 20-ton cyanide plant at Piute, Cal.

H. S. Shaw, a mining operator of Denver, Colo., is in the Black Hills of South Dakota.

J. W. Van Meter left San Francisco, Cal., this week on a ninety-day visit to London.

P. Porter of Salt Lake City, Utah, has gone to Chicago, Ill., on mining business.

A. N. Caton of Chicago, Ill., is examining mining property at Charleston, in northern Nevada.

E. H. Barton, superintendent of the Yellow Aster mine at Randsburg, Cal., is in San Francisco, Cal.

A. C. Lawrence, a mining man of Negales, Ariz., has gone to Sonora, Mexico, on mining business.

W. R. Thomas, superintendent of the Central Eureka mine at Sutter Creek, Cal., is in San Francisco, Cal.

Sydney Reeves, head assayer for the Fremont Con. M. Co. near Amador City, Cal., is in San Francisco, Cal.

R. Guensher has succeeded A. E. Snow as manager of the Martha Washington mine at Robinson, Utah.

D. L. Gregg, local manager of the Mine & Smelter Co. at El Paso, Texas, has returned there from Denver, Colo.

G. A. Laird has resigned the managership of the Victoria mines, Cerro de San Pedro, San Luis Potosi, Mexico.

E. H. Stagg, manager of the Chase Con. mines at Rochester, Cal., has returned there from Randsburg, Cal.

J. D. Wood, vice-president of the Daly-West M. Co. at Park City, Utah, has returned there from Los Angeles, Cal.

C. M. Fueller, Denver, Colo., has returned there from Georgetown, Colo., where he was examining mining properties.

J. Hoatson, superintendent of the Lake Superior & Pittsburg Co. at Bisbee, Ariz., has gone to Chicago, Ill., on company business.

P. T. Farnsworth, manager of the Bullion-Beck mine, in Tintic district, Utah, has returned to the mine from Salt Lake City, Utah.

D. R. Jackson, general manager of the Santa Eulalia Exploration Co. of Chihuahua, Mexico, has returned to the mines from the United States.

W. H. McCord of Guanajuate, Mexico, superintendent of the Peregrina mine, near that city, has returned there from San Francisco, Cal.

John M. Beckwith, E. M., now making a geological survey of a portion of Egypt, expects to return to London, England, during the summer.

F. Ames of Deadwood, S. D., has resigned from the superintendency of the Wauconda M. Co. to take a similar position with the Custer Peak Co.

William Russell, who lately returned to Denver, Colo., from southern California and Arizona, has gone to Sheridan, Mont., where he will be all summer.

L. D. Sivyer, who has been engaged for the past several months in mine examination and geological work at Globe, Ariz., has returned to Los Angeles, Cal.

Harris Franklin, manager of the Golden Reward M. Co. of Deadwood, S. D., has returned from an extended trip through the West and South, including Cuba.

The American Steam Pump Co., Battle Creek, Mich., in Sec. 2 of their catalogue No. 11 give condensed data concerning their Marsh tank and vacuum pumps.

As a member of the Panama Canal Commission the salary of C. E. Grunsky is $12,500 per annum, with $15 per day additional for all time spent on the Isthmus.

John Chalmers, chemist and mill man at the Wano mill, Jamestown, Colo., has

resigned his position, to take effect May 1, and will be at 1750 California St., Denver, for a time.

THE American Con. C. Co., Lordsburg, New Mexico, has elected G. H. Patterson of Colorado director and manager of its properties in New Mexico, succeeding A. R. Gibson, resigned.

JOHN LAWLER, owner of the Hillside mine, 30 miles north of Hillside station, Yavapai county, Arizona, has returned to Prescott from the mine, where development work is in progress.

H. S. MUNROE of Columbia School of Mines, New York City, has returned to New York from the Cripple Creek district, Colo., where he has been endeavoring to make arrangements for a summer school among the mines of the district.

Commercial Paragraphs.

W. M. WALLACE is the manager of the new San Francisco, Cal., office of the National Supply Co.

THE offices of the Wetherill Separating Co. have been removed from 68 Broad street to 52 Broadway, New York City.

THE Lunkenheimer Co., Cincinnati, O., send a fine enameled hanger of unusually handsome design and execution as a wall ornament, advertising their steam specialties.

THE Hydro-Carbon Manufacturing Co. of Denver, Colo., has closed a contract with the Denver Union Water Co. to supply them with their dipping and brush paints. They will double tbe capacity of their present paint factory.

THE first-class armored cruiser California, under construction for the United States Government at the Union Iron Works at San Francisco, Cal., will be launched on the 28th inst. under the auspices of the Native Sons of the Golden West.

THE Crocker-Wheeler Co. will carry in their Denver, Colo., branch a complete stock of motors and dynamos ranging from ½ to 50 H. P. motors and 1½ K.W. to 11½ K.W. dynamos, and will issue a stock list monthly, which will be mailed on application.

THE Brown-Corliss Engine Co. of Corliss, Wis., have an order from tbe Phillips Insulated Wire Co. of Pawtucket, R. I., for one 14 and 28x42-inch tandem compound condensing Corliss engine, and one 18 and 36x48-inch tandem compound condensing Corliss engine.

ARTHUR WARREN is manager department of publicity of the Allis-Chalmers Co., with offices at Milwaukee, Wis. Communications regarding publicity in connection with this company, including the Bullock Electric Co., recently absorbed, should be so addressed.

A NUMBER of officials of representative manufacturing concerns in Cleveland, O., have recently organized "The Manufacturers' Advertising Club." The officials of tbe club are: Charles B. Schenks of the Winton Motor Vehicle Co., president; William Townsley Jr. of the Grasselli Chemical Co., vice-president; Miss E. L. Harmon of the Low Supply Manufacturing Co., treasurer; Mrs. F. A. McIntosh of the Standard Tool Co., secretary. Considerable interest has already been created by this organization.

Trade Treatises.

Synopsis of the S. K. C. system, elaborately illustrated. Stanley Electric Manufacturing Co., Pittsfield, Mass.

Circular 73 from the Jeffrey Manufacturing Co., Columbus, Ohio, gives a general summary of all the Jeffrey machinery.

THE biggest catalogue of the year so far received—750 pages 9x12—comes from the Niles-Bement-Pond Co., N. Y., finely systematized.

Catalogue No. 4 from the Marvin Electric Drill Co., Binghamton, N. Y., makes a good showing for the Marvin drill and electric power in connection therewith.

Table of charges for assays, analyses, mill, treatment and smelting tests; compact and complete. The C. A. Luckhardt Co., 71-73 Stevenson street, San Francisco, Cal.

A pamphlet on "Long Distance Transportation of Ores by Aerial Wire Rope Tramways," issued by A. Leschen & Sons Rope Co., 920-922 North First street, St. Louis, Mo., is of present value to all interested in that form of telpherage.

Latest Market Reports.

SAN FRANCISCO, April 22, 1904.

METALS.

SILVER.—Per oz., Troy: London, 24 1/16d (standard ounce, 925 fine); New York, bar silver, 53⅜c, refined (1000 fine); San Francisco, 53⅜c; Mexican dollars, 43½ San Francisco, 43c New York.

COPPER. — New York: Standard, $13.25; Lake, 1 to 3 casks, $13.25; Electrolytic, 1 to 3 casks, $13.12½; Casting, 1 to 3 casks, $12.87½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £57 18s 9d spot per ton.

Following are the figures of German consumption of foreign copper for the months of January and February, 1904, compared with the same period of 1902-1903:

	1904. Tons.	1903. Tons.	1902. Tons.
Imports	19,778	12,504	9,705
Exports	1,215	1,725	1,483
Consumption	18,563	10,779	8,222

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £12 2s 6d ₱ long ton.

SPELTER.—New York, $5.25; St. Louis, $5.00; London, £22 5s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.87½@28.12½; San Francisco, ton lots, 29½c; 500 lbs., 30c; 200 lbs., 30½c; less, 31c; bar tin, ₱ lb., 32½@35c. London, £127 2s 6d spot.

PLATINUM. — San Francisco, crude, $18.00 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $45.50@46.50, large lots; London, £8 5s 0d; San Francisco, local, $43@44 ₱ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 50@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.20 @14.35; gray forge, $13.00; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@14 75
Northern 2	14 00@14 25
Northern 3	13 50@13 75
Southern 1	14 35@14 85
Southern 2	13 85@14 35
Southern 3	13 35@13 85
Forge	12 60@13 10
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 50@ 1 55
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 36@ 2 41
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	13 00@13 50
No. 1 cast, net ton	12 00@12 50
Iron rails	16 50@17 00
Car wheels	14 50@15 00
Cast borings	4 50@ 5 00
Turnings	8 50@ 9 00

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.15@2.65 ₱ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ₱ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., $1.00.

BISMUTH.—Subnitrate, ₱ lb., $2.00.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—$2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 75c.

SILVER.—Cbloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

SPRING DOWEL FORMING MACHINE.—No. 756,532. April 5, 1904. J. H. Ross, San Francisco, Cal. Assigned to American Steel & Wire Co. of San Francisco, Cal., a corporation. This invention relates to improvements in machines for forming dowels on coil furniture springs. The object of the invention is to provide a machine for making the dowels rapidly and of uniform length without danger of breaking the spring.

DRAPER.—No. 756,548. April 5, 1904. J. C. White, Marysville, Cal. This invention relates to improvements in drapers for grain elevators, headers, harvesters and the like; and its object is to provide a simple, economical and novel form of lateral reinforcement whereby the draper cloth or canvas may be protected against wear due from constant contact with the guides in which the edges of the draper run.

DRAFT EQUALIZER.—No. 757,232. April 12, 1904. P. V. Schandoney, Sacramento, Cal. This invention relates to an improved means for equalizing the draft of large teams used in hauling combined harvesters, gang plows, or other heavy machinery. The object of the invention is to devise means for connecting up the several elements of the equalizer so that each animal may be made to pull his own load and no more, to provide means for shortening the length of the team for rendering the guiding of these large teams easier, to simplify the connections between successive series of animals, and to maintain all the trees in substantially horizontal position, and thus balance the draft.

DRAFT EQUALIZER.—No. 757,233. April 12, 1904. P. V. Schnndoney, Sacramento, Cal. This invention relates to an improved system of draft equalization employing pulleys and interconnecting draft chains. Its object is to render the pulley type of draft equalizer practical, so that the natural inequalities in the length of the sections of chain passing around a pulley or drum will not react upon the animals on the shorter section to make them haul an undue proportion of the load.

SUPERHEATER FOR OIL BURNER.—No. 757,182. April 12, 1904. J. M. Donahue, Santa Rosa, Cal. This invention relates to a superheating attachment and connection for oil burners in conjunction with furnaces wherein such material is used as a fuel. This consists essentially in a return curved pipe located in the boiler furnace, connection between the steam drum of the boiler and one end of said pipe whereby steam may be caused to pass through the pipe, an oil-conduoting pipe fitted centrally within the steam pipe and following its course and extending back to the front of the boiler, connection between the oil pipe and the burner, and a connection between the steam pipe and the burner.

PICKS AND POINTS.—No. 757,206. April 12, 1904. L. Kovacs and M. Kovacs, San Francisco, Cal. This invention relates to improvements in picks and in the movable points therefor. For the purpose of renewing and repairing the wear of the points of picks which are subjected to the principal wear it is desirable to remove these points, and this invention is designed to provide a convenient and easy method for such removal and replacement.

ARTICHOKE TRIMMER.—No. 757,229. April 12, 1904. A. Roumiguiere, San Francisco, Cal. One-half assigned to R. Hickmott, of same place. This invention relates to an apparatus which is designed for preparing the vegetable known as "artichokes" for canning or for other purposes. The object of the invention is to first remove these leaves, then extract that portion of the interior which is not desirable, leaving the edible base portion in proper condition for canning.

ADJUSTABLE CANOPIES.—No. 757,175. April 12, 1904. E. G. Burland, Watsonville, Cal. The object of this invention has heen to design a canopy particularly for use in undertaking establishments which will answer for all occasions wherever it is desired to display a casket during such time as the remains of one deceased, whether infant or adult, is exposed to view. This canopy is adjustable to a frame of any size and it can be quickly removed from or placed upon the frame.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING APRIL 12, 1904.

756,927.—PEDESTAL—C. H. Ashley, S. F.
757,251.—MUSICAL INSTRUMENT — J. E. Berglund, S. F.
757,173.—DREDGE—A. Boschke, S. F.
757,086.—STATION INDICATOR — R. Bosshard, Los Angeles, Cal.
757,262.—PICTURE HANGER — J. Bryden. Colfax, Wash.
757,175.—CANOPY — E. G. Burland, Watsonville, Cal.
757,176.—SLUICE BOX—C. M. Carter, Sultan, Wash.
756,940—SHOELACE FASTENER—C. A. Conger, Oakland, Cal.
758,182.—OIL BURNER—J. M. Donahue, Santa Rosa, Cal.
756,948.—BOILER FEED—H. W. Fellows, Los Angeles, Cal.
756,949.—SPIRIT LEVEL—R. B. Ferguson, Los Angeles, Cal.
756,951.—HANDLING MATERIAL—R. B. Friend, Oakland, Cal.
756,957.—ELECTRIC RAILWAY—Hanna & Gilman, Rivera, Cal.
757,304.—CHECK HOOK—Hellruth & Taber, Sacramento, Cal.
757,192.—WIRE TIP—S. C. Houghton, S. F.
757,206.—PICK AND POINT—L. & M. Kovacs, S. F.
757,045.—PLANT PROTECTOR — Annie M. Lane, Lakeside, Cal.
757,209.—SASH FASTENER—J. A. Long, Spokane, Wash.
756,871.—SPECTACLES — S. G. Marshutz, Los Angeles, Cal.
757,407.—FISH TANK—L. Mayhall, Sultan, Wash.
756,873.—STAMP MILL—W. A. Merrals, S. F.
757,408.—MUSIC STAND—R. D. Noble, Sausalito, Cal.
757,220.—SMELTING ORES—A. R. Partridge, S. F.
757,221.—SMELTING FURNACE — A. R. Partridge, S. F.
757,222.—SMELTING FURNACE — A. R. Partridge, S. F.
757,229.—ARTICHOKE TRIMMER—A. Roumiquiere, S. F.
757,232.—DRAFT EQUALIZER — P. V. Schandoney, Sacramento, Cal.
757,233.—DRAFT EQUALIZER — P. V. Schandoney, Sacramento, Cal.
757,240.—SKATE—T. Spacie, Globe, Ariz.
757,360.—POTATO SLICER—L. L. Stevens, Los Angeles, Cal.
757,241.—HAIR CURLER — N. B. Stone, Outlook, Wash.
757,154.—BICYCLE—R. H. Tate, Portland, Or.
756,910.—ELEVATING MACHINE—A. P. Tatterson, Stockton, Cal.
756,992.—VEHICLE—C. R. Twitchell, Dayton, Cal.
756,994.—LAMP CHIMNEY—Rose L. Valleen, Seattle, Wash.
757,008.—CONCENTRATOR—G. E. Woodbury, S. F.

MINING AND SCIENTIFIC PRESS

Whole No. 2284.—VOLUME LXXXVIII. Number 18. SAN FRANCISCO, CAL., SATURDAY, APRIL 30, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Foresight in Mill Construction.

The cost of mining is influenced to a great extent by the foresight of the management in providing proper means of economically developing and extracting the ore and getting it to the mill or smelter at the lowest expense of labor and materials. But mining is only half the battle. The mill or the smelter, if not in proper hands, may wreck a company as completely as inexperienced management in the mine. After over fifty years of actual practical experience, it would seem that mistakes in the construction of a quartz mill would not be made, or, if appearing, be of little moment; but such is not always the case, for mills are still being constructed along lines far removed from the acknowledged best practice.

The first thing for mature consideration when contemplating the building of a mill is the selection of a proper site. If the ground be flat, there is little choice, except to secure as substantial a foundation as possible; but in a hilly country there are often several sites from which to choose. The mill should be located in such a manner, if possible, that the ore may be delivered at the end of the mill, and not at the middle of the rear portion, as is often seen. The site selected should include a suitable situation for a sulphur house, and, where necessary, also a canvas plant and cyanide works. All should be arranged with a view to automatic passage of pulp from each stage of the operation to the next by gravity. Where this is precluded by reason of being on a flat, conveyors of various types afford an economical means of carrying ore or pulp from one portion of the works to another.

The next thing to be considered is foundations. This is most important, for, to a great extent, upon proper foundations depends the life of the building. If bedrock is near the surface—5 to 20 feet—an excavation should be made to bedrock and terraces cut into the solid rock to afford a substantial and enduring base for the superstructure.

Where the bedrock shows a tendency to cave, retaining walls must be built of rock or concrete. If water under pressure is available the superficial debris and loose rocks can be removed more quickly and cheaply by hydraulicking than in any other way. Sills must not be laid upon the ground, for the changing seasons, the alterations of moist and dry atmosphere will cause sills so placed to rot quickly. In the past a great deal has been published in the MINING AND SCIENTIFIC PRESS on mortar block construction, but there seems to be no uniformity of opinion on this matter. Wooden mortar blocks properly built have been known to last for years, and in some instances they have proven short-lived. Concrete blocks have their firm adherents, and there are those who say they are not satisfactory. That concrete mortar blocks must be built of the best and strongest material goes without saying—a cheap concrete block will not withstand the vibration of the heavy fall of the stamps.

How Stamps of Homogeneous Steel Wear in a Properly Fed Battery.

Amalgam Grinder in the Cleanup Room.

All mills should be supplied with suitable devices for quickly and cheaply moving heavy fittings from place to place. For this purpose there should be a track and traveler above the plate floor, with chain blocks, in order that shoes, dies, etc., may be moved where they may be required without delay, and with the least amount of labor. Similarly above the cam floor should be arranged a track and traveler, with chain blocks attached, for the purpose of distributing cams, raising stamps, removing stems, etc., and this track should be extended outside the mill, to facilitate the bringing into the building of these and similar things. In large, well appointed, modern mills these conveniences are provided, and it lessens and cheapens labor. By means of chain blocks, track and traveler, two men can do what would otherwise require half a dozen or more. Many mill men know what it means to "lug" a stem up a narrow stairway, and to haul it up to the cam floor with a common "snatch" block is only a makeshift. A good plan is to have an extra cam shaft, with cams all set, on the cam floor and in readiness to be taken to any battery where it may be needed. The shaft requiring repairs may be removed, the extra substituted in its stead, and in less than an hour the ten stamps are again dropping, while the other is being put in good condition for a similar service, should the necessity arise. For the handling of a cam shaft it is advisable to have a separate track on the side of the battery adjacent to the cam shaft so that it may be lifted out and placed on a trolley and sent to one end of the mill, where it may be let down to the ground to be sent to the machine shop. The accompanying illustrations are familiar scenes about a gold mill.

A Familiar Scene at the Back Door of the Mill.

The upper picture shows how stamp shoes which are made of homogeneous steel will wear when the feeding is properly attended to. Often shoes will wear until less than ½ inch of metal remains on the shank. The pile of dies in the lower left-hand corner furnishes another illustration of economical use of dies. The consumption of iron or steel in stamp mill shoes and dies per ton of ore crushed is dependent upon the character of the ore and the height of discharge, and also to some extent on the amount of water used, and very largely on the feeding. If a battery is overfed, crushing will be slow and the consumption of iron or steel will be relatively low. Iron shoes and dies do not wear as well as steel, but are considered economical.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1115 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, APRIL 30, 1904.

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The American Mining Engineer at Home and Abroad.

In a recent issue of the Iron Age, J. H. Curle, a mining engineer of London, has this to say of American mining engineers:

The American has played a great part in the development of the Transvaal mines, and to-day holds most of the big positions. He has left his mark as a brilliant judge of machinery or as an engineer gifted with financial genius, rather than as a mine manager. He is imaginative, and takes at the same time a broad grasp of the position; but, in the detail work of management, where a concentration of character is necessary, he has not shown to equal advantage. Far be it from me to decry that wonderful product of the age, the California-reared mine manager; but I class equally with him many Britishers. As mine managers we can show fine men, on the Rand or elsewhere; but we lack that mining instinct, that knowledge of values, and that grasp of the whole mining horizon which so many of the American engineers possess. America is a metal mining country, and England is not. We have not in England the mining atmosphere which is ever present in the States; and it is because of this, not from any inherent defects of mind or character, that we are handicapped in the race.

This is a deserved tribute to the ability and ingenuity of the American mining engineer, but it occasions some surprise that he is not credited with being a good manager of general mining operations, but is considered as more distinguished as a successful "financial genius," or a "brilliant judge of machinery." Knowing and judging the American engineer by his work at home, where he has demonstrated his ability to manage mining affairs in a manner that has never been equaled elsewhere in the world under similar conditions and circumstances, it is presumable that the average engineer of experience would do as well on the Rand as elsewhere. The engineer or manager who can operate a gold mine, where the ore carries only 25 or possibly 50 cents per ton profit under the exercise of the strictest economy permissible with the proper operation of the mine, and successfully keeps within that limit, year after year, enlarging the plant and the scope and magnitude of operations, while constantly larger dividends are being paid on an ore of increasingly lower grade, can manage a mine in the Transvaal or anywhere else, and there are many such men in the United States, of whom it is no exaggeration to say they have done and are still doing just such things as are above referred to. The writer of the above article may have had some particular individual or individuals in mind at the time, for his remarks do not apply with force to the majority of Western mine managers who have "grown up with the business" and made it what it is.

Rich mines are prone to make extravagant managers. The early days of the Comstock showed this to be the case, but in more recent years the propositions which mine managers have had to handle have been of a different sort. Large, low-grade mines — and not always large either — where every cent of cost per ton had to be considered, are the sort the American engineer has had to handle. If one seeks a careful, capable, conservative mine manager, he will find him in the man who has made success under the adverse conditions here described.

Cost of Mine Drainage.

One of the most serious problems that confronts many mine managers is the expeditious and economical handling of water, which sometimes occurs in large volume at unexpected and always unpropitious times, though in some mines the flow of incoming water is both large and constant. At some of the greatest mines of the West this problem has been reudered easy of solution, though the means employed involved great expense—that of drainage by tunneling. Undoubtedly the drainage of mine workings through tunnels driven for this purpose, and incidentally also serving as a means of ventilation and transportation, is the most satisfactory way to solve the perplexing problem, where the topography of the country admits of the possibility of attaining a depth sufficient to justify the expense. Notable examples of drainage by tunnel are found in the Sutro tunnel, which drains the Comstock mines at Virginia City, Nev., to depth of 1750 feet; the Ontario tunnels at Park City, Utah, which relieved that mine of a tremendous and ever present volume of water to great depth; the Yak tunnel at Leadville, Colorado, draining mines on Breece hill, to a depth of more than 1000 feet; the Kellogg tunnel, at Wardner, Idaho, draining the Bunker Hill-Sullivan group to a depth of over 1000 feet; and more recently the El Paso tunnel, draining important mines in the Cripple Creek district of Colorado. All these tunnels were driven at great expense, though no one will deny that in each of the instances mentioned the results justified the expense, and have proven to be and will continue to be an economical investment, but in time mines so drained reach a depth below the drain tunnel level, and then, if the lowest practicable level has been drained by adits, some other means of handling the water must be provided. Most mines are so situated that tunnel drainage is limited to comparatively shallow depth, and in such as these the water problem is usually ever present and must be met in the most economical manner possible.

In those cases where a mine cannot be drained by means of a tunnel, the management has usually the choice of raising water by means of pumps or by hoisting with skips or buckets.

When the shaft is being sunk it is impossible to ascertain or to even estimate the amount of water that may be encountered. In some mines the quantity varies greatly with the season, and also varies from no apparent cause. In such cases as the latter, and, in fact, in every case, it is necessary to have ample provision to take care of the maximum amount. The usual method in the opening of a new mine, where there are no developed mines in the neighborhood to give an approximate index of the quantity of water that may be encountered, is to sink the shaft, bailing as long as it is economy to do so. When this is no longer practicable a sinking pump is put in, and this should have a capacity three or four times greater than the amount of present water requires. Calculation must also be made for an increasing lift as the shaft goes down. When this first pump is approaching the limit of its capacity, as to volume of water or height of lift, a second and larger pump is put in, and sometimes both the old and new pumps may be employed to advantage, each lifting its own load to the surface or drainage level or they may be used in stages. By adding pumps from time to time as necessity demands, the shaft is carried to its deepest point, or to a level at which it will remain for a period of years. The levels are opened, sometimes contemporaneously with the sinking of the shaft, as is usually the case where the shaft is in or near the vein, or the levels are driven later, as is generally the case when a shaft is sunk vertically to cut a low-dipping vein, as in the deep levels of the Rand mines. When the maximum flow of water has thus been practically established, it is economy to put in a single large pump to raise all the water at a single lift, in place of several smaller pumps at various levels, or, at least, as few pumps as may be required to handle all the water. Twenty to thirty years ago large Cornish pumps were commonly installed at great expense to raise large volumes of water to great height, but in more recent years it is generally deemed better economy to employ modern steam, electric, hydraulic or air-driven pumps, raising by direct and, where possible, by single lift, all the water. As to a choice between these various types of pumps, the surroundings of the mine usually determine this. Where fuel is high, electricity, or air compressed by electric power, is often more economical than steam pumps. If water be abundant and cheaply obtainable under high head, a hydraulic pump may be preferred. Each of the four types mentioned are effective and satisfactory under conditions suited to their use. The Cornish system is also effective when once installed, but it is a system of small flexibility. Should the amount of incoming water be suddenly increased beyond the capacity of the Cornish pump to control, its one chief advantage becomes at once apparent—it can not be drowned out; but should it require repairs, they can not be made under water any more than on any other kind of pump. The expedient of "hooking" two Cornish pumps onto a single rod has been successfully done, but at an extreme risk of breaking the pump rod, usually a heavy and expensive construction. Also the employment of two rods in a single shaft compartment is not an unknown condition, but such installations are both expensive and unsatisfactory. Some of the rods operating Cornish pumps are of great length and size. That in the Combination shaft of the Comstock lode at Virginia City, Nev., was 3000 feet in length and 15 inches square. It operated a double line of 15-inch plunger pumps at a maximum of 6½ strokes per minute. A pump of these dimensions contains over 50,000 feet of timber.

The hoisting of water with skips and buckets is a common practice throughout the mining regions of the United States, and it is a method which may be adapted to any condition where the shaft permits the rapid and unobstructed passage of skips or buckets. Where the amount of water encountered is very large it may be necessary to have a shaft exclusively used for bailing, but ordinarily a single compartment of a three or four-compartment shaft, equipped with a large automatically operated bailing skip, can lift a very large amount of water from any depth to which shafts have been sunk (5000 feet), at a cost comparing favorably with other methods of raising the same amount of water to an equal height.

R. V. Norris in Cassiers for May makes the statement that at a Pennsylvania anthracite mine a skip of 1300 gallons capacity raised 780,000 gallons of water from a depth of 1000 feet in twelve hours daily, making fifty trips per hour.

At the Utica (Cross) shaft, Calaveras county, Cal., the bailing skip has a capacity of 1500 gallons and lifts water from a depth of 1300 feet, easily controlling the water in a wet mine.

Whatever means be adopted to raise the water from a mine, there is no economy in installing a mine drainage plant with insufficient power. This is a matter which requires as mature consideration as the determining what means shall be employed to raise the water.

WITHIN the week a distressing and most unfortunate accident is reported as occurring in the Robinson mine near Johannesburg, South Africa, in which forty-three native laborers were killed by the falling of the cage 1000 feet to the bottom of the shaft. Details of how the cage came to fall are not given in press dispatches, but it again emphasizes the necessity for daily trials of the safety appliances on mine cages.

CONCENTRATES.

CHLORINATION TAILINGS would make an excellent flux in the smelting of galena, insuring a recovery of all the possible gold therein.

****

SARDONYX is a crypto-crystalline variety of quartz which is like onyx in structure, but includes layers of carnelian (sard) both dark and light colored.

****

IF fireclay cannot be procured the muffle may be repaired by using a mixture of one to two parts of litharge, ten parts of boneash, made up to a paste with water.

****

BY volcanity is meant the state of being volcanic, or of volcanic origin, and it is used as descriptive of the evidences of volcanic action as seen on the surface of the earth.

****

IT would be possible to reuse water once used in stamp mill operation by means of receiving tanks and allowing sufficient time for pulp precipitation and complete clearing of the water.

****

BORAX is soluble in water, but calcium-borate, from which most of the borax of commerce is made, is not, but is soluble in hot hydrochloric acid, with separation of boric acid on cooling.

****

DYSCRASITE is a silver antimonide, including Ag_3Sb (Ag = 72.9%) and Ag_6Sb (Ag = 84.3%). It is sectile, color and streak silver white, sometimes tarnished yellow; specific gravity, 9.5; hardness, 3.5.

****

SIBERIA'S yearly gold production averages about 1,100,000 ounces, and it is unlikely that the present war will have any lessening effect. Scientific methods and modern American machinery could greatly increase the Siberian gold output.

****

NORTHUPITE is a double chloride and carbonate of sodium and magnesium ($MgCO_3$ Na_2CO_3 NaCl), crystallizing in isometric octahedrons; color, white to yellow or gray. Its only known occurrence is at Borax lake, San Bernardino county, Cal.

****

THE deepest oil well drilled in the United States is reported to be one of those of the Forest Oil Company of West Elizabeth, Pa., which is said to be 5575 feet deep, or 637 feet deeper than No. 5 shaft of the Tamarack copper mine, near Houghton, Mich.

****

A SEVEN PER CENT. grade and a 7° grade are not synonymous. By a 7% grade is meant a rise of 7 feet in each 100 feet horizontal distance. A 7° grade will make a rise of 12.28 feet in each 100 feet of horizontal distance, or about 648.38 feet to the mile—a steep grade for heavy teaming.

****

THE strength of hoisting cables is proportional to the area of the circle described by the diameter of the rope. A factor of 6 is usually allowed for safety—that is, if a rope is required to sustain a maximum load of 8000 pounds, the rope should have a breaking strength of 48,000 pounds.

****

WHEN cupelling, if too high a heat be employed, a portion of the precious metal will be volatilized, and a portion will be absorbed by the cupel, thus rendering the result unreliable. It is equally bad to have the heat too low. Experience soon teaches the proper temperature to employ.

****

CORD WOOD may be used to advantage in lining up mill holes in the form of a crib. A chute lined in this manner is not long-lived, as the wood cuts out rapidly, particularly if the ore is drawn out as fast as it is shoveled into the hole. If allowed to fill, there is always danger of jamming.

****

"BRITTLE SILVER" is the mineral stephanite, an antimonial sulphide of silver (Ag_5 SbS_4); color and streak are iron black; specific gravity, 6.2; hardness, 2—2.5; fracture, uneven; before the blowpipe on charcoal fuses, coats coal with antimony oxide; yields globule of metallic silver. Silver = 68.5%.

****

OCHER is the earthy variety of ferric oxide—usually applied to earthy limonite, brownish yellow to yellow in color. It is often impure from the presence of clay, sand, etc. When clean, it is used for making paint. Red ocher, ruddle and red chalk are applied to the earthy varieties of hematite, the anhydrous oxide.

****

THE specific gravities of the principal precious-metal tellurides are as follows: Sylvanite (gold-silver, in proportion 1 to 1), 7.9 to 8.3; calaverite (gold : silver = 6.5 : 1), 9.04; petzite (silver : gold = 3 : 1) 8.7-9.02; hessite (silver telluride), 8.31-8.45; nagyagite (sulpho-telluride of lead and gold), 6.85-7.2; krennerite (gold-silver), 8.35.

****

ALKALINE SULPHIDES in cyanide solutions retard its work in gold extraction. Where pure 1% cyanide solution dissolved a given weight of gold in ten minutes, a solution of the salt of the same strength, but containing one one-hundred-thousandth part of sulphur as an alkaline sulphide, required two hours to dissolve the same weight of gold.

THE price for molybdenum quoted elsewhere herein is the New York retail price for the metal, and not for molybdenite, the sulphide. Those who have molybdenum ores for sale should not expect to receive this price for their mineral, nor for the metal after it is extracted from the ore, as metal dealers do not sell their wares at the purchasing price.

****

BROADLY SPEAKING, an "ore" is defined as a natural mineral compound containing one or more metals. Strictly, it is applied only to those from which the metal can be produced at a commercial profit. For example: Chalcopyrite (copper pyrites) is an ore of copper but not of iron, though it contains nearly as much iron as copper (Cu, 34.5%; Fe, 30.5%). Pyrite contains 46.6% iron, but it is not considered an iron ore. The term is sometimes also applied to non-metallic minerals, as a "sulphur ore."

****

THE decay of the telegraph pole is caused by the growth of fungi in the wood. The pole first decays at the surface of the ground, or just below the surface, because above the ground the wood has a chance to dry out, and down in the ground there is not enough air for the fungus to flourish. The subject is an extensive one, and a full discussion can be had by writing to Dr. Von Schrenck, Bureau of Plant Industry, Department of Agriculture, Washington, D. C., and asking for his bulletin No. 14, 1902, on "The Decay of Timber, and Methods of Preventing It."

****

PENEPLAIN (from the Latin, meaning "almost a plain") is a geological term indicating a region of faint relief—that is, a region where denudation has reduced the surface to such an extent that further erosion would result in a "base-leveled" plain. If, subsequently, a regional uplift takes place and a new drainage system is established, a view on a level with the tops of the flat ridges thus formed will have the appearance of a peneplain. This feature can be seen in the Sierra Nevada mountains of California, where the peneplain has about a 1° slope from the horizontal toward the west.

****

THERE are ten electrolytic copper refineries in the United States; Great Britain, 6; Germany, 9; France, 4; Austria-Hungary, 2; Russia, 2; total, 33. The world's average daily production of electrolytic copper is about 883 short tons, of which 764 tons, or 86.5%, are supplied by the United States. Of the remaining 119 tons daily production, or approximately 13.5%, Great Britain furnishes 8.5%, Germany, 2.5%, and France 1.5%. The United States now produces annually 280,000 tons of electrolytic copper, which, at $250 per ton, is valued at $70,000,000. The by-product recovered daily contains about 740,000 ounces silver and 950 ounces gold, which equals an annual output of 27,000,000 ounces of silver, valued at $14,000,000, and 250,000 ounces of gold, valued at $5,167,500.

****

IRON can be prevented from rusting by the application of a strong solution of potassium bichromate, the article to be subsequently dried in an oven or over an open fire. Drying at ordinary temperatures will not be sufficient. To know when the heat is strong enough, moisten the iron with a little water. So long as the iron takes up any color the heat must be increased. When the requisite degree of heat is reached a fine deep black color results, which is not acted upon by water and which protects the surface of the iron from the action of the atmosphere. To remove rust from instruments, tools, etc., fill a suitable basin or jar with a saturated solution of tin chloride in distilled water. Immerse the rusty instruments and let them remain over night. Rinse in running water and rub dry with chamois.

****

A MIXTURE of one part niter and three parts argol (deflagrated) is sometimes employed in assaying. It is known as "black flux." A mixture of flour, three parts, and sodium bicarbonate, ten parts, is known as a substitute for black flux, and is used in place of lead flux, which latter is a mixture of sodium bicarbonate (sixteen parts), potassium carbonate (sixteen parts), flour (eight parts) and borax glass (four parts). It acts as a flux, reducing agent and desulphurizing agent, and is particularly useful in assaying lead, and for this reason is known as lead flux. What is known as Chapman's crucible flux is composed of carbonate of soda one and one-half part, dried borax one part, cream of tartar (argol) one-eighth part, white sugar one ounce, with a proper amount of litharge, usually from one to five times the weight of the ore, according to its character.

****

THE principal advantage in using the dovetail style of timbering in framing shaft sets is in the fact that that method requires less timber than in the overlapping ends, framed after the Comstock system. Where the timbers are over 12 inches square, this would make a considerable difference in 1000 feet of shaft. Where the timbers are 12x14 it would make a saving of 56 feet, board measure, on each set; and if the sets were arranged at 5 feet from center to center, in 1000 feet of shafts there would be 201 sets—making a total saving of over 11,000 feet of timber, board measure, which in most Western mining regions would be worth over $200. The long timbers should be bought to cut with as little waste as possible. It pays to buy special sizes for blocking; 10x10-inch timbers are as good as any others for 12x12 sets.

MAGNETIC PYRITES containing 3% nickel and 3% copper are heap roasted at Sudbury, Ontario, Canada. Being first classified into three sizes—4 inches, 1½ inch and ¾ inch—the coarsest is laid upon a bed of wood, over this the intermediate size, and then the whole covered with the fine material. In the center of the heap is a small rectangular vent or chimney to aid combustion. The bed of wood is laid upon a layer of fine ore 6 to 10 inches thick, which usually becomes itself roasted about half way down. The heaps are usually 5 to 15 feet high, 82 feet long and about 39 feet broad. A "heap" will contain from 300 to 600 tons of ore. A cord of wood is allowed to every twenty tons of ore. The length of time required for roasting varies from thirty to sixty days. One roasting will reduce the first proportion of 30% sulphur to 4%, and of 40% sulphur to 7%.

****

THE sudden influx of a large amount of water into mine workings is due to cutting a water course connected with a subterranean reservoir. The reservoir need not be an open excavation or a natural cavity in the rocks, but may be a zone or irregular body of fractured porous rock. Often when first cut the water gushes out with great force, but this usually soon disappears, and the stream assumes a normal flow. Until this normal flow is reached it is difficult to determine the capacity of the pump required to handle the water, but it is wise to put in a pump considerably larger than seems necessary, for if it handles the water readily it can run slowly, and should a large flow be again encountered the pump will probably be able to care for it. There is no economy in buying machinery which must soon be thrown out to be replaced by that of greater capacity.

****

SPECIFIC GRAVITY is the ratio of weight of a substance (solid, liquid or gas) to the weight of an equal volume of another body which is used as a standard. The specific gravities of solids and liquids are referred to pure water at a temperature of 15.5° C. In the case of gases the standard must be at same temperature and pressure. Gases are usually referred to pure dry air either at 60° Fahrenheit and 30 inches barometric pressure, or 0° Centigrade and 760 mm. barometer; though in theoretical chemistry the standard is usually hydrogen instead of air, as the atomic weights are also referred to hydrogen as the unit (making, in the case of the elementary gases, their atomic weights identical with their specific gravities—e. g.: Oxygen specific gravity = 15.88 with hydrogen = 1). In this connection it may be stated the specific gravity (H = 1) of a gas or vapor is the weight in grams of 11.11 litres of it. To determine specific gravity of a gas, especially designed apparatus is necessary. For solids: Weigh the body in air, then weigh while suspended in water (balances are necessary for these weighings), and difference in weight is weight of equal volume of water—specific gravity = wt. water ÷ wt. body. For liquids: Weigh a flask filled first with the liquid and then with water, and subtract from both the weight of flask.

****

MANGANESE is not known to occur native; it most commonly is found in nature in the form of black oxide (pyrolusite or psilomelane). In gold and silver mines, particularly the latter, it is of common occurrence. On the surface it is found as black oxide, and often in depth it is seen as carbonate (rhodochrosite) or as the silicate (rhodonite). It is rare to find it as sulphide, which, as is the case with most other base metals, is the normal condition; but the sulphide exists, and it is probable that all manganese oxides, carbonates and silicates were originally sulphides. The sulphide of manganese is an iron-black mineral of high specific gravity, having a greenish streak. It is called alabandite and is an uncommon mineral. It occurs at Tombstone, Ariz., associated with silver ores. It was found in limestone near contact with grano-diorite. Manganese oxide occurs abundantly at Leadville, Colo., in the oxidized zone; also at Butte City, Mont., and at Broken Hill, New South Wales. It also occurs in other countries, often as an ore of manganese alone, with neither silver nor gold. It is found mostly associated with limestone or cherty (siliceous) rocks, though occurring elsewhere, but usually in less amount than in limestones or cherts.

****

THE main geological eras or groups, with their principal divisions, are as follows: Archæan, Algonkian, Paleozoic (Cambrian, Silurian, Devonian, Carboniferous), Mesozoic (Jura-Trias, Cretaceous), Cenozoic or Tertiary (Eocene, Neocene, Pleistocene), Quaternary or Recent. The Archæan was formerly divided into Laurentian and Huronian in the United States, but the Huronian is now included with the Keweenawan in a new group called the Algonkian, which is pre-Cambrian. The lower Silurian in England is designated Ordovician. The Permian is an age of the upper Carboniferous. The Jurassic and Triassic divisions of the Mesozoic, though distinct in their characteristics, are not sharply separated by unconformities, and so are usually included in the compound name Jura-Trias. The Pleistocene of the Tertiary is separated into glacial and post-glacial stages. The Quaternary or Recent covers the human epoch. The Cambrian, Silurian, Devonian and Carboniferous are the principal ore carriers of the world, though the ore bodies themselves are not contemporaneous with, but later than the formations enclosing them. The so-called Mother Lode proper of California is referred to the Jurassic. The mines of the east belt occur largely in rocks of the Calaveras formation, which are of Paleozoic age.

California Mountain Road and Region.

When the Californiа miner is delayed for weeks by lack of transportation facilities he sometimes envies his brothers in less mountainous countries who can secure quicker service. The State of California, through its department of highways, is in present activity in commendable effort to give miners and others in isolated districts badly needed roads. There is in present progress a State highway to connect the main portions of the commonwealth with the part lying east of the Sierra Nevada mountains, comprising three counties, Mono, Inyo and Alpine, the road passing through the heart of the Sierra Nevada mountains. It makes use of "the old Tioga road, which a mining company constructed over twenty years ago," at a cost of $64,000. It took out from the Big Oak Flat road at Crockers, in Tuolumne county, and extended 56 miles by way of Lake Tenaya and Yosemite creek, passing only a little east of the Yosemite valley to a point 9800 feet above the sea level, where the mines are situated, while around about are elevations vastly higher. Adjacent are the towering granite peaks, Mounts Dana, Gibbs, Conness and Lyell, rising to altitudes above 13,000 feet and bearing on their northern slopes the remains of great glaciers, which once covered immense areas over this grand mountain complex. Granitic boulders, many of huge size, are scattered everywhere over the surface.

The engravings herewith illustrate the style of country through which this highway is being executed by the State, using the old Tioga road as a part of the enterprise.

One of the scenes is on the survey of the Tioga State road in Mono county. Mount Tioga, which is shown in the middle background, has an altitude of 11,000 feet; the road at this point has an elevation of 9000 feet above sea level, and here must be constructed through crevіced granite and is to connect that part of California included in the counties of Alpine, Mono and Inyo, east of the Sierra Nevada mountains, with the principal points in California by way of the Yosemite and the San Joaquin valley. At present the only commercial outlet for the people of the counties above named is by way of the State of Nevada.

Another illustration shows the broken talus of granite, averaging in diameter about 2½ feet. The road over this is to be of 7% maximum grade, and is to be walled on both lower and upper sides.

A third illustration shows the great angular boulders of granite near Mount Parker, such as are sometimes encountered on the line of mountain roads.

The fourth illustration shows a scene of less rugged grandeur, indicating that the extreme difficulties of construction are not always present. The picturesque little lake, like the most of the lakes and meadows of this Sierra region, is of glacial origin, though in some instances they are the result of damming of the valleys by recent flows of andesite or basalt.

The inaccessibility of the crest of the Sierra Nevada mountains has delayed the development of the mineral resources of that elevated region, though it is well known that at various places along the summit of the range and near it there are great veins and ore deposits, though mostly, as far as known, these ores are base—that is, not free milling, being complex mixtures of the sulphides of iron, zinc, copper and lead, with gold and silver. Considerable prospecting has been done near the headwaters of the North Fork of the San Joaquin river, in the northeastern part of Madera county, at an altitude approximating 8000 feet. In that district is a system of nearly parallel quartz veins, most of them of large size—15 to 75 feet in width—and traceable for several thousand feet. Shipments of selected ore are said to have carried 30 to 40 ounces silver, 17% lead and $2 gold per ton. One vein assayed 30% copper and 27 ounces silver per ton. All of these veins have only prospecting development, and only lack of suitable transportation facilities retards their development. At Mount Raymond, a few miles southwest of this district, are mines containing lead, zinc, iron and copper sulphides, with gold and silver values, and to the eastward of North Fork district are the great iron deposits known as the minarets. About 15 miles to the northeastward of the North Fork district are the mines of Tioga district, through which the road above referred to will pass. This district is on the summit of the Sierras, at an altitude of nearly 9800 feet. Bodie is 25 miles distant in a northeasterly direction. Bennetville is the name of the village that once was the center of the mining industry there, which perished for lack of transportation facilities in that rugged mountain region. That portion of the road above referred to as being completed was made at an expense of $64,000 by the Great Sierra Mining Co. in 1882-83. The principal development in this district is on the Great Sierra and Sheepherder lodes. Crosscut tunnels were driven to reach the veins at a depth of 800 feet, but were discontinued before the veins were reached after running over 1000 feet, and with less than 300 feet to go.

The veins occur in highly tilted and folded metamorphic rocks (slates and quartzites) and partly in gneiss. The lodes are large—10 to 45 feet wide—and of great continuity. The gangue is white, crystallized quartz. The minerals contained are described as argentiferous and auriferous mixtures of pyrite, chalcopyrite, zincblende, with subordinate occurrences of galena, bornite and arsenical iron sulphide (mispickel). The gold values are said to run from $1 to $8 per ton. No metallurgical operations have been carried on in the district.

In addition to the districts previously described are those of the region about Mammoth, in Lake district, near the North Fork district. The veins here are said to occur between porphyry and quartzite. The ores here also contain iron, lead, copper and zinc sulphides, with the secondary products of their alteration and both gold and silver. The bullion varies from $7 to $16 per ounce, dependent on the amount of silver present. In the early history of the district it is reported that about $20,000 worth of ore was shipped from the Mammoth mine. This mine has opened a vein 15 to 40 feet wide by means of tunnels. A 20-stamp mill was built on the mine in 1878 and twenty more stamps added in 1879. Only free gold was saved from these ores, and no attempt was made to concentrate the ores, which is the real road to success in mining in this region. Samples panned from the tailings are said to have returned a good percentage of sulpurets, high in gold and silver. The tailings have since been run over canvas sluices and a rough saving of the sulphides made in that manner.

In addition to the districts already mentioned in the high Sierras are Lundy, Pine City, Patterson district, north of Bridgeport, the Keith district, formerly part of the Mono diggings, the Jordan district and others, both north and south of those described. The only drawback to the development equipment and successful operation of these mines is cheap transportation, for there is abundance of wood and water. Many of the veins can be worked to the depth of several hundred feet by tunnels and the climatic conditions are less severe than those of the Rocky mountain region of Colorado. In the latter State several of the principal mining cities are at a greater altitude than any of the mines here referred to. But in Colorado, when mineral resources are shown by miners to exist, the enterprising railroads of that State quickly make the region accessible by building into the district.

In California the mining community has been spoiled by having the greater number of the mines developed in a region of gently rolling hills, where

Broken Talus of Granite on Leevining Creek Canyon, Near Tioga Mines.

A Spur of Mt. Parker on Tioga Road.

snow seldom falls, or quickly disappears, should it come, and where the difficulties of transportation offer no material drawback to the development and operation of the mines. These mines are for the most part not above 1500 feet altitude. Outdoor operations can be carried on throughout the year, and the cost of mining has been reduced to the lowest possible figure. Men accustomed to such conditions do not look with favor upon a mine situated on or near the summit of a great mountain range, which is mostly covered with snow throughout the year; but in Colorado the miners are used to this, and abundance of snow to them means abundance of water in the summer season, and this is synonymous with prosperity.

Near the Summit, Tioga Road.

Mount Tioga—Road Survey Around Left-Hand Side.

ANY metallurgical process, whether patented, secret, or otherwise, for which it is claimed that a greater value can be extracted from ores than is indicated to be present by assay, may be safely looked upon with suspicion. The methods of determining the amount of metal contained in ores, by either fire or wet analysis, have been reduced to an exact science, and, processes operating on a commercial scale by which it is claimed the operator can produce more than is indicated by these searching methods of assaying, is pretending to produce something from nothing—a physical impossibility.

Iron Ore in the Uinta Mountains, Utah.

In a reconnaissance study of the general geology of the region lying east of the Wasatch Range, Utah, J. M. Boutwell of the United States Geological Survey recently visited deposits of red iron ore (hematite) and obtained geological data concerning that region. In a short article published in the Survey's Bulletin 225, entitled "Contributions to Economic Geology, 1903," Mr. Boutwell presents the essential facts learned about these iron deposits of the Uinta mountains.

The Uinta Range is in the northeastern part of Utah, but it extends also into the extreme northwestern part of Colorado, immediately south of Wyoming.

In about the latitude of Salt Lake City and the southern shores of Great Salt Lake, it reaches from the Wasatch Range eastward approximately 150 miles, with an average width of about 35 miles. The range is in the form of an elongated dome composed of a deeply dissected central plateau and encircling hills. The iron deposits described by Mr. Boutwell occur in limestone near the inner margin of the belt of encircling hills, and thus outside of the interior plateau region. The narrow divide in which they occur overlooks eastward the broad glacial amphitheater of the upper Duchesne and its canyon, and westward the corresponding amphitheater of the basin of Soapstone creek. The locality is easily accessible from the west by way of Provo river and Soapstone creek. It is reported that the continuation of the same route leading by other deposits, farther south, may also be taken from the Duchesne on the east.

The iron was probably discovered and first used by the Indians, who are reported to have looked with favor on it as a source of paint. About twenty-five years ago the most promising deposits were located by a party from Heber. It is believed that they did the first actual development work on the property and hauled a few loads of ore to the smelters in Salt Lake valley. It is known that shipments were made amounting in all to at least 500 tons. About 1882 the ground was surveyed for patent, and seven claims, each 600x1500 feet, were eventually patented by E. P. Ferry. Some further prospecting has since been done in the vicinity, and, as a result, a few more claims may have been staked. In the fall of 1902 other croppings were prospected, additional claims were laid out and some assessmeet work was done.

The ore is a red hematite of two varieties—the red of the ocherous and the gray of the massive, semi-specular type. It varies in purity from samples of high grade, which are solid, pure iron oxide, to those in which the barren country rock in closes mere patches of lean ore. An analysis of a selected sample of a high-grade massive, semi specular variety reveals not only a high content of iron (79.34%) and a suitable amount of silica (18.55%), but also a most desirable absence of the deleterious elements — titanium and sulphur—and only a trace of phosphorus. It indicates a high-grade, workable iron ore. So little development work has been done, however, that there is meager basis for estimating its quantity.

A surveyor who ran a line for a railroad through this region in the early days reports an extensive body of iron, apparenty on this same divide, several miles to the north, and others state that promising outcrops occur to the south along this divide at intervals of several miles. A good wagon road, now out of repair, was built in the early '80s from the main road along Provo river up Soapstone creek, past a sawmill, to the ore pits at the crest of the divide. At present the nearest railroad point is Park City, about 35 miles west. Standing timber is plentiful and a small creek flows across the property. If, on thorough investigation of these deposits and the others reported to occur in the vicinity, it should appear that the amount of ore warranted operation of the property, the chief problem would be that of transportation.

Interesting Smelting Operations.

A smelter operator in Mexico says: "Our ores carry one-half of 1% copper, and consequently our matte is low in copper, but rich in gold, with some silver. We have found that one-fourth of 1% copper is sufficient to collect all the gold and silver, and this amount pays freight and treatment charges. In the furnaces hot blast is supplied by waste heat from the boilers and furnaces. About 15% of pyrite is used in the charge. The amount of coke used varies with the quantity of pyrite used, and other variations in conditions. A monthly run showed that an average of 7% coke was employed. Coke is freighted 60 miles and costs $20 gold per ton. There is little flue dust. The ores are dumped directly into the furnace as they come from the mine, breaking up the largest lumps only. No extra lime or other flux is required, the ores being self-fluxing when suitably mixed. The slags are very clean and carry from 40% to 45% of silica and insoluble mineral; iron 25% to 30% and lime 3% to 5%, but no lime is necessary. A silicate of iron slag is considered good enough, and so is iron matte, which runs 55% to 56% iron and 27% sulphur. The losses in the slag are small, and the labor at the furnaces light."

THE year 1903 stands as the high-water mark of prosperity in the anthracite coal trade, as the tonnage for that year exceeded by more than 6,000,000 tons that of any previous year, and the demand for coal was so good as to make it possible to dispose of the product at prices which brought a fair return to all concerned in the industry. Some significant figures in connection with the production of Pennsylvania anthracite during 1903 have been collected by W. W. Ruley, Special Agent of the United States Geological Survey, and will be included in E. W. Parker's report on the production of coal in 1903, which is a regular feature of the Survey's annual volume on the Mineral Resources of the United States.

CYANIDE OF SODIUM is becoming a competitor of 98% cyanide of potassium in cyanide practice, it giving favorable returns in cost and results.

Mill Construction, Milling and Amalgamation.*

Written by I. ROSKELLEY.

Like all other machinery and processes in vogue for the recovery of gold on the Witwatersrand, the mill and milling practices of to-day have been gradually evolved out of ruder machinery and cruder methods. Despite the improvements that have been made, the millman still finds many details in mill construction which could be changed with advantage both to economy of working and to the life of the mill. Engineers have already recognized many of these defects, and nothing but the cost of installation has prevented them from being rectified, and in the numerous new mills in course of construction will see them remedied.

Before treating of milling, I will point out a few of the alterations which, I consider, would materially improve our mills:

1. Lack of adequate space is, I am sure, a serious defect in most of our mills. Sufficient space should be allowed at the end of the mill for men to reverse the ends of a cam shaft. Usually, we find barely enough for them to range up to carry it. The cam floor, too, is much too narrow for the rapid working which breakages demand if the output of the mill is not to be lowered.

2. Then, again, instead of being provided with one tackle block carriage or overhead crawl, a mill should have four—one over the stamps, as is usual, another over the cam floor and two others at right angles to these, one at each end of the mill, so that parts needing repairs or renewing can be readily brought into position from the door of the mill.

3. The keyed cams and shafts in general use now can be advantageously done away with in favor of the new self-tightening cams. With the former, mill men find it difficult to tighten a loose cam—and they are continually working loose—because they can not get at the key, owing to the adjacent cam. In case of breakage, stamps have to be hung up an unnecessarily long time, since all cams from the end of the shaft to the broken one have to be loosened and again keyed up. In the new cams the entire cam hub, by its self-tightening construction, takes hold upon the shaft, and dependence is not to be placed on the shearing stress of a key, which is liable to work loose, or which may be driven so tightly that it may split the cam or impair its strength. Taking off the new cam is a simple and rapid operation. A slight blow on the back edge with a hammer loosens the cam so that it can be slipped off. Where these cams and shafts are in general use, breakages can be remedied in less than quarter the time taken with the old style, and mill operators would not be troubled with loose cams.

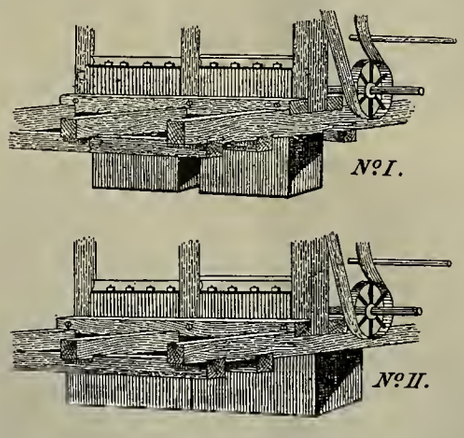
4. In modern mills ten stamps are usually placed on one shaft, and, as long as things are running smoothly, this seems a good arrangement, since less timbering, pulleys and belts are required than with five stamps to a shaft. The economy in timber is, however, slight—five king posts instead of six—and pulleys and belts have to be proportionally heavier for their heavier duties. This slight gain in initial cost is, in my opinion, more than counterbalauced by the excessive loss of time and waste of labor in repair of breakages, and for this reason I advocate a return to the old-fashioned five stamps to a shaft. The disadvantages of the present arrangement when anything goes wrong are that (a) ten stamps are held up instead of five while repairs are being done, and, (b) if the breakage occurs near the pulleys, some seven or eight cams instead of three or four have to be taken off and put on again, unless the pulley is taken off, and this is often a very difficult job. Hence, twice the number of stamps are held up for about half as long again as would occur were there only five stamps to a shaft.

It may be urged that I am thinking of nothing but breakages, and that these do not occur as often as I would imply. But repairs of one kind or another have to be made daily, and in the construction of a mill this should be borne in mind and everything done to facilitate it. Besides, when men are working at repairs, the rest of the mill is being neglected, and a broken stem or screen may pass unnoticed for some time.

5. In building a mill much care should be given to the selection of timber, especially to that which is used for king posts (battery posts). Good, well-seasoned pitch pine should be used for this purpose; unless this is done, splitting and shrinking and consequent loss of strength will occur, owing to the vibration. In many mills little attention seems to have been given to king posts, although they have to bear the brunt of the work. Where ten 1250-pound stamps are run to a shaft, the king posts are often the same size as those used in light mills, where five 1050-pound stamps are run. A cross-section of these posts measures 12x23 inches, but 18x23 inches would be better. The usual foundation of king posts is not good, as it admits of considerable vibration, that can be avoided by giving it a solid support, as shown in the following diagram.

This can be done by continuing the blocks that support the mortars outwards, so that the streak sill on which the king posts rests is supported by them directly beneath the king post.

Other points in mill construction I will leave until I come to the working of the mill, when I shall have something more to say on the point. When ore is brought up from the mine it is classified into "fines"



and coarse rock by dumping the skip load on a grizzly. Theoretically, "fines" is rock that passes through about an inch gauge, but, practically, it is often very different. I have seen rock weighing a stone (fourteen pounds) getting into a mill as "fines." The bars of the grizzly get worn or bent, and occasionally one falls out, hence the presence of these coarse "fines" in the ore bins. The grizzly should be examined often and anything defective rectified immediately winding ceases. Careless workmen and worn machinery here and in the crushing house are responsible for numberless breakages in the mill and for a low crushing capacity.

SORTING.—Since Mr. Johns introduced sorting on the Ferreira mine, in 1892, it has become geueral along the Rand; but since crushing has been resumed after the war scarcity of native labor has compelled the managers to sort less, and hence the grade of their ore has been lowered. H. H. Webb, in his address to the South African Association of Engineers, has, I think, put the question of sorting in a nutshell. "Sorting," he said, "will bear investigation for each individual property, at least, to find the desirable percentage of quartzites to be eliminated."

CRUSHING.—Usually. the crusher is supposed to break rock to about 2-inch cubes; but it is often coarser, owing to worn machinery. The tonnage crushed in the mill could be materially increased if the rock brought into the bins was first reduced to 1-inch cubes, since the drop could be lowered and the speed increased. Much more attention must be given the ore coming from the mill if we would get that rapid and effective crushing which is aimed at.

CONVEYING ORE TO MILL.—After passing through the breakers the ore is delivered to the mill bins by belts or mechanical haulage. The latter is the more usual, but where belts are used they give very satisfactory results. A Robins belt conveyor has been in steady use on the Robinson Deep for about twelve mouths, carrying from 700 to 1000 tons of ore per day to the bins, with no sign of undue wear. The belt, which is 24 inches wide, is made of canvas thickly coated with rubber, the center part being thicker than the sides.

The ore is tipped from the belt into the bins by means of a tripper. Just behind the point of tipping the makers supplied a brush which was intended to sweep off any particles of sharp rock adhering to the belt. This the brush failed to do effectively, and the result was that in passing over the supporting rollers on the return journey they were forced into the rubber.

The brush has been discarded for a stream of water from an inch pipe, acting at the point where the brush was placed. The water is brought up by a simple device. A long hose is attached to a water pipe outside the mill and brought in over a roller through a small window on a level with the tripper. As the tripper is moved backwards or forwards in the mill, the hose coils or uncoils automatically around a wooden cone placed directly beneath the window. The belt is cleared of water by a rubber scraper, placed a little in advance of the hose pipe, and the water is conveyed down through inclined launders to tanks, where the particles of ore settle.

FEEDERS.—Ore is fed into the mortar box by an automatic feeder. The feeder is operated either by a tappet rod or by a forked level, which engages a feed collar placed on the central stem of the battery. Many attempts have been made to improve on the Challenge feeder, but the two or three so-called improved feeders I have seen at work certainly do not justify discarding it. Probably an improvement will be made so that the brake wheel and three pawls can be done away with.

THE STAMP.—(a) THE STEM.—Hard, fine steel is the material of which stems are made, but after from four to six months' wear they often snap right above the head. It occurred to me that, to get an ideal stem, two materials should be used—hard, fine steel for the center part, where, with more pliable, though tougher material, bending would occur; and a tough iron for the upper and lower parts, where bending never occurs, but where the stem often snaps.

Acting on this idea, I had some 3 feet of iron welded to both ends of an ordinary hard steel stem and tried that. I have had about a dozen of these iron and steel stems in constant use for about eight months, and up to now I have not had a breakage with them. Though I can not as yet speak definitely as to the life of these stems, I consider them an improvement on the usual hard steel ones. Coarse steel, however hard, gives very unsatisfactory results. A number of stems of this material broke in the middle in the Robinson Deep mill after only two weeks' work.

(b) HEADS.—These should be made of hard, fine, cast steel. The difficulty which millmen experience with heads is the driving out of the broken stem. Often he has to resort to dynamite, and the chances are that he splits the head with the charge. This difficulty is one which occurs in large mills daily, but a slight alteration in the construction of the head would do away with it altogether. Between the end of the shankway of the head and the end of the shankway of the stem there is at present a solid center of from 2 to 4 inches. If the makers supplied heads with a 2-inch or 2½-inch hole through this part, the difficulty could be overcome. This alteration having been made, the stem would be driven out by placing the head with the broken stem downwards and giving the stem a few blows with a hammer worked by steam or compressed air. The small hole through the center would not materially weaken the head. At present blasting is about the only thing that splits them.

(c) SHOES.—Battery shoes should be made of hard steel from bottom of shank to bottom of shoe. The shank itself should not be as hard as the remainder of the shoe, as it would be liable to snap if it were. To get this difference in tempering of the two parts, the shoe itself, after being heated, should be cooled rapidly in water, leaving the shank above water to cool slowly. A new 12-inch (high) shoe weighs 225 pounds, and a worn out one weighs from 35 to 40 pounds. The shoe can be safely worn down close to the shank. A shoe will run for about ninety days and crush from 450 to 500 tons of rock.†

(d) DIES.—Great care should be given to the tempering of dies, as, owing to their stationary position, uneven tempering causes uneven wearing, and the result of a badly woru die is diminished crushing, and, possibly, a broken stem. It will be found on examining a heap of worn out dies that, although many of the dies are worn down at the center, some 2 or 3 inches still remain around the edges. The mistake that is made in the manufacture of dies lies in the heating, not in the cooling. A block of steel to be tempered evenly should be heated slowly, so that the whole block has a chance of getting to the same temperature. If the block is heated rapidly, the outside is ready for forging long before the iuside, and when the unevenly heated block is cooled in a bath the outside becomes hard, while the inside remains soft. If the die has been heated slowly and thoroughly, it can be cooled rapidly or slowly, according as a hard or medium hard article is required.

A 6-inch die which weighs 120 pounds will wear out a 12-inch shoe, and, consequently, wears for about ninety days and helps to crush from 450 to 500 tons of rock. A fairly evenly worn discarded die weighs about forty pounds; but, if the tempering has been bad, it weighs considerably more.

(e) TAPPETS.—These should be made of fine, hard cast steel. Those made of coarse steel split and become useless. I prefer a three-keyed tappet to a two-keyed one. The bore of the tappet should be $\frac{1}{32}$ inch larger than the stem it has to take. This little precaution will save millmen much hard work and prevent delay when the stamps are held up.

(f) GUIDES.—Many attempts, more or less successful, have been made to improve on the old-fashioned, solid guides. Wood guides in iron frames and many varieties of all-iron sectional guides have been tried, but I have found the solid guides better than any of the so-called improvements. It has been stated that six months is the life of a solid guide; but by keeping the bolts tight I have found them last much longer than this. Solid guides, made of English oak, that were put in the Robinson Deep mill six years ago, are still in use.

(g) WEIGHT OF STAMP.—This varies from 750 pounds in light mills to 1350 pounds in the heavy ones. It has been suggested in the society that compensating weights should be used when shoes, etc., get worn, to keep the mill at constant weight. To keep any particular stamp at constant weight without some such arrangement is, I admit, impossible; but it is easy to keep the average weight of the mill fairly constant.

A shoe ordinarily lasts about three months, so that in a 100-stamp mill thirty new shoes are put in every month, and this keeps the mill at a constant weight.

*Abstract Trans. Jour. Chem. Met. and Min. Soc., S. A.

†This varies greatly, depending upon the quality of the shoe and of the material crushed, manner of feeding, height of discharge, etc.—ED.

(TO BE CONTINUED.)

The Distribution of Placer Gold in Oregon.*

Written by C. W. Washburne.

In Oregon placer gold is limited to areas of the older rocks or to their vicinity. This means to pre-Jurassic rocks in the Blue mountains and to pre-Tertiary rocks in southwestern Oregon. Of course the streams from these areas carry fine gold even to the sea, and it may be detected in their gravels and sands at many places to so great an extent, indeed, that in sea beaches 200 miles from old rocks flour gold is so plentiful that it is supposed to contain fortunes for those who will find a way to save it. But stream gold which can be saved by methods now in use and in paying quantities is limited to the vicinity of old rocks. This is not a theory, but a fact observed during several years of field work in the placer districts of Oregon and during numerous reconnaissances in the Coast and Cascade ranges. It may be clearly seen by picking out the placer mines on Lindgren's map of the gold belt of the Blue mountains, in the twenty-second annual report United States Geological Survey.

The reason for this distribution is not hard to find. The later rocks in the Blue mountains do not contain much gold. The workable veins of the region are in Triassic or in Paleozoic rocks. Gold coarse enough and abundant enough to be worked with profit can therefore not be found in the stream beds where these rocks are covered for any considerable distance by later lavas or sediments. The same reason applies to southwestern Oregon, except that in this region mineralization continued through the lower Cretaceous (Knoxville) and probably into the upper Cretaceous (Chico), but did not continue thereafter, or at most only feebly. In both regions secondary enrichment may have continued to the present day, but primary depositions ceased at the times mentioned.

This explanation is not entirely sufficient, however. That the presence of gold bearing deposits in the rocks does not mean the presence of workable placers in the streams is evident from a study of the Cascades, though, of course, the absence of gold in the rock of any region must always result in the absence of placers. In the Cascades of Oregon and Washington there are many quartz veins which yield paying quantities of gold. The gold is in Tertiary rocks, and its deposition has continued almost to present time. In this case the absence of paying quantities of gold in the stream is due to the slight amount of erosion which the ore bodies have suffered. Since the late Tertiary the canyons of the Cascades have been cut, and in some cases divides have been worn to sharp ridges. More often the dividing ridges are broad and along their summits have approximately the surface of the last lava flows that did not enter the present canyons. In other words, erosion has been slight, being limited to the cutting of the valleys and canyons of the range. The scarcity of stream deposits among the lavas and tuffs of the range shows that previous to the cutting of the present canyons the piling up of volcanic material greatly exceeded erosion. Hence at that time veins were more likely to be covered than to be worn down by weathering.

In the Blue mountains and in the Klamath mountains, which is the name given by the United States Geological Survey to the mountains of southwestern Oregon and northwestern California, comprising the Siskiyous and part of the Rogue River mountains in Oregon, and the Salmon, Trinity and other mountains in California, on the other hand, there has been great erosion since the deposition of the ores. They are composed of pre-Tertiary rocks, and hence include all the gold deposits of southern Oregon. The erosion of the crumpled pre-Jurassic rocks of the Blue mountains probably amounts to many thousand feet vertically. The erosion of the pre-Tertiary rocks of the Klamath mountains must have been almost as great, as Mr. Diller has found evidence that these mountains were once covered by a heavy mantle of Cretaceous strata which has since been almost entirely stripped off. The latter region has been worn down to sea level, and elevated for recutting into its present form, since the deposition of the gold ores. This erosion, to which that of the Cascades is significant, has resulted in the breaking up of millions of tons of gold ore, the streams concentrating most of the gold therefrom within a short distance from its source.

It is a natural deduction from these two arguments that valuable placers will never be found in the Cascades south of central Washington, nor in the Coast range between the Olympic mountains and the Klamath mountains.

The Oregon coast has many deposits of black sand, but they furnish paying quantities of gold in but very few places. The sand is abundant from beyond the California line to Long Beach in Washington, and will give tests for gold at any place. But no miner has yet found a practicable means of working the sands farther north than the mouth of Big creek in Lane county, though reports have been received from B. F. Jones of Toledo, who is successfully working a beach deposit at Otter Rock, Lincoln county, which is north of the point indicated. In 1902 the writer found W. Reynolds saving $2 a day by working between tides with a rocker at Big creek. Mr. Reynolds also showed the writer a vial containing about three ounces of platinum which he had saved in a winter's work. Mixed with the platinum was another white substance, probably iridosmine, which constituted about one-fifth of the mass.

South of the above place gold has been found mined along the beach at innumerable places. At the mouth of Rogue river there are some beach mines that were once among the richest placers of Oregon. The discoverers of the deposits north of the mouth of Rogue river found it profitable to mine them, even though for lack of horses, it was necessary to hire men to carry the black sand on their backs to the top of the terrace back of the beach where running water could be had for washing out the gold. This was in the sixties. Since then these sands, as well as those near Gold beach, across the river, have been practically exhausted, being worked to-day in a most desultory way.

The source of gold in the beach sands is an interesting problem. Miners along the beach believe it has been brought down by streams from back-lying parts of the Coast range, and concentrated on the shore by the waves. They argue that the presence of black sand in these streams supports their view, which is mostly maguetite, and occurs in nearly all the rivers of Oregon which have basalt or other basic igneous rocks on their drainage, and rarely contains more than a trace of gold. In the Coast range it is not known to contain platinum or iridosmine, which are nearly always associated with the beach gold.

We must therefore conclude that the gold has been transported along the coast from the north or from the south. We have already noted the fact that the gold is too fine or scarce in the black sands from Long beach to the coast of Lane county to be successfully worked. We have also noted that the richest sands are at the mouth of Rogue river. South of this stream the sands are not rich and have never been worked beyond the Klamath river.

*Abstract Bulletin University of Oregon.

Competitive Prices on Quartz Mills.

To the Editor:—We are often asked to figure on a first-class up-to-date quartz mill, the intending purchaser stating that he would like to have the mill operated by steam power, and to be furnished complete with all necessary shafting, pulleys, boxes, belts, copper plates, engine, boiler and they may possibly state the weight of stamps they require, but that is all the information generally given, except that they want everything "first-class."

This information is generally given out to several firms in San Francisco, with the request that they submit specifications and the price on same. While a great many of our mining men are able to distinguish between the good and the bad, still many of the parties, who have the final say in purchasing the mill, are men who do not understand the fact that there is a great deal of flexibility in the word "first-class," and are apt to measure everyone's specification with the dollar measure, which is at times very misleading.

We had a peculiar instance of this a few days since, where we were figuring on a flexible specification of the kind mentioned above—the only information given us was that the party wished a 10-stamp concentrating gold mill complete, to be driven by steam power, stamps to weigh 1000 pounds each, rock breaker to have ample capacity for crushing enough ore in ten hours to operate the stamps for twenty-four.

We furnished our usual specifications giving them full weight of stamps, cast steel cams and tappets, forged steel shoes and dies, and mortar which was lined throughout with removable liners; copper plates 5 feet wide by 10 feet long, four concentrators for the ten stamps and 8x12 Blake rock breaker, a 10x12 25 H. P. slide valve engine, a 40 H. P. horizontal tubular boiler, heavy counter shaft and 12-inch five-ply main belt from engine. In short, we figured up what in our judgment was the very best mill we could produce.

We submitted for same a detailed specification, giving exact weight of the stem, tappet, shoe and stamp head, which weights were guaranteed by us, the total of which was 1013 pounds. We submitted this specification and one of our representatives called on the purchasers regarding same. He was informed that while our specifications were very complete, and no fault could be found with our plant in any way, still our price was between $300 and $400 higher than that of the lowest bidder; that while they had a high regard for our machinery, etc., still they could not pay us $400 more than our competitor, whose machinery presumably was just the same.

Our representative suggested that possibly our competitor's machinery might not be the same, and suggested that the specifications be laid side by side and compared.

The first thing that developed was that their grizzly was 3x8 feet, made of plain bars 2½x⅝ inches, while ours was 4x10 feet, made of taper bars ¾-inch wide at top, ⅝-inch at bottom and 3 inches wide, thus making a grizzly which could not be clogged up.

His mortar was an unlined mortar, while ours was to be supplied with removable liners, thus making the mortar everlasting; the aggregate weight of his stamps could not by any hook or crook possibly exceed 950 pounds. His copper plates were 4 feet wide, 8 feet long, instead of 5x10, as in our mill, but the crowning thing of all was his steam plant, where he specified a common slide valve engine with cylinder 8 inches in diameter by 10 inches stroke, and horizontal tubular boiler containing only 210 square feet of heating surface, as against 600 feet of heating surface in our boiler.

His engine was an Eastern engine of well-known make, and our representative immediately procured the manufacturer's catalogue wherein the engine was rated at 13 H. P. and the boiler at 20 H. P. Both of them were overrated, as we only rate a boiler of that capacity at about 15 H. P. and the engine at 12 H. P. Our representative pointed out the fact that this engine and boiler could not possibly be made to run the mill when running at the speed recommended by the manufacturers, and at his suggestion the intending purchaser called up our competitor and put the question to him regarding the capacity of engine and boiler. His reply was that he intended to run the engine at 350 revolutions and carry 150 pounds of steam on the boiler. Our representative also pointed out the fact that the main drive belt on this engine was only 8 inches wide, the battery belt was only 10 inches wide, while in our specifications both of the above belts were 12 inches wide.

All of this goes to show that unless a purchaser is a mill expert, they often get fooled by various people who supply mills, and whose only idea is to sell them cheap. We do not care for this class of business and prefer not to build cheap mills. Salesman.

San Francisco, Cal., April 25.

Hints on Shaft Work.

To the Editor:—In view of the enormous expense incurred in shaft work and the necessity of capable and economical management connected therewith, a few hints of practical value may prove of interest to readers of the Mining and Scientific Press.

Occasionally we see statements made by managers setting forth the cost per foot of shaft work and pointing with pride to the low cost of same, but never a suggestion of how or under what conditions this was accomplished. On the other hand, I have heard managers announce at stockholders' and directors' meetings that shaft work cost from $90 to $120 per foot. It is easy to see what a 1000-foot shaft would come to at such a figure.

These reports are accepted by the stockholders, unconscious of the fact that such work should and could be done for from one-half to three-fourths of the above amount.

After you have decided what kind of shaft you want—and to my mind a vertical shaft is the only proper working shaft—the next thing is to introduce some system and religiously adhere to it. First of all, do not have too many bosses. Usually a superintendent goes to the sinking crew and gives certain orders; perhaps before he is gone ten minutes the foreman comes along and advises something directly opposite; then probably two or three shift bosses come along and make counter suggestions. So it is only reasonable to suppose that chaos is the inevitable result.

My idea is to give the foreman full charge of the shaft work, if he is capable, and if not, get some one who is. Then if the superintendent has orders to give, let them be given through his foreman. It is well enough to have shift bosses come around to see if the shaft men need anything, and if they do, procure it for them. For the aim should be to have the men in the shaft stay there and not be running all over the mine looking for tools, etc. To avoid this, as a means of communication with the top man, I have used what I call a tag board. A piece of board 6x12 inches is a convenient size, and have written on it, or better still burned on, everything liable to be needed in the shaft, and opposite each item a hole in which to insert a wooden peg. This board is fastened on the cable just above the hook so as to be in reach, and left there. When anything is needed all the shaft men need do is to insert the peg opposite the article needed and send the bucket to the surface. At a glance the top man sees what is wanted and sends it down. This keeps the men at their work and avoids the careful handling of men by the engineer. One of the greatest items of expense is the breaking of the ground, and care should be taken not to break too much out of the sides of the shaft.

The space between the walls and the timbers must be filled in and consequently is a lot of needless work, and besides is not so substantial. To avoid breaking too much ground out of the sides, or too little for that matter, I have used a plumb-bob attached to a light pole, long enough to reach the last set, by placing the pole, with plumb-line attached, in the corners of the set and letting the plumb-bob drop to the bottom; you can see at a glance how much ground is to come out. Aim at least to take out from 4 to 8 inches outside of the shaft timbers. This leaves enough room to get blocking and lagging behind the sets. Some men who profess to be miners try to

take too much ground out of the bottom at one setting up, and to that end they tell the men to drill 9-foot or 10-foot holes, then fill them with dynamite. The result is that it takes one, and sometimes two and three days, to replace the timbers that have been blasted out, and besides they don't break the ground clean, but leave it in such a condition that it cannot be drilled or picked out. When the men are shovelling have them pick the bottom carefully and be sure to take out all the shattered rock, for it is difficult to drill ground that is shattered.

Machine holes should not be deeper than 6 feet for cut holes and 5 and 5½ feet for back and center holes. Of course local conditions will sometimes vary this and judgment must be exercised accordingly, but the above should be the maximum depth. There is no necessity of blasting out timbers if a man knows his business. Miners like to use large quantities of dynamite because it breaks the rock finer and makes easier shovelling. When timbers are blasted out, caution the men and let them know it will not be tolerated; if it continues it is time to get a new crew of men.

The wall and end plates should be protected against blasting by nailing on the under sides 3-inch plank and leaving it there until you are ready to timber again.

Do not allow the timbers to get too far from the bottom—in fact as soon as there is room for a set, put it in. To avoid injury the guides when blasting have two sets of false ones, one pair long enough to reach between two sets, and the other pair long enough to reach three sets. It is necessary that at least one man on a shift should be a good timberman.

Do not have too many men in the shaft, especially when timbering. One man in each compartment is sufficient. If you have a machine crew of four men, when it comes to timbering send one of them to the surface to help the top man send down the set. He will be more useful there than in the shaft. I have made it a point to timber on the night shift, so as to have the timber framer have everything in readiness during the day. Have the top man place everything uecessary close to the shaft so that there may be no delay in getting the set down; have the hangers in good shape; have the staging ready at hand, and it should go down first of all; then the tools, axes, hammers, plumb-bobs, saw, nails, two picks and a few wedges; then the wall plates; be careful to send them down in pairs so that it will not be uecessary to send them to the surface again; then the end plates, posts and centers, now a bucket of assorted blocks (and plenty of them) and 3-inch wedges.

All this should be sent down without any delay, as the men in the shaft have nothing to do until the set is down, when they get ready to hang it. The set should be blocked in three hours at most, and then the lagging should be sent down. From the time the staging goes down until it is back at the surface again with the set complete, should not take over six hours. Yet how often is this done?

Do not allow every man in the shaft to ring the bell for the cage or bucket. Have one man on a shift do it and have him educated to do it properly. Do not give your machine men a starter and a 6-foot drill and expect them to do good work. Have plenty of steel and do not have three or four different sizes, for they will not follow in the holes and besides will cause vexatious delays.

If you are sinking by hand have each shift drill, blast, and send up their own rock, so that in case of missed holes they will know exactly where to look for them. Have a tally board at the top and tally the amount of rock sent up by each shift. This creates a rivalry and brings good results, but do not expect the shift that has to take out the cut to send up as much rock as the shift that comes after. Keep powder and fuse for your shaft men at the surface, and have the top man cut and cap the fuse during his spare moments.

If the ground is wet, fuse should be greased for 2 or 3 feet back from the cap so as to avoid gettiug the cap wet. These few suggestions have been tried and proven in actual work, and to some one lacking in experience their application may mean the difference between an assessment and a dividend.

A. R. McDONALD.

A BORAX DEPOSIT is located in the marshes south of Lake Alvord, Harney county, Oregon, which covers over 10,000 acres. With transportation facilities as they are at present, about one-fourth of this area is rich enough to pay for working. The product is shipped by mule teams to Winnemucca, Nevada, 150 miles distant. The ground is level and treeless, and is encrusted with a layer of salt 6 inches thick—sodium carbonate, sodium sulphate and sodium chloride being constituents of the crust along with borax. During the long, dry summers this material is shoveled up, dissolved in boiling water to which sulphuric acid is added, the solution decanted, and the boric acid obtained by precipitation as the liquor cools. From 5% to 20% of the raw material is borax. Four hundred tons per year was reported for the years 1898, 1899, 1900 and 1901. No production in 1902. The Rose Valley Borax Co. owns the richest of the marsh land. The deposits are renewed each year during the winter rains. Hot springs carrying borax are the reputed source of the mineral.

A Magnetic Separator.

Written for the MINING AND SCIENTIFIC PRESS by W. R. CRANE.

Of the special and successful methods of concentration in common use, that which takes advantage of the magnetic properties of minerals is not only one of the most interesting, but also one of the most successful for difficult separations.

The electrical concentrators, although belonging to the same general class, have a much wider application, being applicable, in fact, to the treatment of practically the whole range of ores.

Excellent descriptions of many of the older and better known magnetic concentrators, or separators, such as the Monarch, Payne, Wenstrom, Wetherill, etc., have appeared from time to time in the mining journals. The Cleveland-Knowles concentrator is one that has come to the notice of the writer in the Joplin lead and zinc district. A company known as the Joplin Separating Co. has a mill at Joplin, where they are handling zinc ores in which occurs disseminated pyrite, and are turning out a remarkably clean product.

Several years ago, when the zinc smelters were located at Joplin, the Wetherill people had one of their inclined type of magnetic separators installed in the smelter by the roasting furnaces, and it was handling zinc ores with such a high per cent of pyrite as to render smelting of the same practically impossible. These ores were roasted before separation was attempted, which is done also in the use of the Cleveland-Knowles separator.

Only those ores that have considerable quantities of pyrite in them are treated by this separator in the Joplin mill, and as a good many mines—or portions of mines—yield such ores, the need of such a separator is apparent. Many mines and mills would, in fact, have to shut down if there was no market for such products.

The schedule on which zinc ore contaminated with pyrite is sold is as follows: A discount of $1 per ton for every per cent above 1, which remains constant until 5% is reached, above which a still further reduction is made, depending largely on the character of the ore aside from the pyritic content.

The Cleveland-Knowles separator is a belt machine and in that respect is similar to several other forms. The construction of the magnets, as well as the method of discharging the concentrates, is different from that of any other separator and gives the separator its distinguishing characteristics. See accompanying engraving, Fig. 1.

Referring to Fig. 2, it is seen that above the horizontal feed belt, of a single machine or unit, which runs over two wide-faced pulleys, are two large cylindrical magnets. The belt is seamless rubber, 12 inches wide, and extends horizontally for a distance of 7 feet 3½ inches. It is kept tight by adjusting screws acting on a sliding bearing at one end of the machine.

A short distance above and partly to one side of the feed belt are the two magnets, which are mounted upon vertical journals. The journals are held in position and supported by two bearings—the lower being of the ordinary form, while the upper are ball bearings. The magnets are driven by bevel gears mounted upon two shafts that run transversely with the machine. Upon one of these shafts is the main drive pulley; the other shaft is driven from the first by belt.

The vertical distance between the feed belt and the horizontal face of the magnets is ½ inch, but may be varied by raising or lowering the magnets, thus enabling the operator to adjust the separator to suit the requirements of the mineral treated.

Attached to the supporting journals of the magnets and directly below the lower bearing are the continuous acting brush connections, one to each journal, by means of which conuection is made with the exciting coils of each magnet. The connections consist of two metal rings mounted upon an insulated hub, the rings being insulated from both the journals and each other. Two brushes attached through rods to an insulated disc, which in turn is fastened to a cross timber above, rub upon and make electrical contact with the rings. A heavy wire leads from each ring to the two ends of the wire in the coil or coils.

The cross sectional area of the maguets is the same, which, as the magnets are cylindrical, is the surface area of the faces. The diameter of the magnets is 26¼ inches, and as the feed belt is 12 inches wide, the former is 14¼ inches wider than the latter.

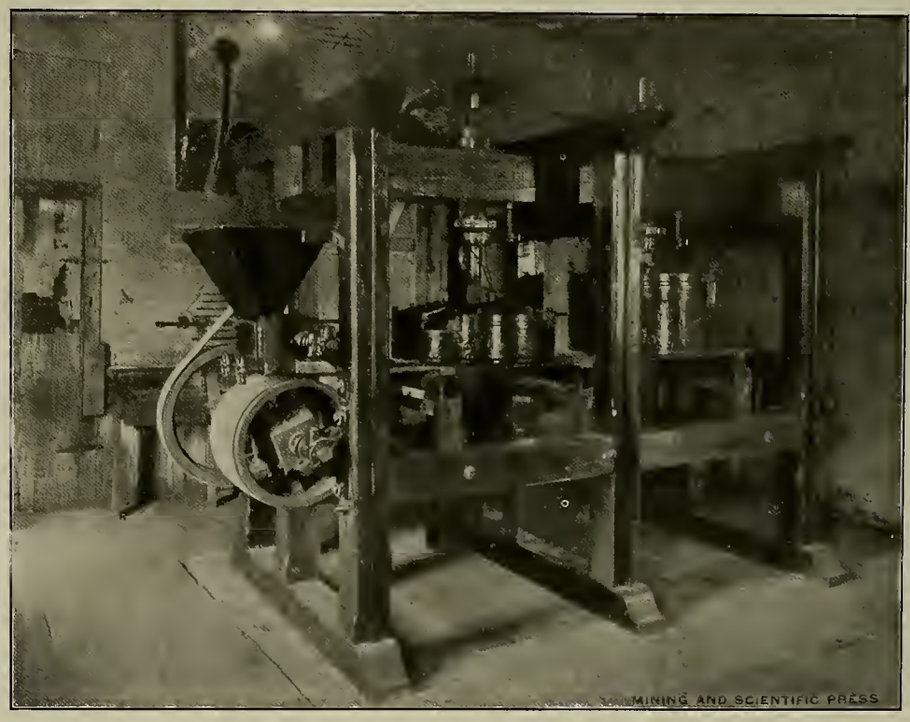


Fig. 1.—The Cleveland-Knowles Electro-Magnetic Separator.

The magnets are hung in the middle of the supporting frame, while the feed belt is set to one side in order that room for the discharge of the separated minerals may be had.

To prevent the belt sagging when loaded, and so increase and vary the distance between it and the face of the magnets, rollers are placed below the upper lap of the belt. There are three of these rollers, which are placed one between and one at the outer edge of the face of each magnet. The belt is supported at two diametrically opposite sides of the magnet, thus maintaining a fairly uniform space between the two parts, i. e., belt and magnet faces. The rollers are also made adjustable vertically, the supports being slotted below, and temporary adjustment, especially while in operation, is usually made here.

On the side of the magnets opposite the belt, or on the side where the larger part of the face is exposed, are steel knives or scrapers, which are fastened to the framework and extend across and press upon that part of the face of the magnets not covered by the belt. These scrapers do not extend radially with the face of the magnets, but are set at a considerable angle with the radii, thus acting as a plowshare in forcing any adhering mineral to the periphery of the magnets. They keep the face of the magnets free from accumulatious of mineral, which also aids in maintaining a uniform space between the belts and magnets. Directly below the scrapers—and, therefore, the exposed portion of the faces—are wide-mouthed hoppers, into which all materials scraped from the magnets are caught and conducted to separate boxes.

The magnets proper are very compactly built and consist of central, circular cores and encircling shells, which serve as the two sets of poles, respectively. The shells have flat annular faces, which form continuations of the bases or faces of the cores, when the two parts are bound together by the surmounting yoke. Through the yokes and extending iuto the core to a depth of 3 inches is a hole, which is the seat for the supporting and driving journal. Within the

annular space left between the core and the outer shell is placed one or more coils to each magnet. Between the coils and the metal of the magnets, as well as between the individual coils, when more than one is employed, are placed strips of wood or wooden washers for insulating purposes.

The coils are square in section, are made of well insulated wire and are, when formed, served with tarred rope. They have inside and outside diameters somewhat larger than that of the cores and the inside diameter of the shells, by which arrangement there is a dead air space between the coils and the metal on the sides, while the wooden washers give the desired insulation above and below. Connection is made between these coils and the feed wire brought

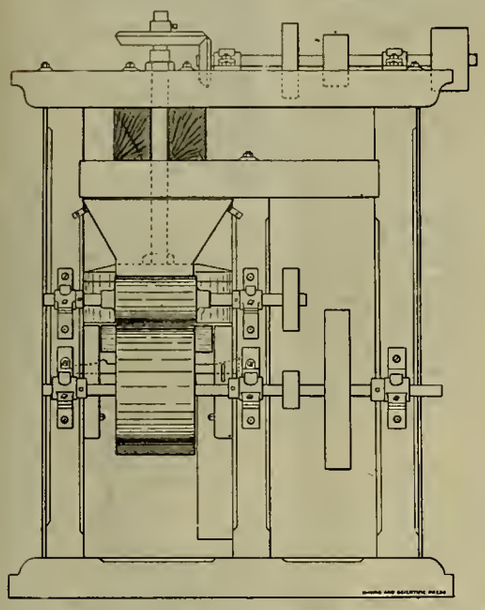


Fig. 2.—Front View of Magnetic Separator.

wheel action of the heavy magnets, the inertia of which keeps them in motion and allows energy to be stored up, when the load lightens, due to irregularity in feed or a change in the character of the mineral fed.

The strength of the current fed to the magnet is, in the order of separation, three-quarters and six and one-half amperes at ninety volts, respectively.

In the Joplin mill the ore is roasted in hand-raked

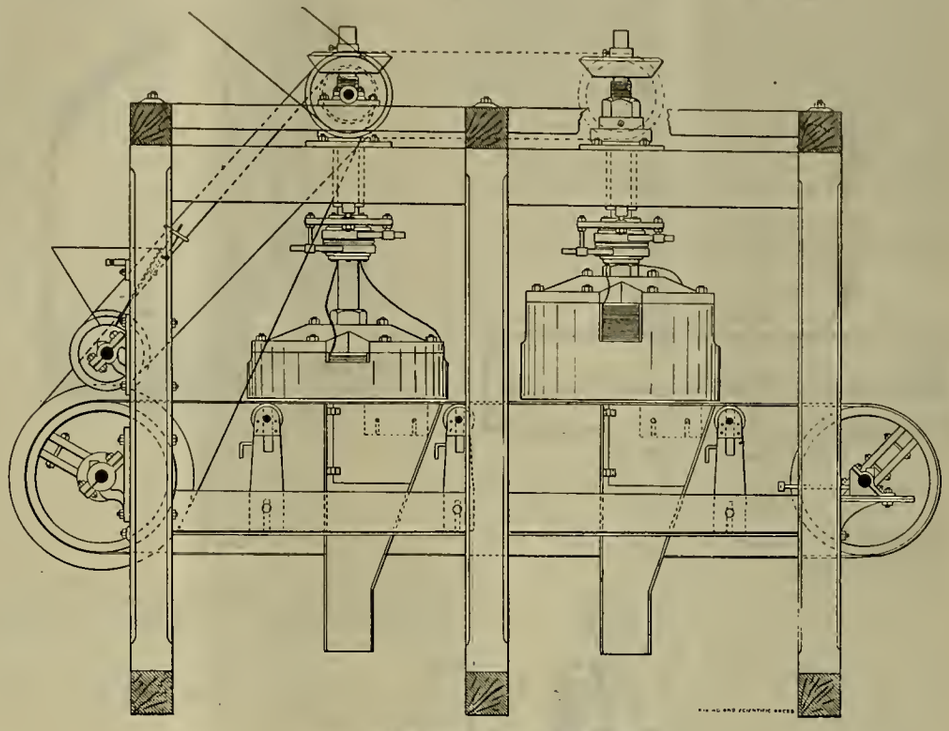


Fig. 3.—Side View of Magnetic Separator.

to the top of the machine, as stated above, by the rubbing connection on the supporting journals.

The two magnets in a unit are made of different strengths in order to subject the mineral treated to an increasing tractive force. This is accomplished by giving to the magnet adjacent to the feed end of the separator only one coil, and to the second two coils. The former magnet is then only about one half as high as the latter or the one at the discharge end. The field of the two magnets will then be as 1 : 2, provided the exciting coils are similar, but a still further variation can be effected by varying the number of ampere turns, i. e., increasing or decreasing the strength of the current and the size of the wires put into the coils. The coils must, however, remain the same size. The simplicity of construction of the magnets permits such a change to be readily made if desired.

At the feed end of the separator is situated the feed hopper, which stands directly above the pulley over which the feed belt runs. Mineral is drawn from the hopper and its discharge regulated by a corrugated drum revolving within a circular housing, which is a continuation of the hopper above. By means of this feed a continuous stream of mineral, uniform in thickness, is delivered to the feed belt, which in turn passes it close to the faces of the magnets, and that not acted upon by the magnets is discharged at the opposite end of the separator. Both feed belt and feed are driven by belt from above, as shown in Fig. 2.

The feed belt has a speed of about 100 linear feet per minute, while the magnets revolve at or close to fifty revolutions per minute, i. e., the peripheral speed is very close to the speed of the feed belt.

The separator works as follows: The mixed mineral fed into the feed and carrying belt, as it advances, comes under the influence of the weaker magnet first, which has, however, a moderately strong field. Here the more highly magnetic portion of the mineral is picked off the belt and attaches itself to the face of the revolving magnet. Still adhering to the magnet, it is rotated from over the belt to a point over the receiving hopper situated below, when it comes in contact with the scraper and is by it worked off latterly to the extreme edge of the face, where it accumulates and falls off in a constant stream as the magnet revolves. That part of the mineral which is magnetic, and yet not enough so as to be removed on passing the first magnet, is passed on to the second and stronger, where it is subjected to the same although a much more intense action. That attracted is discharged into the hopper below, while the non or feebly magnetic portion is discharged by the feed belt to the receiving box at the end of the separator.

The objection might be raised that, due to the method of removing the mineral attached to the magnets, considerable power would be necessary, which is partly true, but is largely overcome by the fly-

kilns for five to ten minutes, which renders the iron sufficiently magnetic to ensure separation. It is claimed that fully 95% to 98% of the pyritic content of the zinc ores handled can readily be extracted by this separator. The iron (largely in the form of pyrite) still remaining in an ore, which formerly had .5%, would range between .5% and 1.25%. This, especially the former, is considerably below what many ores sent to the smelters show.

The following outline of the method of treatment in the Joplin mill gives an idea of the general scheme followed in such mills :

Ore by wagon to 1.

1—Platform by shovel to 2.

2—Hand-raked kiln by elevator to 3.

3—Roasted ore bin to 4.

4—Magnetic separator: tailings (iron) to 5; middlings (mixed iron and blende) to 6; and heads (blende) to 7.

5—Waste bank.

6—Rolls reducing from 8 to 20 mesh by elevator to 8.

7—Ore bin, blende, finished product.

8—Middlings bin to 4.

That the Cleveland-Knowles separator has proven to be a fairly successful machine is shown by the quantity of ore handled and by its almost continuous operation from its installment up to the present time. The large banks of iron oxide piled up about the mill also attest to the successful operation of the separator.

Concrete in Mining and Metallurgical Engineering.*

NUMBER II.

Written by H. W. EDWARDS.

For the best and strongest work it is usual to have the cement about 15% of the total quantity of the ingredients. Generally, however, there should be three different classes of concrete, according to the use for which the work is designed.

1. Strong, containing about 15% of cement, retaining walls, flues, culverts, arches and walls for dust chambers. Arch work in general and foundations in wet places.

2. Medium, containing about 10% of cement, engine and machinery foundations on good, dry ground, floors, bottom of flues and dust chambers, stack and furnace foundations.

3. Poor, containing about 7% or 8% of cement, for leveling the bottoms of excavations previous to commencing foundation proper. For all foundations and below ground work where the weight to be supported is not to exceed 6 tons per square foot.

Both medium and poor grades may be diluted still further, without diminishing the ultimate strength,

*Abstract Trans. Am. Inst. Min. Engs.

by embedding large boulders, provided the concrete be well rammed around them.

For testing purposes it is only necessary to work upon one of the above-named varieties, usually the strong. At the end of one week one or two test blocks from each series may be tested, leaving others to be tested at the end of four weeks.

In an article on the subject of concrete in the Architects and Builders' Magazine, C. R. Neher says, in speaking of concrete made from a mixture of copper slag and gravel :

"My first tests of the slag mixture gave only about 80 tons per square foot in seven days, and appeared to demonstrate a low value for the slag, but examination of the fracture showed an excess of gravel and a fracture through the spaces where the most gravel existed. A slight diminution in the quantity of gravel gave results of over 140 tons in seven days."

Neher refers to compression tests on a 12-inch cube.

This statement is quoted in order to show that I am not alone in urging the importance of testing various proportions of the ingredients at hand before beginning the work. This condition is one of the cases in which haste must be made slowly.

The search for ingredients for concrete is generally limited to material found in the immediate vicinity of the work. It would not be of much use to go into the question of absolute figures on typical crushing weights, and as the figures sought for are comparative only, the experimenter is confined to seeking the best material attainable in his vicinity. Any block standing up to a 2-ton tensile breaking test as above described can be pronounced very good, although a 4-ton test after drying for several months is not too much to expect. Hence, the whole question is concentrated to, "How little cement can be used to obtain the desired strength?" It is to be noted that the cement is the most costly ingredient of the concrete mixture.

Concerning the total quantity of material required to fill a given space, this case is one in which two and two do not make four. For example, two parts of sand and four parts of crushed rock mixed together do not give six volumes of mixture, for the reason that a portion of the sand will fill up the spaces between the larger pieces of rocks. Moreover, on adding one part of cement it passes entirely into the voids between the sand and rock particles, and adds nothing to the total bulk. Also, on wetting and thoroughly ramming the concrete in place, it will pack to a bulk of four parts—or, approximately, equal to the original bulk of the crushed rock. Therefore, in estimating the quantity of ingredients required for a piece of work, it is necessary to provide a cubic foot of crushed rock for each cubic foot of completed structure, counting that the sand and cement do not in any way contribute to the final bulk.

The use of lime as well as cement is the subject of much difference of opinion. My experience is that it is quite neuter, appearing merely to delay the setting of the concrete.

As a general rule it may be stated that the effect of an excess of fine material is weakening, but gives a good, smooth, finished appearance to the work.

Before leaving the subject of ingredients I ought to point out a curious property of Portland cement which is of importance, especially if the work is to be let out on contract, the contractor providing the

materials. When a package of cement is opened and emptied it can be dusted out so that the bulk is increased quite one-third. I will defy anyone having once emptied a barrel of cement to replace the whole of it in the same barrel without considerable effort.

At first, until confidence is gained with unaccustomed material, the best way to measure the sand and the rock is to use one or more empty cement barrels, having the heads and bottoms knocked out. When placed upon the ground and filled, the barrel can be lifted off and the operation repeated until the desired volumes of sand and rock have been measured; then a barrel of cement in the original package can be added to the mixture. This procedure prevents the buying of cement in sacks, for the reason that it would be almost impossible to empty the sacks into the barrel without largely increasing the bulk, unless, of course, the exact number of sacks per barrel has been accurately ascertained beforehand.

During the whole process of making concrete it is essential to avoid admixture with earth, clay, dirt, sawdust, chips or other undesirable material.

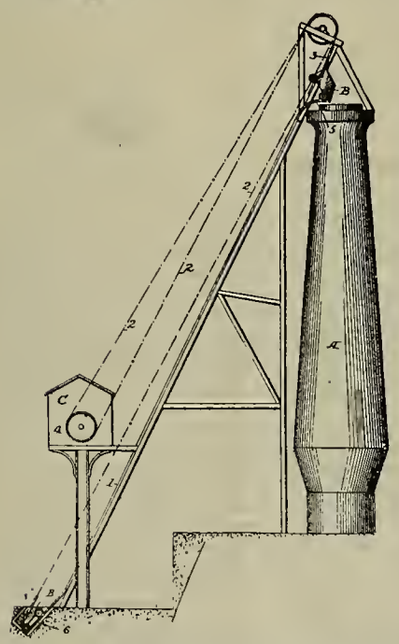
(TO BE CONTINUED.)

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 19, 1904.

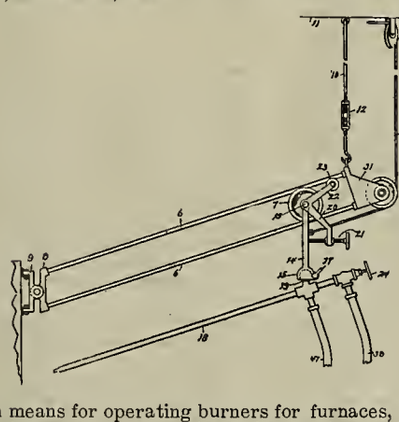
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

HOISTING EQUIPMENT.—No. 756,821; G. W. Bollman, Pittsburg, Pa.



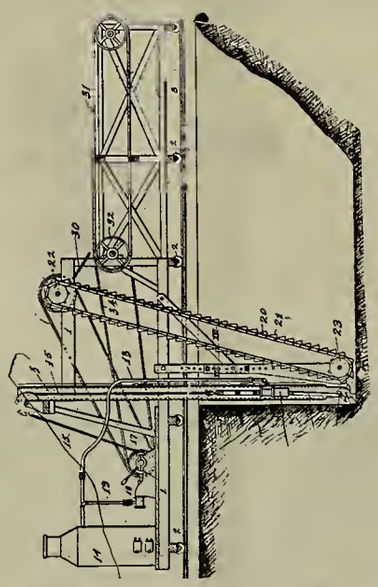
Combination with double tracks of lifting apparatus and with cars traveling thereon, of cable connected to each car, means for driving cable alternately in opposite directions and upper and lower inclined track sections, of lower grade diverging from main tracks, lower inclined sections diverging at lower grade in opposite direction, cars running on tracks and each connected near rear with one end of lifting cable, and engine driving lifting cable.

MEANS FOR OPERATING HYDROCARBON BURNERS FOR METALLURGICAL FURNACES.—No. 757,606; H. W. Falk, Milwaukee, Wis.



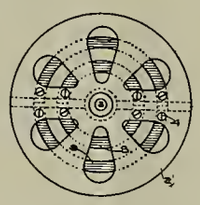
In means for operating burners for furnaces, combination of furnace provided with opening, rail extending from furnace, carriage adapted to travel on rail, burner carried by carriage, means for permitting angular adjustment of burner and means for causing carriage to travel inwardly on the rail so as to carry burner to opening of furnace.

TRENCH DIGGER.—No. 757,459; J. Helm, St Louis, Mo.



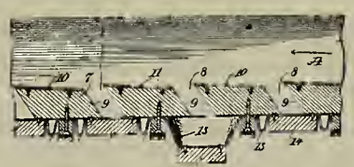
Trench digger comprising main frame having vertical guideways, elongated framework movably mounted in guideways, engine mounted on framework and cutter-head arranged to be actuated by engine.

WINDING OR HOISTING DRUM.—No. 757,622; H. F. James, Franklin, Pa.



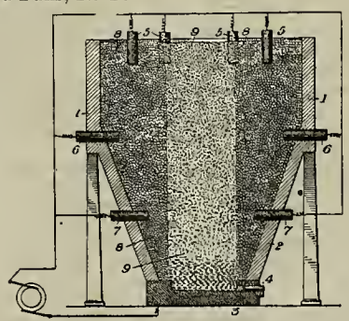
In hoisting or winding drum, primary drum having flange at each end thereof, radial beads upon flanges, holes formed in flanges adapted for reception of bolts or screws, in combination with semi-cylindrical shells, having flange at each end thereof adapted to be received between flanges of primary drum, and be attached thereto by means of screws or bolts, means of relieving shearing strain upon bolts or screws.

CONCENTRATING SLUICE BOX.—No. 757,176; C. M. Carter, Sultan, Wash.



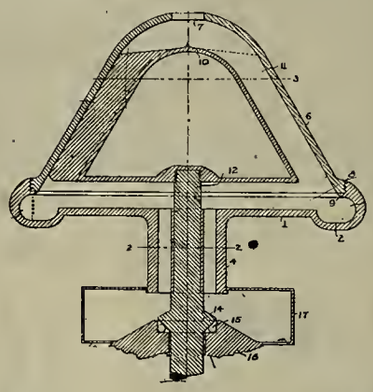
Sluice box having series of bottomless riffles in lower portion, series of pliable chutes spanning open lower sides of riffles and adapted to be lowered to inclined positions and false bottom members attached individually to pliable chutes and arranged to span lower open sides of riffles and thereby close latter.

ELECTRIC HEATING.—No. 757,633; E. F. Price, Niagara Falls, N. Y.



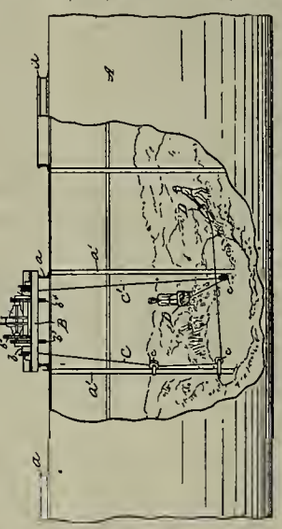
Process of heating materials by placing material in proximity to stable resistance conductor, and passing superposed electric currents through conductor, thereby increasing current density along path of current, through portion of conductor in proximity to material.

CENTRIFUGAL ORE CONCENTRATOR.—No. 757,699; E. R. Week, Spokane, Wash.



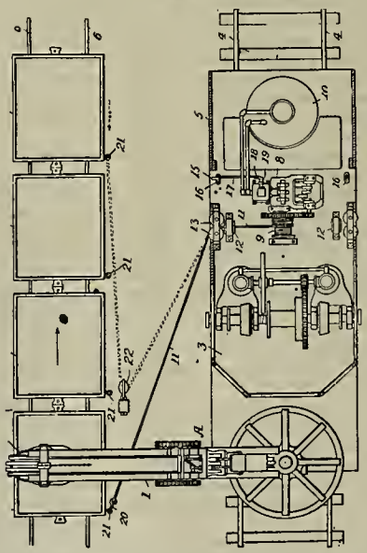
Centrifugal ore concentrator and amalgamator, comprising rotatable base having water-escape openings and annular trough, outer cone having lower edge concentric with trough, and provided with inlet opening in upper end, inner concentric cone supported above base, and one or more radial wings extending across annular space between cones.

APPARATUS FOR SCRAPING ORE FROM WINGS OF VESSELS.—No. 757,858; M. Andrews, Cleveland, O.



Combination, with hull of vessel having suitable hatchways, of frame carrying winding drum, frame being adapted to span hatchways and rest upon hatch coaming, means for anchoring frame, and scrapers within hold of vessel arranged to be operated by wind drum.

CAR PLACING ATTACHMENT FOR EXCAVATORS.—No. 757,450; H. H. George, Jr., Richmond, Va.



Combination with power excavator and its sustaining car or platform, of track adjacent to excavator and adapted to sustain cars to be filled by excavator platform and independent of excavating apparatus, drum operated by engine, cable connected with drum, and means for connecting cable with dump-cars on track, whereby cars may be successively located in position to be filled by excavator.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

The report of the Alaska Treadwell mines for month of March shows 240-stamp mill ran 18¼ days, crushing 20,027 tons ore; value of bullion, $49,524; saved 525 tons sulphurets, value $42,876. Working expenses for month, $54,712.

ARIZONA.

Cochise County.

(Special Correspondence).—At Pearce, work in the Commonwealth mine, other than running of a drift, has been suspended. The mill has not been operated since December last. Swatling & Smith have leased the tailings dump and are putting up a cyanide plant. It is estimated there are 300,000 tons of tailings which, while not high grade, will pay to cyanide. As a beginning, four leaching tanks are being set up below the mill and a tram has been built to elevate the material to them. The mill engines will supply power and crude oil is used for fuel.

W. Pearce is developing the Horn Spoon property, an extension of the Commonwealth ledge. At a depth of 75 feet he is crosscutting.

Three miles east of Pearce is the Fluorine of P. S. Simmons, et al., which has been bonded by W. C. Greene for $100,000. S. King, superintendent, is sinking a shaft. The locators have considerable ore sacked for shipment that was taken out before the property was bonded.

Seven miles west of Pearce the Middlemarch C. Co. is developing its copper mine, H. B. Ellis of Los Angeles, Cal., president, with M. M. O'Gorman vice-president and resident manager. Development work has been carried on for several years. A smelting plant was built three years ago, but discontinued on account of lack of proper fluxes. Recently a concentrating plant was built and is being operated on the sulphide ore. Two tables are used and others will be added. Underground, they are working the fifth level. The work is done at present by contract, principally Mexican labor.

Three miles south of the Middlemarch, the Black Diamond C. Co. has been operating a smelting plant for two years, and 150 tons of ore per day are handled. The mine is on the mountain side a mile west of the mill and an aerial tram conveys the ore to the smelter. The mine is worked with power drills.——Over the ridge from the Diamond, west, is the Dragoon C. M. & S. Co. group, not operating at present, but Superintendent Henry says work will be resumed by May 15th. They have bodies of sulphide ores.

Fourteen miles south of Pearce, at Gleeson, the Copper Belle M. Co. is again starting operations, with thirty-five men at work in the mine. The smelter is being overhauled and will be blown in in May, says Superintendent W. Kemp.——Near the Silver Belle are other properties that have formerly been producers of high-grade copper and silver ores, among which are the Silver Bill, the Turquoise M. & S. Co., and Gleeson mine.

Three miles from Gleeson, northeast, are several copper companies, the Butte & Arizona, L. W. Grow of Tombstone, president; the Great Western, P. B. Warnecross of Tombstone, president; the Leadville, owned by Fitch, Holmes, Storheck, McKean & Shattuck, and now under option for bond; and some turquoise mines which are being operated by a company with Superintendent R. O'Leary in charge. D. W. Brown owns a group in this section, not operating at present. All these properties are tributary to the Pearce terminus of the Cananea, Yaqui River & Pacific Railroad, which branches south from the main S. P. line at Cochise. This branch is finally to be extended to connect at Naco with the Cananea section of same road.

Pearce, April 24.

(Special Correspondence).—The smelter at Benson is completed. With the 100-ton furnace designed to use either coke or oil as fuel is to be, in addition, a 200-ton blast furnace. Both of these furnaces are the product of the Fulton Iron Works of San Francisco. It is at the junction of the E. P. & S. W. Railway and the Southern Pacific. A. J. Pidgeon is manager.

The Martinez G. M. Co. is developing its property, 7 miles north of Benson. To date 300 feet of work in shaft and drifting has been done. In running a tunnel several veins were cut, all dipping toward the main ledge. The ore carries copper, gold and silver.

Fairlee & Castenada are supplying Bisbee, Douglas and Cananea with fireclay from their mine, 8 miles south of Benson. From eight to sixteen carloads a month are shipped. It is used for converter lining.

Benson, April 25.

Bisbee reports say the Golden Fleece G. M. Co. is preparing to build a 10-stamp mill.

Mohave County.

Los Angeles, Cal., men have organized a company for handling a group of mining claims in San Francisco mining district, near Acme, as the Gold Giant M. & M. Co. J. M. Kellerman, W. H. Clune, H. E. Crandall, B. F. Crews, C. E. Slosson, W. L. Moore and C. A. Sergeant are incorporators. The company will take over and work the Mossback group of mines, which have been under bond.

J. Carter, superintendent of the Cedar Valley M. Co., has teams hauling freight from Yucca to the mines. He reports the road from Yucca to Cedar completed. The company will install its smelter and other machinery and will this summer have the mines, mills and smelter in full operation. In that section are several mines carrying values in copper that are expected to produce the necessary ores for reduction of the concentrates from the Cedar Valley mines.

A. I. Richardson, manager of the Black Mountain M. Co., is taking in an outfit for his camp, near Silver creek, in the San Francisco mining district, near Acme.

J. D. Jordan is putting in a Cornish pump at the mines of the Treasure Hill M. Co. at Stockton Hill. Work on the mines is temporarily suspended owing to the large volume of water encountered in the shaft. As soon as the pump is set up and the water pumped out the work of crosscutting to the veins will be resumed.

Pima County.

(Special Correspondence). — Work is progressing in the mining districts contiguous to Tucson. The Silver Bell and Old Boot mines, west of Tucson, are increasing operations in anticipation of connection with the Southern Pacific main line by branch railroad now building from Red Rock. South of Tucson the Azurite mine, on which a smelter stands, will be operating this summer, as a deal is pending. The San Xavier adjoins it on the south. South of these properties, which were copper producers, is a silver producer, the Speculation (also called Banister and Paymaster). It is under control of J. Crane, Jr., A. McArthur and S. F. Squires of Boston, Mass., the last named being resident manager. It is being further opened up and ore taken out.——Recent developments on the Twin Buttes M. & S. Co. property are encouraging. It lies to the east of the Paymaster about 6 miles. Baxter, Ellis & Irish are owners with D. S. Rose and W. H. Earles of Milwaukee, Wis. Development has opened up sulphide ore bodies in two shafts, one on the Glance group, the other on the Senator Morgan group. As yet neither is opened far enough to show full dimensions, but there is said to be enough ore in sight to justify erection of a smelter, which is being negotiated for. H. Blakeley is resident manager, with Superintendent Baxter in charge of mining operations. The Glance shaft is 320 feet deep and the Morgan 100 feet, with drifts leading from them. High-grade copper ore is being piled on the dumps.

The Helvetia mine has been taken over by the Michigan-Arizona Dev. Co. and is doing extensive development work. The shaft, 400 feet deep, is being sunk to 1000 feet, and nine 1000-foot diamond drill holes will reach out from this into adjoining territory to determine the size and lay of the ore body, and this data will also determine the extent of the plant necessary to work it economically. There is a smelter on the mine which, with a 40x96-inch Jacket furnace, handled in a few months' run 36,000 tons of ore, with a recovered value of $16.44 per ton, says Superintendent Close.

Near the Helvetia is the Tiptop C. Co., which is carrying on increased development work. The company is owned by J. H. Currier and G. A. Ryan of Philadelphia, Pa., with W. J. Brooks, resident manager, and H. A. Swift, superintendent. Its holdings include twenty-six claims. There is a 750-foot tunnel with crosscuts. These properties are on the western slope of the Santa Rita range. On the opposite side of the range are the mines and smelter of the Rosemont M. Co., which is at present idle. Eight miles south of this is Greaterville, around which are placer deposits. They were formerly worked by Mexicans. At present the ground is held by the Santa Rita Water & M. Co., and preparations are being made to work the deposits on an extensive scale.

Tucson, April 24.

Yavapai County.

J. M. Sullivan, president of the Great Republic M. Co., which owns claims on lower Turkey creek, in the Bradshaw mountains, southeast of Prescott, says he has put in a hoisting plant and will continue development. The main shaft is down 200 feet and a tunnel is being driven to connect with the shaft. Work will also begin on another shaft on the property. A whim will be used for this work. The new hoisting plant is ready to operate as soon as the lumber arrives for the shaft. The ore carries values principally in copper.

The Rincon M. Co. will put in a small stamp mill on its Welcome group of mines, near Prescott, to prospect the ground and sample the ore during development.

In the Verde mining district, near Jerome, the Pittsburg-Jerome M. Co., 1 mile southwest of the United Verde smelter, has arranged for building a hoisting plant and will begin sinking as soon as it is completed. They will sink to 1000 feet.——The smelters at Jerome and the Equator are both running full blast.

Yuma County.

The Billy Mack mine on the Arizona side of the Colorado river, above Ehrenberg, is reported sold to Randall & Forden, Los Angeles, Cal., men, for $51,000. The mine has been owned by W. H. Mack for twenty years, himself sinking the shaft and exposing a large body of free gold ore.

CALIFORNIA.

Amador County.

At the Kennedy mine, near Jackson, grading for the additional forty stamps to the new mill is progressing.

At the Amador Queen mine, south of Jackson, five stamps of the Amador mill in Hunt's gulch have been put in running order, preparatory to crushing rock from the Amador Queen mine No. 2.

The Amador-Hyrazine M. &. M. Co. has been incorporated, with principal place of business in Sutter Creek, by H. H. Harrah, C. J. Best, E. J. Harrah, G. A. Norton and M. E. Sayre, of Oakland.

Butte County.

C. H. Munro, superintendent of Biggs No. 2 dredger, at Oroville, says his company intends building another dredger.

Articles of incorporation of the Viloro Syndicate, Ltd., of Great Britain were filed last week at Oroville. This company bought the T. McGee dredging land last month.

Calaveras County.

Superintendent G. I. Wright of the Del Monte mine, near Railroad Flat, reports the tunnel last week cut the ledge and that the quartz prospects well in free gold. The intersection is 1048 feet from the mouth of the tunnel. The original survey allowed 1040 feet as the distance to be run to strike the ledge. The tunnel cuts the ledge 300 feet below the bottom of the shaft. This main tunnel has been driven through hard rock at a total cost of $50,000. Preparations will be made to remove the mill to the mouth of the tunnel and take out ore for crushing.

Operations were started last week on the Live Oak No. 2 quartz mine, about 1 mile east of Mountain Ranch. A 10-stamp mill was bought in Amador county and men are placing the same in position. E. L. Holder is manager, with H. C. Higgins as superintendent.

The Summit View quartz mine in Salt Spring valley, near Hodson, is reporting improving. Superintendent B. D. Beckwith is putting in a heavier pump.——The Ranch mine is closed down.

O. H. Bogart, secretary of the Rodesino M. Co., near Mountain Ranch, says he is arranging for working the mine on a larger scale.

M. Rigney of the Ritter mine, near Mountain Ranch, is arranging for a hoist on the mine.

El Dorado County.

A 5-stamp mill will be built by Edwards, Banks & Jones on their mine east of Latrobe. They have developed a gold-bearing ledge on their property, below the Oro Fino mine.

Nevada County.

The 10-drill compressor has been moved from the Centennial mine to the Green Mountain mine, near Nevada City, and is ready for operations. The Green Mountain is putting in a heavier pump and the shaft will be pumped out so that deeper underground operations can be begun.

San Bernardino County.

(Special Correspondence).—A gold lode has been discovered in this vicinity by C. F. Blackburn, 15 miles northeast of Victorville, in a ridge of metamorphic-crystalline rocks intruded by eruptive dikes. The ridge rises 800 feet above the valley and dry lake bed. The gold lode is 100 feet wide. The character of the ore is siliceous, but contains some iron, and is a fine-grained, live-looking white, gray, yellow and brown colored quartz, showing flour gold by pan test. One sample assayed $7.85 per ton gold.

Victorville, April 27.

Sierra County.

(Special Correspondence).—The snow is disappearing and preparations are being made for a resumption and continuance of work in mining in the district.

Jay O. and E. A. Hayes, of San Jose, have purchased the Sierra Buttes mine, that for several years has been worked in a desultory way, and are arranging to operate this property on an extensive scale. Ten stamps will be added to the 20-stamp mill. The Butte Saddle is another mine to be reopened under management of the Hayes brothers, they having a bond on same.

As soon as weather permits and supplies can be secured, a 10-stamp mill will be put up at the Keystone mine at Sierra City. Power to operate the mill will be secured from an electric plant that will be installed at the river above the Marguerite mine. The water from the tunnel at the mine will be piped down the mountain to produce power for the electric plant. It will be conveyed through a 6-inch pipe and will have 1100-foot head.

The Hilda placer will also be operated this season, a bond having been taken out on it by W. J. Anderson, of San Francisco, who is arranging to equip same for hydraulicking.——It is also reported that the Bigelow mine is about to pass into the hands of Eastern parties.

Another quartz property is the Mountain mine, 6 miles east of Sierra City, which has been idle for several years owing to litigation. This mine was partially reopened last fall by L. H. Carver, a mining engineer of San Francisco, who is now in charge of the work, which was discontinued in December last, owing to the impossibility of securing the requisite supplies for mining operations so late in the season. It is stated by those who were employed in the mine that a large amount of ore is ready for extraction, that can be milled profitably. Some work yet remains to be done to completely open the mine for continuous operation and to reach the ore bodies known to exist in the upper levels. This mine is opened entirely by tunnels and adits, and a contract will be let to extend No. 4 adit, which will reach the ore bodies at a depth of 750 feet below No. 3 tunnel, and give a large reserve tonnage. The equipment, including the 40-stamp mill, is being overhauled and put in condition and the addition of concentrators to be installed this summer will increase its efficiency.

There is a rumor that the Young America mine, a bonanza property of the early days, lying north of the Mountain mine, will be put in operation, if negotiations now pending are consummated, in which event the mill which was recently destroyed by fire will be rebuilt. It is asserted that there is ore left in the mine that will pay to mill and the old tailings dump can be successfully treated by the cyanide process.

Sierra City, April 26.

A contract has been let to run a raise from the Miami tunnel, for tapping the old workings and securing better air.

Siskiyou County.

At the Mount Vernon mine, on the head of Cherry creek, near Yreka, a vein of ore averaging 2 feet in width, has been struck in the lower tunnel, which is in over 1000 feet. The winze in the same tunnel is down 90 feet. On the foot wall a streak of telluride 2 inches wide is reported showing.

The Headwater G. M. & M. Co., J. Johnston manager, is said to be preparing to build a smelter near Yreka.

Tehama County.

Red Bluff reports say a strike has been made at the Basler mine, in the foothills west of there. Manager Basler says the ledge in places is 18 feet wide and that it will average $20 per ton. A tunnel has been run in 900 feet and 5 miles of road have been built to the mine.

Tuolumne County.

The Cosmopolite mine, near Groveland, has been unwatered and operations resumed.——Last week operations began at the Republican mill, near Jacksonville.——The Confidence mine, at Confidence, is expected to start in full blast June 1st, when there will be fuel enough on hand, says Superintendent Carmichael.——Three men are sinking a shaft on the Eureka mine, at Jacksonville. A depth of 30 feet has been attained.

W. S. Wilhelm, superintendent of the Republic G. M. Co. mine on the Stanislaus river, near Columbia, known as the Kanig mine, reports bins and tunnel full of ore ready for the mill.

The Old Crœsus mine, near Carters, has been sold to the West Side F. & L. Co.

Men are at work at the Crystalline mine, near Jamestown, drifting east into the Juanita ground to pick up the Gem shoot.

The Lady Washington mine, near Carters, has suspended operations.——Ore is being crushed at the Prudhomme mill from the Cordova mine, near Arrastraville.

COLORADO.

Boulder County.

At sheriff's sale last week C. B. Jentry bought the ten acres of the Republic Oil & Dev. Co. for $1475. Jentry says he will drill another well on that tract. The two wells of the company have produced oil, but were not regarded as paying wells. However, they are so near the oil refinery that but a small volume is required to make a well pay there.

Chaffee County.

Near Buena Vista the St. Elmo Con. M. Co., composed of New York men, C. K. Kankhauser local manager, at St. Elmo, owning the Pat Murphy mine, proposes to increase development and improvements as soon as the snow is gone sufficiently to allow work to be done. This mine is on Murphy mountain and joins the Mary Murphy. This spring they will build a bucket tram connecting the mine with the Colorado & Southern railroad, thus reducing the expense of hauling the ore to the railroad. They also propose building a mill to handle the low-grade ore that averages $8 per ton.——The Mary Murphy mine has resumed shipments to outside smelters, having not yet started their smelter at Buena Vista, which was damaged by fire two months ago and which has now been rebuilt. The smelter proper was not seriously damaged, but the power house and its engines and dynamos were nearly a total loss.

The Buena Vista M. Co., near Buena Vista, headed by C. A. Smith, of Denver, has begun excavations for building a power plant and is working on the tunnel to be run 2500 feet. This tunnel is expected to cut a body of high-grade silver and lead ore.

The Camilla G. M. Co., near Buena Vista, under management of W. G. Smith with A. A. McKnight superintendent, has the plant of machinery set and ready to start. The men have worked through the winter, driving the tunnel by hand and have a depth of 100 feet. This tunnel proposition will tap Pomeroy mountain at depth.

An electro-chemical amalgamating and concentrating mill has been started in operation in the Turret district, 12 miles north of Salida. T. J. Snedekar of Chicago, Ill., superintendent, says the ores are heated to a proper degree of temperature, varying with different classes, then treated in the electro-chemical solutions, which dissolve the cement that holds the particles of mineral and rock together, so that it is readily reduced to a pulp suitable for concentrating or treatment by any of the approved methods of extraction, such as cyanide amalgamation and chlorination. The Vivandiere mine, which will furnish ore for the mill, has three levels opened at depth of 600 feet, with ore on each level. There is low-grade ore on the dump which will be concentrated. The ore is first dropped into the bins at the top. From these bins it passes to the crushers immediately beneath them, where it is crushed to a maximum of 1½ inch. The crushed ore then drops into bins below the crusher and is drawn out into the drier, where it is heated to expel all moisture. Then it passes into the chemical solution tanks, where it is softened and disintegrated. Then it goes into the Huntington mill on the lower floor, where the free gold is amalgamated and the residue passes over tables to be concentrated. The concentrates are shipped to the smelter. Manager J. J. New expects later to cyanide the tailings, and also take wet ore as it comes from the Huntington mill and to save the values of the ore by cyanide process at the mill instead of shipping the concentrates.

Custer County.

The tunnel of the Swallow Tail mine, near Querida, will be extended 200 feet farther. It is in 150 feet. The extension of the tunnel will be in connection with such other exploratory work as may be suggested as development progresses. Machinery, including a duplex, compound air compressor and drills, will be put in.

The Toledo mine at Querida is working full-handed. Sinking at the 200-foot station is in progress. It is expected the shaft will be sunk to the 500-foot point. ——Work has been resumed on the Bismuth mine and the principal operations will be on the main shaft.——Work has been resumed on the Aburdix group at Querida by the Little Jim M. Co., composed of Pueblo and Custer county men. Operations for the present will be centered on the Elemental shaft, which is 400 feet deep and which is being unwatered. The ore carries lead, copper, silver and gold. It is said the Elemental shaft will be continued to the 700-foot point.

Fremont County.

(Special Correspondence).—The Union and Dorcas mills are unable to procure all the ore necessary to keep running full force. The Dorcas is handling 2700 tons per month, while the Union plant is operating four of its six furnaces.

Coal mining, which is a feature of Fremont county's resources, is practically at a standstill, due to the strike, although it is thought some of the mines will open up during May.

The oil prospects are better than ever before. Several additional companies have been organized to prospect and operate oil properties. New wells are being struck frequently and the old wells are holding their own.

Florence, April 24.

(Special Correspondence).—The Empire Zinc Co. is treating eighty tons of ore per day. They are only operating a portion of the mill. They find the magnetic separators will do the work without the aid of the concentrators; therefore, the wet method has been discontinued for the present. They may start up that portion of the mill containing the Wilfley tables later on. They also propose doubling the capacity of the mill. They have a large supply of ore on hand. A. R. Livingston is superintendent.

Canon City, April 24.

Fremont County.

The Sobach Oil Co. opened a body of oil at 1500 feet depth last week that is expected to produce twenty-five barrels a day. The company will put the well to pumping and then drill another. The striking of oil on this land proves the field productive north as well as south of Florence, says the Post.——The Majestic Oil & Gas Co. has been incorporated with G. Wilson, C. Cowan, R. A. Ramsey and I. M. Menzel as officers. The company owns eighty acres of land and intends drilling several oil wells. —— The Empire Oil Co. has also been organized by local men. It has leases on two separate pieces of land and proposes drilling eight wells. —— There are twenty-seven companies operating in the oil belt, with three more ready to begin development work. Figures show that the first well drilled, including the derrick and drilling machinery, costs the operators about $3500 to $3700.

Gunnison County.

The Taylor Park Railway Co. is preparing to complete its 115 miles of line into the Taylor Park region, thereby furnishing the mines of that part of Gunnison county with an outlet to the markets. President A. A. Stewart, of the company, says the tunnel through the divide between St. Elmo and Tin Cup will be completed by fall and that trains will be running into Tin Cup before Jan. 1, 1905.

The Blistered Horn tunnel, near Tin Cup, being driven by the Brunswick M. Co., is in 1000 feet and has cut two fissure veins. The first vein is 8 feet wide and shows values. The second is 17 feet. It was cut at 550 feet from the tunnel entrance and is said to be of concentrating value the entire width. This ore has been left for the present, as the company desires to reach the Jimmy Mack vein, farther ahead, before it does any stoping, says Manager A. Lejune. The Brunswick Co. has proven by its explorations that three distinct fissure veins exist in that part of the district. The 100-ton mill, owned by the company in West Willow gulch, below the mine, will be remodeled this spring and operated. It will treat the low-grade ores.

At White Pine the Spar group of mines, embracing thirty-eight acres of mineral territory, has been sold to the Spar C. M. & T. Co., of which A. F. Downs of Davenport, Ia., is president. This property was formerly known as the Morning Glim. Development consists of a 750-foot tunnel driven on the vein, with 325 feet of stoping. The average grade of the shipping ore is said to contain 60 ounces silver, 7% copper, 0.4 ounce gold and 10% lead. A company has been formed by J. Goodwin et al. on the Copper Queen mine, above Gothic, to build a road to the property from the Sylvanite road. The tunnel will be driven ahead until the main vein is reached. The surface workings produced high-grade silver-copper ore. The ore is a sulphide.

W. F. McQuarrie of Cripple Creek has bought the Sheep Mountain tunnel at Crystal and has begun operations there with a view to continuing the bore until all the main veins and mineral contacts of that mountain are reached. This will include the Black Queen, Lead King, Milwaukee and Silver Temple. Bodies of low-grade concentrating ore have already been exposed in the tunnel and a concentrator is proposed. Water power is available in the river, which flows by the tunnel's dump.

The Woods G. M. Co., composed of Carrollton, Mo., men, has twelve men at work in Pieplant gulch, near Tin Cup, developing the 5-foot vein of free milling gold ore uncovered by them last fall. They have their 100-ton mill ready to start. —— In Bertha gulch, 2 miles below Tin Cup, lumber is on the ground to build settling dams for placer operations by the Bertha Gulch M. Co. The gold is coarse and nuggets of $5 and $10 in value have been found in prospecting. In washing to bedrock at the mouth of the gulch a vein carrying gold and copper was uncovered, and Manager A. W. Hall has a shaft down 70 feet on the lead. He is preparing to ship ore.

Lake County.

The Diamond mine, on Upper Evans gulch, near Leadville, is reported outputting 100 tons of ore daily, besides doing much development work.

For three months past the United M. D. Co. has been putting down a drill hole with an oil well drill on the Mike claim, on the western slope of Rock hill, 2½ miles south of Leadville, about half way between California and Iowa gulches. This drill hole has shown that there is only 48 feet of wash and gravel at the surface overlying the lake bed. After passing through 400 feet of lake bed the white porphyry was encountered and the blue lime found at a depth of 680 feet. The drill was sunk into limestone for 70 feet. The contact between the lime and porphyry was heavily iron stained, full of talc, and gave assays in gold, silver and copper. It is the intention to sink to blue lime, or 1000 feet, ten drill holes along an east and west line drawn through the present drill hole. It is the company's intention to continue these drill holes to the Cambrian quartzite with diamond drills as soon as solid formation is reached in any given drill hole.

Preparations are being made for extensive placer operations at Twin Lakes by N. A. Loggin, who has men clearing away the ice preparatory to the installation of a large hydraulic plant to work 1750 acres of placer ground which he controls in that district. About 100 men will be employed during the summer. The plan includes drifting on the bedrock.

Mineral County.

At Creede, the United M. Co. has bought the properties of the Winchester M. Co. and the Sewell M. Co., consisting of nine claims lying west of the United Mines property. This consolidation named in the deed is that the United M. Co. agrees to pay one-fifth of all royalty from all ores mined on the premises, or that may hereafter be acquired, lying between and bounded by the end lines of the new properties, in case the mines should be worked and operated by the United M. Co. and not by its lessees, to pay a dividend to the parties owning the Winchester and Sewell companies one-fifth of all net profits realized from the working of the mines lying between the end lines. The Creede United M. Co. is a consolidation of five mining companies, whose owners were formerly in litigation over apex rights.——Another transaction in the Creede district is the proposed consolidation of all the mines south of the United Mines, to operate below the Nelson tunnel level. There are said to be bodies of ore below the tunnel level and, because of the water, a joint pumping proposition seems to be the necessary plan.

Ouray County.

The first section of the Poughkeepsie Mineral Point State road is complete from the Uncompahgre bridge on the Red Mountain toll road to the Fermaugh group, near the Micky Breen mill, and they will finish the remainder this spring. The Khedive mine, near Ouray, is reported in pay ore. The owner is G. Hulbert. The Khedive and Bachelor will again be shippers. Ore is being hauled to the Ouray smelter.

The Ouray & Silverton M., I. & R. Co. is being organized by D. Wood, manager of the Portland mine, and others, to undertake a tunnel proposition near Ouray. The tunnel will be about 7 miles in length. The initial point will be on the Ouray side of Mount Ahram. It will pass through Mount Abram and Brown mountains and its outlet will be at or near Gladstone, on the Silverton side of the range, says the News. It will tap a large number of claims, some of them former producers of iron and copper ores. A revenue of $2 per ton for the transportation of this ore, to be paid by the owner of the claims to the tunnel company, would in itself be a paying proposition, but the company proposes to buy and to own a number of the claims through which the tunnel will pass, and adjoining claims that can be opened from it. It is thought that after the first 1000 feet of tunnel is driven and the first veins cut, the output will pay for the work of further driving the tunnel. On the Ouray side an electric railroad will be built from Ouray to and through the tunnel, and when completed will connect on the Silverton side at Gladstone with the Gladstone & Northern Railway.

San Miguel County

In Telluride district the payroll for labor alone for the month of March at the three largest mines of the district amounted to $75,000, these properties employing 1000 men. The expenditures for that period were $250,000 for supplies of all kinds. The greater part of this sum goes into local channels.

Summit County.

The American G. Dredging Co. will start its dredger, near Breckenridge, on its season's run this week. To facilitate thawing of the ice in the artificial pond, on which the boat with its endless chain of steel buckets floats, blasting was resorted to, to shatter the ice. It will probably be May 15th before the high bar placer, owned by the American company in Galena and Gold Run gulches, will be in full operation with hydraulic giants and lines of riffled sluices washing the auriferous gravel. —— The Germania lessees, West & Klinefelter, are at work in the former bonanza drift of that property. It is reported they have opened a vertical vein that extends downwards from the flat blanket vein. The ore carries copper, gold and silver.

The Lincoln G. M. Co. has been organized to operate the former holdings of Clark & Rithman, consisting of 645 acres of placers and several groups of lode mines on Nigger hill, Mineral hill and on Mount Baldy, near Breckenridge, by W. Lennox, T. W. Giddings of Colorado Springs, N. B. Scott of West Virginia and M. G. Evans of Denver. The company will have several shafts sunk to bedrock of French gulch on Emile placer to locate the pay streak of the old channel. The placer will also be worked with giants and ground sluices during the season. The Helen and Helen's Babies group of lode mines at the mouth of Australia gulch will be developed by the Lincoln G. M. Co. by driving the lower tunnel, now in 300 feet, ahead to cut the veins of the group. The ore will be cyanided.

Teller County.

(Special Correspondence).—The Sioux Falls G. M. & D. Co. is operating the Fort Wilcox and Fluorine claims on Copper mountain, on which it has a lease for five years. They are handling seventy-five tons of ore per day through the cyanide mill. The ore averages $5 per ton and they mine and mill the ore for $1.25 per ton. All the work is done in open cuts. Ore is carried down by a gravity tram to the mill. The largest cut is 30 feet deep. Superintendent R. Blanchard is having a tunnel driven underneath the open cut, which will give them 65 feet additional depth. This tunnel is in 70 feet. It is the intention of the management to increase the mill capacity.

The Metallic G. M. Co. is sinking a shaft on the Bill Nye claim, which adjoins the Fluorine, on Copper mountain.

Cripple Creek, April 25.

(Special Correspondence).—The mining conditions in the Cripple Creek district are improving each week, as will be noticed by a trip through the district. The mines are operating with about the same number of men as before the strike. The latest move on the part of the operators is to not permit a lease to be given to any one unless he is recommended by the operators' association, and the party securing the lease must agree to not employ any one without he is recommended by the association. This, it is believed, will compel the men to leave the Federation of Miners or the district as they choose, as they will be unable to secure work in the district as long as they are affiliated with the federation.

Cripple Creek, April 25.

The tenth level of the Moon-Anchor mine at Cripple Creek has been reached in lowering the shaft, but it has a depth of only 920 feet from the surface. This last sinking has been accomplished during the past five months and shows that the drainage tunnel has relieved that portion of Gold hill of its supply of water. So far no lease has been granted on the Moon-Anchor property save in the upper levels.

Banks & Co. have a lease on the Rose Nicol mine, near Cripple Creek, and it is intended to push development work. On the north end of the property, near Bull hill, they are making occasional shipments of ore which they are taking out at depth of 65 feet. They are driving the Gurley tunnel, and when this reaches the vein it will cut it at depth of 200 feet.

D. N. Heizer of Colorado Springs says it is intended by the owners of the St. Thomas mine, on Beacon hill, Cripple Creek, to work that property this season.

Max Boehmer, manager of Stratton's Independence, is said to be besieged by applications for leases on the property. Many miners who have worked in the mine believe that they know where they can make a fortune, and as a result on certain levels in the mine as many as fifty miners have asked for leases.

It is stated that the United States geological survey of Cripple Creek district is about completed. The citizens of Cripple Creek and Colorado Springs raised half of the sum necessary for this work, which was estimated by the geological depart-

ment at $7000. It is said that the report would have been made public some time ago, only the government geologists desired to more fully investigate the lower workings of some of the different mines, which several months ago was impossible on account of water. The drainage tunnel has now made this possible. There are several other matters of lesser moment, but still of considerable importance, which they desired to thoroughly investigate. The report will embrace maps of the lower workings of the properties, together with all details which will be of benefit to the mining man. The boundaries covered by the survey have extended from Barnard creek on the north to the Midland Terminal track on the east. The southern boundary is the original Cross-Ponrose survey line, which takes in the greater portion of Big Bull mountain. Long Hungry gulch is the western limit. Cow mountain, Trachyte mountain and other hills outside these boundaries showing promise of mineralization are to be included in the report. Galena mine on Red mountain is shown on the new map. This producer has been omitted from previous maps of the Cripple Creek district.

The Mary McKinney Co. has now got the property unwatered sufficiently to get into the 600 foot level, and work is in progress there. The management has been driving for several days in the north drift, which has been extended for a distance of about 115 feet from the shaft, says the Cripple Creek Times. During the last few days the miners have cut the vein, which it is believed contains the values found above. In the sixth level there is a little water on the floor, but none drops from above. During March the Mary McKinney produced 630 tons of ore, which gave values of two ounces in gold to the ton. As soon as the miners can get into the new shoot in the bottom the force will be increased.

IDAHO.

Blaine County.

The shaft on the Lipman mines, near Hailey, is going down at the rate of 1½ foot per day, the work being done by hand. The shaft is to be 5x7 feet in the clear, to have a working compartment and a manway. The gasoline hoist is in operation ——A vein carrying 18 inches of solid galena was cut into in the Relief mine last week.——A blind vein carrying galena was cut on the 700-foot level of the Crœsus mine last week.

Custer County.

P. L. Fearn, manager of the White Knob C. Co., at Mackay, says the smelter of the company is again in full operation. Both stacks are in blast and are reducing 600 tons of ore daily. In the mine the developments have been important. The electric railway up the mountain to the mine is running satisfactorily, transporting ore and supplies.

The consolidation of the mines owned by the Ramshorn Co. at Bayborse and the mines owned by the Clayton M. & S. Co. at Clayton and Bayhorse is reported made. This means the extending of the Mackay Railroad to Salmon river and the starting up of the camps of Bayhorse and Clayton, says the Challis Messenger.

Idaho County.

The American Eagle mine, at Elk City, is shut down and likely to remain so for some time, says the Spokesman-Review. ——The Diamond Joe gold mine is reported improving and a mill will be built on it. It is 4 miles from town. J. Olson is superintendent and part owner. W. Struve of Almont, Iowa, is president of the company. The group consists of ten full claims in Diamond Joe gulch, a branch from Red Horse creek, and has a good wagon road to Elk City. On the east side of the gulch the main tunnel is driven 225 feet on the vein, with crosscuts from wall to wall, showing the ore bodies. At the mouth of this tunnel is a shaft 35 feet deep, crosscut also at bottom. In the cuts the ore bodies are shown 8 feet wide. Oxidized ore throughout the ledge shows free gold. About 300 feet below the main tunnel and shaft is the millsite, with sufficient water for use on Red Horse creek, and from this point a new working tunnel will be driven.

D. McKenzie of Boise has bought the Golden Gate group of claims on Johnson creek, in Yellow Pine basin, for the East Dewey M. Co., near Roosevelt.

The dam and bridge at the Dewey mine, on the South Fork of the Clearwater, near Grangeville, has been taken out by high water, causing a loss to the company of $15,000. The Dewey Co. has been putting in an electric power plant with which to run the mine. The dam was nearly completed. The Dewey mine is owned by M. Jacobs et al. of Spokane, Wash., and O. Abeling is manager. He has been planning erection of a 100-ton cyanide mill.

Shoshone County.

S. A. Easton, manager of the Bunker Hill and Sullivan mine at Wardner, says they are working 400 men and are paying dividends of $45,000 a month. They will continue to use mostly water power for the mine, but will take some power from the Spokane electric line.

Washington County.

Mining operations are said to be increasing in the Seven Devils district, near Weiser. The Weiser Signal says extensive operations are proposed by several companies interested in that section.——The Idaho M. Co., Ltd., has been organized in Buffalo, N. Y., to develop the California group of six claims on Camp creek, 2 miles above Landore. The officers are: C. F. Macey, president and manager: A. H. Beckham, F. Macey and J. C. Sutherland, with F. Powell superintendent. The company will begin building boarding and bunk house, blacksmith shop, etc., next week, and when operations begin the work will be confined to sinking the shaft, which is down 100 feet.

The Golden Rule Placer M. Co. (the Hatbaway Co.) will increase operations this season on its Grouse creek properties, near Council, says Manager S. S. Curry, of Milwaukee, Wis.

MISSOURI.

Madison County.

Secretary M. J. Duryea of Mine La Motte Dev. Co., at Fredericktown, says he is preparing to build a concentrating plant at the company's mines.

MONTANA.

Fergus County.

C. A. Case, manager of the Case-Wilson Cyanide and Dev. Co. operating in Cone Butte district, near Lewistown, reports work progressing on the property, which his company has bonded of Losinger and Morrison. Two 50-foot shafts and a tunnel have tapped the ore body in three places, the assays averaging $5. Work will be continued this summer and as soon as sufficient ore is blocked out a mill will be built.

Missoula County.

C. Wing, of the Oro-Monarch quartz gold mine, south of DeBorgia, says he has secured title to the Oro-Monarch ground and will resume work. It is a short distance east of the Deer Creek M. Co.'s mine, owned by an Eastern company.

Silver Bow County.

C. A. Wisner of New York is reported making an investigation of ores of Butte district, carrying zinc, lead and gold, with a view to establishing a plant for treating the ores. He is a member of the company which controls the Emma mine.

NEVADA.

Esmeralda County.

A vein of coal 14 feet in width at depth of 150 feet has been found in Esmeralda county along the line of the new railroad, about 30 miles southeast of Sodaville and 35 miles northwest of Tonopah. The coal is said to be bituminous. A new town called Coaldale has sprung up on the railroad at a point nearest the mines.

A. H. Mayne is preparing to increase developments on the Goldsmith group of mines near Sodaville.

Lander County.

T. K. Code of San Francisco, Cal., will this summer at Pittsburg canyon, 16 miles from Battle mountain, work the tailings from the Pittsburg mine by the cyanide process. The engine and other machinery are being overhauled.

Lincoln County.

Twenty-eight thousand dollars' worth of gold bullion from the Bamberger De Lamar mines at DeLamar were shipped last week to the sub-treasury in New York, being the result of a two weeks' run at the mill.

At the Quartette mine at Searchlight the repairing of the shaft has been completed and 25-pound rails laid to the 700-foot level. The shaft has three inclines, 40°, 45° and 50°, the latter being the dip of the lead. Sinking will be resumed, when the shaft will be sunk to the 900-foot level. The steel tailings tanks at the mill are nearing completion. These tanks are expected to make a saving of water sufficient to run twenty stamps.

At a depth of 60 feet a body of high-grade ore is reported struck in the Golden Terra mine of the Empire Con. M. Co., near Searchlight. The ore shows free gold, says Superintendent E. K. Woods. The shaft is down 80 feet. The shaft will be sunk to the 100-foot level, when a crosscut will be run to show width of vein.

Nye County.

Coaldale has been added to the mining towns of Nevada. Tents and frames of houses are going up. The town is the present terminal of the Tonopah-Rhodes Railroad, and is brought into prominence on account of a recent coal strike. The Los Angeles & Salt Railroad people, it is understood, have secured control of the property and Coaldale will be the base of supply. In addition, a number of gold prospects are being opened up.

White Pine County.

C. Minoletti, owner of the Ne Plus Ultra mines near Hamilton, says he is shipping ore which affords an average of 55% lead, with from ten to twenty-five ounces silver.

The New Gold Bug M. & M. Co. of Salt Lake City, Utah, has been incorporated by A. M. Christensen, O. Grover and J. M. Christensen. The company owns five mining claims in White Pine county.

NORTH CAROLINA.

Davidson County.

(Special Correspondence).—The Southern Homestake M. Co. of Munhall, Pa., with O. P. McCrutcheon, president, and E. W. Lynn of Greensboro, N. C., general manager, is having plans prepared for a 100-ton cyanide plant to treat the ores from the Southern Homestake mine in Lytton mining district, near Thomasville. The ore will be taken out by open cut work, and it is the purpose of the company to increase the milling capacity immediately their first plant has gotten into steady commission.

The Empire gold mining property in the same district has been bought by Pittsburg, Pa., men, who intend to incorporate and equip the mine with a cyanide plant. The vein has been traced for 5000 feet and is from 150 to 200 feet wide, with an average gold value of from $3 to $4 per ton.

Thomasville, April 22.

NEW MEXICO.

Grant County.

Work is progressing on the concentrator for the International M. & M. Co. at Malone, 27 miles from Silver City. The company has forty men working the mines and setting up the machinery in the concentrator.

W. H. Reynolds, at Rodeo, says a copper camp is being opened up 12 miles from Rodeo station on the El Paso & Southwestern Railway. He says there is plenty of wood and water and 90,000,000 feet of saw timber in the Chincanboras mountains. The mineral belt is 10 by 20 miles.

Rio Arriba County.

In Bromide camp, near Tres Piedras, the Bromide tunnel is in 300 feet. The new electric drill is working satisfactorily and a blower to drive the smoke out of the tunnel is being put in.——It is expected a mill will be built in Bromide camp this summer by one or more of the larger mines. This will serve as an impetus to the other mines.——O. Rosenfeld of Manistee, Mich., president of the Tusas Peak G. & C. M. Co., which owns the Tampa mine in Bromide district, says orders have been given to sink 200 feet deeper from the 300-foot level. An air compressor will be set up to supplant the steam drill. It is thought the company will build a mill this summer to treat the ore before shipment.

Sierra County.

The Sierra County Advocate says a gold discovery has been made on Animas creek, 25 miles from Hillsboro, by G. S. & L. Du Bois. The find is 8 miles above the Morrison ranch on the Animas.

Socorro County.

W. H. Cottingham of Las Vegas is reported to have a group of claims in Socorro county, which he will equip with a concentrating plant.

Taos County.

A strike is reported made in a crosscut from the main tunnel on the Gold Mint mine, near Twining. The property is on west side of Gold Hill in Rio Hondo mining district. The vein has been cut at a tunnel depth of about 250 feet and vertical depth of 200 feet. It is 20 feet wide between walls and shows 4 feet of high-grade ore carrying free gold and is accompanied by 4 feet of talcose matter. More men will be put on.

OKLAHOMA.

Comanche County.

Gold is reported near Apache, and many have staked off mining claims in the foothills of the Wichita mountains west of Apache. While digging a well on his place, near Apache, H. Gilbreath found gold ore said to assay $15. The mill run of the ore was $7 per ton.

OREGON.

Baker County.

Development is being increased on the Queen of the West group in Cornucopia district, near Sumpter, after the disastrous slide experienced there last month in which two men lost their lives, says Manager D. H. Soderling of Baker City. Superintendent Smith has men in the crosscut which is being driven to open the vein at depth of about 600 feet. The property is proven above, where a crosscut has been driven to the vein, drifts extended, and a winze sunk to depth of 90 feet below the adit level. Since the snow packed because of spring thaws, slides have ceased to menace the property.

E. C. Allen, superintendent of the Black Butte mine, near Sumpter, says work has been resumed. The hoist will be taken in as soon as the roads permit.

Columbia County.

Work has begun for the year in developing the mines of St. Helens, says G. W. Simpson, of Portland. His company has let a contract for 200 feet of tunnel work on the Last Chance mine. It is purposed to carry on the work until they have the complete plant up. They have worked on the properties all winter.——One of the plants to be installed in the district this summer is on the Mount St. Helens Con., in which H. W. Coe is interested. The plant will be of 150 tons a day capacity. Bodies of ore are blocked out.

Grant County.

G. J. Barrett will resume work at the Grand Union mine, near Granite. He will drive the crosscut to the continuation of the Concord vein. This tunnel has already cut four veins, but little drifting has been done as it is desired to complete the crosscut before starting to open up the ledges.

About May 1, or as soon as the roads will permit getting of supplies to the mine, men will be put to work at the Big Four mine, about 4 miles northwest of Granite. This property is managed by W. C. Rutter of Seattle, Wash. The work will be centered in driving the 600-foot crosscut that was started before shutting down last fall. This crosscut taps the vein at a depth of 400 feet and is being driven for a working tunnel.

In the Copperopolis mine, near Prairie City, a body of high-grade copper sulphide ore has been opened up, says W. W. Gibbs, superintendent. In driving the tunnel on the ledge they found the vein faulted, and they started in another direction and struck the vein, which shows a width of 30 feet. They propose to put in a leaching plant which will have a capacity of 100 tons per day.

Jackson County.

M. P. Ward, manager of the Millionaire mine, near Gold Hill, has begun preparations for putting in pumps, hoists and other machinery for development of the property.

Josephine County.

A. B. Cousin, of Portland, manager of the Galice Con. mines, at Galice creek, near Grant's Pass, has started the ditch to Rogue river to work the property recently bought by the company from P. B. Wickham.

C. J. Allen, F. B. Roberts, et al., owners of the Allen mine, near Grant's Pass, propose to dam the Rogue river, near the mine, to develop 12,000 H. P. Power drills and other equipment will also go in.

Lane County.

G. E. Waggoner, of the Badger mine, at Blue river, is preparing to put up a 10-stamp mill.

The Black Butte cinnabar mines are 36 miles from Eugene and 16 miles from Cottage Grove and are producing a large output of mercury, the ore being reduced by a 40-ton furnace. This property is said to have 5000 feet of tunnels.

SOUTH DAKOTA.

Lawrence County.

P. Wibaux, president of the Clover Leaf M. Co., operating the Uncle Sam mine at Roubaix, is planning for further work. These plans contemplate operating the twenty remaining stamps at the mill, giving the plant sixty stamps in commission. It is also intended to sink the main shaft from 700 to 1200 feet.

The Oro Hondo M. Co., near Lead, is working three shifts in the main shaft, which has reached a depth of 900 feet. It will be continued to 1000 feet and crosscutting will then begin both east and west. It is of three compartments. G. M. Nix is manager of the company.

The Gilt Edge-Maid M. Co. is preparing to build a reduction plant in Strawberry gulch for treatment of ores from the Gilt Edge and Dakota Maid mines. The plant will involve wet crushing and cyanide treatment for the ore. O. P. Ankeny and G. A. Duncan of Deadwood have charge of the property.——The mill of the Ruby G. M. & M. Co. in Ruby gulch has been started. The principal owners are J. Conzett of Deadwood and residents of Newcastle, Pa.

Another shoot of ore is reported by the Penobscot M. Co. in Garden City. It is opened east from the main shaft. The shoot shows a thickness of 12 feet, all of which carries values in gold. The company is putting in an air compressor capable of running twelve drills. The old

air compressor has capacity of six drills, hut has heen required to run ten drills as well as pumps and hoists. —— The Goldstake M. Co. is continuing its crosscut tunnel. This company owns 200 acres adjoining the Penohscot, on which there are hoth the vertical and horizontal formations.——The Dizzy G. M. Co., owning several hundred acres north of the Penobscot, is preparing for the season's work. Considerable money was expended last season in sinking and drilling with a diamond drill. A shaft will he put down this year following the diamond drill, the work to he under the supervision of H. H. Francis of Custer, one of the principal owners.

The McGovern group of mining claims in Bald Mountain and Annie Creek districts, near Greenmont, has heen sold to the Imperial M. Co. Included in the property are five distinct groups of claims —the Burlington and Apex, Reindeer, Rudolph, Costello and Baltimore. All of these groups have heen producers in the past, but for several years have been in litigation.

Work at the Big Four M. Co. property near Deadwood will be resumed and development work carried on. The machinery has been repaired and added to. The machinery was damaged to some extent hy the fire which hurned the company's plant last winter.

The Gordon M. Co. has heen incorporated to develop a mineral tract near Maitland by F. E. Little et al. of Deadwood. They will build a mill.

A rearrangement of the No. 2 cyanide plant of the Homestake mine, on the north end of the property, is being made in order that the plant may treat more satisfactorily the different characters of ore ohtained on that portion of the company's territory. Some of the ore carries a greater percentage of slimes than others, and different modes of treatment are necessary, particularly at the cyanide plant. In order to keep the ores separated part of the hatteries in the stamp mills will be set apart for the treatment of one character and the remainder will be run on a different character; to continue the distinction a new pipe line is being laid from the old Caledonia stamp mill to the cyanide plant. It is claimed that by this arrangement a greater saving will he made possihle not only in the cyanide plant, but on the plates in the stamp mill as well. The cyanide vats in this plant are being enlarged and the tankage will be increased by 1250 tons. There are various improvements under way on this end of the Homestake property. The Washington tunnel project is being pushed under the direction of N. Treweek. The company has been concentrating its energies more and more in this locality, and the indications are that it will become one of its most active fields.

The Tinton Tin Co. is operating its tin concentrating plant at Tinton, in western Lawrence county, and has apparently entered upon a successful career, says the Review. The first product of the mill has been hauled to Iron creek and is awaiting shipment to the East for refining. The plant has a daily capacity of 100 tons. In this plant the waste material is eliminated and the cassiterite, or black oxide of tin, is the result. The Tinton company has plans in contemplation already for the enlargement of the present plant. C. Waite of Tinton is manager.

The Gold Eagle M. Co. is developing eleven claims adjoining the Penobscot mine, in Garden City district, says the Black Hills Mining Review. The company's territory lies 3½ miles northwest of Deadwood. The company has ore in both the horizontal and vertical formations. J. N. Hawgood of Deadwood is general manager.

UTAH.

Beaver County.

President S. Newhouse says his company has decided to construct a railway over which to forward the ores of the Newhouse mines near Frisco to the concentrator at Newhouse, grading for this equipment to be contemporaneous with grading for the San Pedro branch between Frisco and its terminus at the bins of the plant. An electric railway had been originally projected, but the plans have been changed and steam will be used. The route between the mill and the receiving bins at the mine will cover a distance of 2 miles with a 5% grade.

Grand County.

It is reported P. T. Stevens has closed a deal whereby he gains control of the Paradox-La Sal mines on the east side of the range, near Basin, and has also completed arrangements for building a branch line of railroad from Placerville, Colo., down the San Miguel river to Naturita and up the Dolores to La Sal creek at Cashin, where the mines are. Boston, Mass., men are associated with him.

Iron County.

S. B. Milner of Salt Lake City says the Colorado Fuel & Iron Co. has established a camp at Desert Mound and is preparing to start the systematic development of the ground hy means of diamond drills. Milner has men doing the necessary work to secure patents. He has thirty-three claims still unpatented.

Juab County.

The new machinery for the Eagle & Blue Bell mine, near Eureka, is being set up. It includes a compressor. ——The roads throughout Tintic are dry and no more trouble will be experienced in hauling to and from the mines, unless the weather changes materially.——Six leases have heen let at the Victor, from the 300-foot down to the 600-foot levels. The leasers will work under direction of former Superintendent J. Trelear, who will undertake to develop the territory below the 600-foot level. The company is to receive a royalty of one-third on all ores, and pays one-half of the transportation and smelter charges.

The Joe Bowers, at Robinson, has increased the working force.——Arrangements have been made to reopen the Eureka Hill mill, says the Robinson Record. Work is under way at the plant to get it in condition.——It is reported that the $100,000 litigation between the Eureka Hill and the Bullion Beck companies for unlawful extraction of ores and in which the latter company won, has been compromised on payment of $90,000, which will be distributed to the Beck stockholders in the form of a dividend.

The management of the Utah mine at Fish Springs in the Deep Creek section has under consideration a plan for its equipment with a traction engine for ore hauling. To deliver a ton of ore at Oasis, the loading station on the San Pedro, under present methods, says J. Oberdorfer of the company, now incurs an expense of $12.50 with the tariff between that station and the furnaces of the American S. & R. Co. to be added, the total cost of loading and transportation, approximates $15 per ton.

Manager Chipman of the Uncle Sam Con. of Tintic says the ore body in that property is 12 feet wide, one-half of which is shipping ore, assaying 45% lead, $2 in gold and twenty-five ounces in silver to the ton, says the Salt Lake Reporter. The mill is concentrating sixty tons of low-grade rock per day, the concentrates averaging 40% lead, twenty ounces in silver and $2 in gold.

Millard County.

The Oasis G. & C. M. & M. Co. has been orgauized in Salt Lake City. The properties of the company are in the Detroit mining district, in Millard and Juab counties. Its officers are: M. S. Browning, J. T. White, J. A. Jennings and J. B. Toronto.

Salt Lake County.

(Special Correspondence). — The Utah Copper Co. is handling 400 tons per day at its mill which has recently been started. The mill has a capacity of 500 to 600 tons and the crushing capacity is 800 tons, but before this tonnage is reached it will be necessary to put in more concentrators. They started shipping concentrates April 1st. The concentrates run about 30% copper. D. C. Jackling is manager and F. G. Janney superintendent.

Bingham, April 24.

The Fortuna mine of Bingham is shipping fifty tons of ore per day, and this output will be doubled nexth month.

J. B. Stepbens is preparing to start work on the Julia S. mine at Bingham.

S. Newhouse has bought the Evans land near Bingham Junction, near Bingham, for $23,400. The tract comprises 117 acres and is expected to be used as the site for reduction works for the Boston C. Co.

Summit County.

The force at the California mine of Park City is to be doubled, says Manager W. I. Snyder.——The forwarding of concentrates to market from the Kearns-Keith mill at Park City has been temporarily suspended on account of the bad condition of the roads. The plant continues in operation, however, the product being piled up in the bins until it can be moved.

The Wahash, at Park City, has closed down for lack of water. New tanks are heing built.——The strike in the Nelson of galena ore has widened out considerably.——W. I. Snyder reports that in the California a new body of pay ore has been uncovered.

MacDonald Bros., O. T. Johnson, G. Wilson, F. Auhrey and F. Hansen have organized a mining company to develop ground lying near the Majestic and Nelson group near Park City. The company will he known as the Eagle.

Tooele County.

The Honerine West M. Co. of Stockton has made final payment on the Monroe group of claims. Another payment has also been made on the Copper Queen group, but a halance remains due on that property. Development work will he started at the Honerine West next week. Its territory is being unwatered hy the Honerine drain tunnel and operations can be carried on at less expense than formerly.

The Midas mill, Clifton district, near Ibapah, is again in commission after its partial destruction hy a windstorm last season. The structure has heen changed throughout, and has heen so designed on the interior as to make the engine and boiler rooms proof against the clouds of pulp dust as it is conveyed to the tanks from the rollers and crusher. An assay office has heen built. The capacity of the eight cyanide tanks is intended for twenty-five tons each, making a total of 200 tons, says Superintendent W. F. Oden.

The flow of water from the drain tunnel at the Honerine mine of Stockton has increased to 8000 gallons per minute, with waters in the various workings on the zone being correspondingly reduced, says Manager Snyder. The mill has been producing ahout forty-two tons of concentrates per sixteen hours; hut as the third shift has been put on, the management expects to increase the output to seventy-five tons of concentrates, or from thirty-seven to forty tons of lead daily. Meanwhile provision is heing made for five more tables and two additional slimers.

Uinta County.

State Coal Mine Inspector G. Thomas reports the mine of the Gilsonite Asphaltum Co., near Duchesne (known as the St. Louis mine), closed down. The electric lights and ladders have heen taken out and the twenty-five men laid off. The tools and machinery are heing taken to White river in Colorado, where other gilsonite mines are to be opened. The reason given for the move is that they will have railroad connection with the Rio Grande by August 1st and will then he ahle to get cheapor transportation and furnish a larger output. —— The Pariette mines are 30 miles south of Duchesne, employing twenty-five men in three shifts. One double cylinder 50 H. P. hoist, one 40 H. P. air compressor, a complete electric light plant and a 70 H. P. return tubular boiler constitute the machinery equipment. The company will increase the number of men to fifty and the output to forty tons per day of gilsonite. The vein has widened to 3 feet and 10,000 tons have been blocked out. The mine is owned by the American Asphaltum & Rubber Co. of Chicago, Ill.

S. P. Barron, vice-president and manager of the American Asphaltum Association's gilsonite mines on the Uncompaghre reservation, uear Duchesne, says the development of the Cowboy ledge, over which there was rivalry prior to concessions from the Indians which gave the association possession of it, has heen with satisfactory results. A crosscut shows 18 feet of gilsonite, of which 2600 tons has been marketed during the past six months. At present, however, there is no desire to levy on its resources, as the line of railway from Rifle into the region will reduce the cost of transportation and do away with the train of wagons now employed. The company's headquarters are in St. Louis, Mo.

WASHINGTON.

Ferry County.

During March the mines in Republic camp made heavy ore shipments to British Columbia smelters. The Mountain Lion shipped 2250 tons of ore, the Nob Hill mine 150 tons and the Zala M. shipped 750 tons. The average daily shipments amounted to 101 tons.

Stevens County.

Manager E. J. Wilson of Le Roi C. Co. smelter, at Northport, says the smelter will hlow in this week. The new sampling works, which have a capacity of from 800 to 1000 tons of ore per day, is ready for operation.

J. M. Davey, manager of the Iron-Hill mines west of Valley, says they have completed 1500 feet of development work on the property, besides 600 feet of boring with a diamond drill. It is expected work will be suspended next month.

WYOMING.

Bighorn County.

Prospectors report uncovering a ledge of gold-bearing rock on south side of the Rattlesnake mountains, 4 miles west of Cody. The rock is said to carry tellurides.

Carbon County.

The output of copper from the ores of the Ferris-Haggerty mine at Rudefeha has hegun. The concentrator is in operation, and as soon as the ore bins at the reduction works are emptied the tramway will start carrying ore, says the Douhlejack of Dillon. The management of the North American C. Co. has adopted new systems of conducting affairs and will run at less expense. The concentrator has been remodeled and additional machinery installed, increasing its capacity. Changes have heen made to the smelter and roaster to improve the efficiency of the plant.

H. O. Granherg, secretary-treasurer of the Pluto M. Co., says his company is preparing to put in a 65 H. P. steam engine, with hoilers, air compressors and six air drills, at their No. 1 group, ahove Dillon ½ mile, as soon as the roads get in shape to haul them.

The State Line M. Co., operating in the southern part of the Grand Encampment district and 3 miles north of Pearl, Colo., has opened a 4-foot vein of copper ore. This ore hody has heen opened on its No. 4 claim, and it is a separate vein from others on which work is heing done. A shaft is heing sunk.

Work is progressing on the Copper Age mine (the Copper Blossom) on Cow creek, near Dillon. The plant of machinery was put in last fall and ten men have been working all winter. The shaft is down 200 feet and following the vein with satisfactory showings. At 87 feet good ore was struck. The tunnel from Cow Creek canyon is not heing driven farther at present, though it is in 450 feet, ahout half way to the point where it is expected to cut the vein. The policy now adopted is to follow the ore and demonstrate its extent and value. This tunnel will give a depth on the vein of 1050 feet.

Sheridan County.

The East Sheridan Coal Co. has been formed to operate coal deposits which have heen discovered on the Moncrieff ranch, near Sheridan, by W. Moncrieff, J. N. Drake, E. Frost, F. J. Marhle and I. W. Wettford of Omaha, Neh.

Uinta County.

G. W. Short states that the Globe Oil Co. at Fossil has resumed drilling operations and expects to place two more rigs in the field this summer, and that the Fossil Oil Co., of which he is manager, has hegun drilling. The Idaho-Wyoming will have a drill in operation by May 1, and the Cinderella Oil Co. of St. Louis, Mo., proposes building a rig by July.

FOREIGN.

AFRICA.

Transvaal.

The collapse of a cage in the Robinson mine on the 26th inst. is reported to have dropped forty-three natives 1000 feet to the bottom of the shaft. All were killed.

AUSTRALIA.

New South Wales.

U. S. Consul F. W. Goding, at Newcastle, writes from an advance report of the Under Secretary for Mines the following are taken respecting the mining interests of New South Wales during 1903: The aggregate value of the mineral wealth to the end of 1903 produced in the State is estimated at $770,560,627. The value of the production for 1903 is $29,488,488.61—a net increase of $2,086,455.97 over that of the previous year.——The total number of persons employed in and about the mines of the State during the year was 37,739—an increase of 4044 over 1902. The total value of the machinery erected at the mines (other than coal and shale mines), inclusive of dredging plants, is $10,208,505.71. This does not include the value of the various smelting plants.

ESTIMATED PRODUCTION OF MINERALS IN 1903.

Description.	Value.
Gold	$5,255,961 12
Silver, silver lead and concentrates	7,306,577 70
Lead	187,778 76
Zinc	421,375 63
Copper	2,098,366 66
Tin	607,791 78
Alumnite	30,230 69
Antimony	656 97
Bismuth	46,411 80
Chrome	35,729 84
Diamonds	48,601 73
Cobalt	7,640 40
Ironstone flux	77,056 16
Iron oxide	5,747 33
Limestone flux	69,206 46
Lime	83,767 06
Hydraulic cement	271,258 71
Opal	486,650 00
Platinum	8,163 35
Molybdenite	21,594 85
Other minerals	46,129 54

The chief inspector of coal mines has issued a report in which he shows that the total amount of coal produced in New South Wales during the year 1903 amounted to 6,354,846 tons—an increase of 412,835 tons over 1902. The figures for 1903 as compared with those of 1902 are as follows:

District.	1903. Tons.	1902. Tons.
Northern	4,410,565	3,900,297
Southern	1,476,005	1,588,473
Western	468,276	453,241

Work at all the collieries was slack during the last quarter of the year, materially reducing the output. The output of bituminous shale for 1903 was 34,776 tons, as against 62,880 tons in 1902, the reduction being due to the less number of producing centers, one only now being in operation. The quantity of coke made dur-

ing the year was 160,592 tons—an increase of 33,720 tons over the 1902 output. Several of the plants were not fully operated. With the revival of metalliferous mining, it is expected this industry will show improvement during the current year, as its use has proven satisfactory at various mines, supersoding the imported article. ——The total number of persons employed in the coal mines in 1903 was 14,117, as against 13,114 in 1902.

Coal-cutting machines are being introduced in the mines of Newcastle district, writes U. S. Consul Goding. At one colliery, where 250 miners were formerly employed, the number has decreased to those only who are engaged in working the machines and those following up by blasting, drilling and timbering. There is not now a miner in the working faces of this colliery who is getting coal with the handpick. The miner's pay was 11s ($2.67) per day, the helper receiving 7s ($1.70) per day; most of those employed now are placed in the latter class. About 150 miners from this mine must look elsewhere for work or do this unskilled labor at 7s per day.

BRITISH COLUMBIA.

Boundary District.

It is reported in Phœnix that the British Columbia C. Co., Ltd., owning the Mother Lode mine in Deadwood camp, will resume development in the deep levels of that mine. For two or three years the company has been shipping only ore extracted from the surface quarries of the mine. About 300,000 tons of ore have been shipped, and work will still be continued there while development is still going on from the workings in the main shaft. The Mother Lode main shaft is 325 feet deep and long drifts were run at the 200-foot and 300-foot levels, showing up bodies of ore. Improvements are also being made by Manager Keffer at that mine. Another ore crusher for use at the mine will be set up. The mine is shipping from 600 to 700 tons of ore daily, the smelter handling besides some outside ore.

East Kootenay District.

J. Cronin of Spokane, Wash., manager of the St. Eugene mine at Moyie, says the St. Eugene mine will start shipping ore May 1st and will add 200 men to present number at work. J. A. Finch of Spokane, associated with Cronin in the ownership of the St. Eugene, says the mine will ship in part to Kootenay smelters and in part to Germany. It has been working fifty men. The ore carries silver-lead values.

Work will be resumed this week at the Poerman-Tiger group of mines on Wild Horse creek divide, near Fort Steele. The mine is owned by J. P. Larsen.

Rossland District.

J. J. Warren, managing director of the White Bear Con. M. Co. at Rossland, says the grade of the ore is improving. They are opening up one stope, that on the 850 level, at present, and there have an ore body 20 feet in width and 130 feet long. The company will proceed with the construction of its milling plant as soon as the snow is off the ground. By August 15th they expect to be crushing ore. It is planned to hoist 150 tons of ore per day, of which fifty tons will be shipped to the smelters and the balance put through the concentrator. Recent shipments from the White Bear mine have been satisfactory, running $14 per ton. The company has 7000 tons of milling ore on the dumps.

J. H. Mackenzie, temporary manager of Le Roi mine at Rossland, says they are making a thorough sampling of every stope in the mine, with a view to determining, not only the values, but the exact character of the ore. The smelter requires more iron than is produced in some of the stopes. When they have finished the sampling under way they expect to find that the mine will be able to take care of its own fluxing to a large extent. The temporary shut down of the smelter has allowed the company to do some overhauling and make necessary repairs. The sampling in progress in the stopes of Le Roi mine will be a guide in the making up of shipments. The ores that contain sufficient iron for self-fluxing purposes can then be segregated from the more siliceous product and shipped and smelted without loss or delay. The rest can be treated in connection with baser ores from outside mines. In this way the mine will be worked to a better advantage.

The O K mine's stamp mill near Rossland was started last week by the lessees of the I X L mine, Loff & Co. M. Purcell represents the mine and mill owners on the ground. The mine lessees have a quantity of ore broken down for treatment.

The buildings and plant at the Velvet-Portland amalgamated properties near Rossland will be completed next month. The building of a small smelter, designed to reduce the output of the mine, will then be taken up.

The White Bear Con. M. Co. has broken ground for its 100-ton concentrator near Rossland. The machinery for the works has been under orders in the East since the first of the year. It is estimated that six weeks will suffice to complete the buildings. The plant will be located southeast of the shaft house, where the topography of the ground lends itself to construction on the terrace principle. Stops are now under way to secure water for the plant. The company has secured several water rights and is taking up further water to guard against emergencies or enlargements of the plant in future. The mine itself will contribute to the water supply for the concentrator.

West Kootenay District.

A snowslide 1200 feet wide is said to have killed one man and carried away ore sheds, mine buildings and 1600 feet of the tramway of the Silver Cup mine in the Lardeau, near Camborne. The slide also carried down the mountain a large quantity of sacked ore and badly smashed the compressor. The damage is estimated at $75,000.

In the Lardeau, work will be resumed on the Mohican group at the head of Gainer creek, near Trout Lake, next week. This property was taken up by the Caribou Creek Syndicate, formed by Oliver & J. C. Murray, since which time the company has opened up a body of ore at depth of 125 feet, a test shipment of which netted $45 per ton. The new work mapped out is to drive a tunnel to tap the ore shoot at depth of 350 feet. The tunnel will be a crosscut for a distance of 100 feet before tapping the ledge, when it will be continued along the vein.——There are several properties to be worked this season on Gainer creek, among which is the Bad Shot, owned by F. C. Campbell et al., and the Black Prince, under option to T. Becker. These properties are contiguous to the Mohican, and it is thought the Government will build a wagon road during the summer.

CANADA.

Alberta.

The International Coal & Coke Co., developing its coal mines at Coleman, is preparing the foundations for 104 coke ovens.

Yukon Territory.

W. M. Ogilvie of Ottawa says his company will operate a dredger on the Stewart river, which will be one of three to be taken into the gold fields this summer.——The Forty Mile Co., which owns the concession on the Forty Mile river from the mouth of the stream to the boundary, will take in another dredgor, while a third will be operated in the Atlin country. The dredger on the Forty Mile is one that has been used in California, the company not having time to get a new one made for use this summer.

ENGLAND.

The United Kingdom's output of coal in 1903 showed an increase over 1902 exceeding 3,000,000 tons, or about 1½%. The gross output reached 230,323,391 tons. The greatest increase was in the Yorkshire district. The number of mine employes was 842,066, an increase of 2% over 1902, writes F. W. Mahin, U. S. Consul at Nottingham.

HONDURAS.

U. S. Consul W. E. Alger, of Puerto Cortes, says a coal deposit in Las Mogotes is being exploited.

MEXICO.

Chihuahua.

Manager P. Ginther at Santa Rosalia, says the capacity of the smelter of the Encinillas mines, Ltd., east of Santa Rosalia will be increased from 100 tons to 300 tons daily.

D. R. Jackson, general manager of the Santa Eulalia Exploration Co., has bought boilers, hoisting machinery, compressors and drills for the company's mines at Santa Eulalia. The machinery will be on the ground within the next month. The new working shaft on the Buena Tierra mine is down over 300 feet and will be sunk to 1100 feet, with drifts and winzes at stated distances.

D. W. Shanks, general manager of the Almoloya M. Co., operating at Sierra Almoloya, between Jiminez and Parral, says he will put in an electric power plant at Dorado station, on the Mexican Central, about 5 miles from the mines. This power is to be transmitted from the central station to the mines, where it will be used in their operation. On the Cerro Colorado mine Mr. Shanks has struck a body of low-grade lead-silver ore. The 800-foot tunnel being run on another property is in 175 feet.

It is reported that the deal for the Quebradillas mine, in Parral, by the Pan-American M. & S. Co., G. G. Gillett manager, is for $475,000 in gold. Fifty per cent royalty is to go to the owners to apply on the purchase price. The management is making extensive improvements at the mine.

Guerrero.

The Mitchell M. Co., G. Mitchell president and manager, is opening up a group of copper mines 40 miles from Acapulco, with which port the mines will be connected by a railroad to be built by the company. The ore carries chalcopyrite, said to assay 10% copper. Lime occurs associated with the ore. It is expected the railroad will be completed by November next. Power will be developed from the water rights available on the claims. There is also an extensive acreage of pine and oak timber. The cost of labor is said to be 45 cents per day and fuel $5 per ton. The ore body is reported opened up for 90 feet across, 5000 feet long and to a depth of 500 feet. The company is building reduction works at the mines, which are expected to be ready for operation by Sept. 1. The plant will produce twenty-five tons of metallic copper daily.

Jalisco.

The Altamira M. Co. has been organized, with W. M. Matthews as president and J. M. Ryan, secretary and treasurer, to develop a group of mines near Etzatlan. Machinery and other equipment will be put in.

L. E. Fuller et al. of Chicago, Ill., have bought the Rosa Amarillo and adjoining mines, near Navidad, and will put in machinery.

Nuevo Leon.

The Valley M. Co. is preparing to put in a plant, near Monterey, to unwater its Camel shaft.

The Asuncion mine, near Monterey, having been leased to T. S. Moorhead of Washington, D. C., he will build an aerial rope tramway to transport ore a distance of 2 miles to the Mexican National R. R.

Sonora.

Improvements will be made by the Providencia G. & S. M. Co., operating the Providencia mine, near Nacozari. A 10-stamp mill will also be built, says Superintendent S. Fields.

J. M. Romadka, manager, and others are preparing to operate El Globe gold and silver mines, 8 miles west of Nacozari. Additional machinery will be set up.

Superintendent A. J. King says he will build a 30-stamp mill at the King mine, near Yzabel.

Tamaulipas.

Ebano reports say the Mexican Petroleum Co. has struck at that place a 1000-barrel gusher. The flow of oil when the well was shot was strong. It is stated that the oil is now under control, as the company has a 120,000 barrel tank. The strike was made at a depth of 1700 feet. The oil is a thick, heavy variety. Four other wells are being sunk near the one struck, and these will be shot next week. F. L. Doheny is president of the company. There is almost a prohibitive tariff on fuel oil and, if it can be discovered in Mexico in large quantities, it will prove a valuable resource.

NORWAY.

The Norway Nickel M. Co. has been organized at Salt Lake City, Utah, to develop nickel ore bodies in southeastern Norway. In addition to the payable nickel values in the ore, assays proved it to contain copper values. Treatment facilities can be had at the smelters at Swansea, Wales. A. H. Lund and R. Smoot are interested and F. F. Hintze is president.

Personal.

F. F. Sharpless of New York is in Medellin, Colombia.

A. J. McMillan is in New York, en route to Rossland, B. C.

Jno. Dern of Salt Lake City, Utah, is spending a month in Mexico.

E. K. Smart, of Grass Valley, Cal., is in San Francisco, Cal., on mining business.

F. J. Seibert has resigned as superintendent of the Tonopah M. Co. at Tonopah, Nev.

W. Techow succeeds J. N. Esselstyn in the management of the Mt. View mine, Sumpter, Or.

E. C. Rice has returned to Cripple Creek, Colo., from El Oro and Mexico City, Mexico.

H. E. Gamble, manager Cuatro de Julio mine at Parral, Mexico, is in San Francisco, Cal.

W. H. Kilpatrick of Denver, Colo., interested in Colorado mines, is in San Francisco, Cal.

Emerson Gee is in Mexico on mining business and will return to Los Angeles, Cal., June 10th.

H. Monroe of Salt Lake City, Utah, is in Wyoming, conducting examination of mining properties.

J. Heney, who has mining interests in the Northwest, is in San Francisco, Cal., from Seattle, Wash.

C. W. Crusoe of Randsburg, Cal., and connected with the Yellow Aster M. Co., is in San Francisco, Cal.

R. L. Pritchard of the United Alkali Co. of Great Britain has opened offices in Salt Lake City, Utah.

J. F. Josephs of San Francisco, Cal., has gone to Tonopah, Nev., where he has mining and other interests.

C. Wing, owner of the Oro-Monarch, south of De Borgia, Mont., has returned from an extended trip East.

S. P. Mahan of Valley Spring, Cal., formerly superintendent of the Yellow Aster mine, is in San Francisco, Cal.

R. L. Burcham, largely interested in the Yellow Aster mine and secretary of the company, is in San Francisco, Cal.

W. B. Buckmeister, of Boston, Mass., interested in quicksilver properties, is in San Francisco, Cal., on mining business.

G. M. Nix, manager of the Oro Hondo M. Co., operating near Lead, S. D., is in Philadelphia, Pa., on company business.

W. H. Leffingwell of Lake City, Colo., is now manager Butters-Salvador mining property, Salvador, Central America.

S. L. Bean is appointed mechanical superintendent of the Santa Fe coast lines, with headquarters at San Bernardino, Cal.

A. S. Hickey, superintendent of the Detroit Dev. Co., operating near Placerita, Ariz., is in the East on company business.

W. Kemp, formerly with the Rosamont M. Co., is superintendent of the Copper Belle M. Co. at Gleeson, Cochise county, Ariz.

J. J. Morrow has resigned as general manager of the Greene Con. C. Co. at Cananea, Sonora, Mexico, and is in New York.

S. S. Curry, of Milwaukee, Wis., is manager of the Golden Rule Placer M. Co., operating in Idaho, vice Hathaway, resigned.

J. Knight of Salt Lake City, Utah, half owner in the Nevada-Park mine in Lincoln county, Nev., is visiting that property.

J. Singleton, one of the discoverers and present owners of the Yellow Aster mine of Randsburg, Cal., is in San Francisco, Cal.

R. Blanchard is manager of the Sioux Falls & Cripple Creek M. Co., operating on Fortune hill, near Cripple Creek, Colo.

D. Evans returned to Salt Lake City, Utah, last week, after a trip around the world, and will resume charge of his mining interests.

P. Wibaux, president of the Clover Leaf M. Co., returned to Deadwood, S. D., last week from spending the winter in Paris, France.

W. J. Astley, manager of the Snowshoe mines, near Phœnix, B. C., is in London, but expects to return to British Columbia by June 1.

T. P. Rigney returned last week to Salt Lake City, Utah, from New Mexico, where he has been examining mines in the interest of Eastern men.

H. W. Throckmorton, president of the Mohave Con. M. Co., has returned to Denver, Colo., from the company's mines in Mohave county, Ariz.

R. Angove of Grass Valley, Cal., has gone to South Africa as underground superintendent for the Con. Main Reef Co., near Johannesburg.

Manager T. Jacobson of the Columbus Con. M. Co. of Salt Lake City, Utah, is visiting mines in the Lake Superior copper region of Michigan.

Dr. V. T. McGillicuddy of New York, and at one time a topographical engineer of the United States Geological Survey, is in San Francisco, Cal.

J. J. Warren, managing director of the White Bear Con. M. Co., operating at Rossland, B. C., has returned to Toronto, Canada, after a visit to the mines.

Consulting Engineer Dwight of the Greene Con. C. Co. at Cananea, Sonora, Mexico, has been appointed man-

ager of the company, vice J. J. Morrow, resigned.

A. V. THORNES, former superintendent of the Densmore mine, near Columbia, Cal., is at El Dorado, Cal., and A. W. Crowell has succeeded him at the Densmore mine.

S. S. CURRY of Milwaukee, Wis., president of the Golden Rule Placer M. Co., will have charge of the company's mines in Marsball Lake district, near Grangeville, Idaho, this season.

M. DERBY, superintending dredging operations at Oroville, Cal., for W. P. Hammon, has been given charge of dredge lands in other sections of that State and in Wasbington.

J. F. WATSON of Portland, Or., succeeds J. T. Grayson, deceased, as third vice-president of the American Mining Congress. The selection is temporary, until the congress convenes in Portland, Or., next fall.

H. G. OGDEN, assistant chief of the United States Geological Survey, who had charge of the party which located the boundary line between British Columbia and the United States, is in San Francisco, Cal., from Washington, D. C.

J. W. A. OFF, W. W. HITCHCOCK, H. J. CORNISH, R. H. LACY, C. A. MILLER, D. A. HART AND G. B. EARNSHAW, of Los Angeles, Cal., members in the Zubiate M. Co., operating in Sonora, Mexico, are in San Francisco, Cal., attending the annual meeting of the company.

R. V. NORRIS has resigned as chief engineer of coal and water companies of the Pennsylvania Railroad Co., with which he has been connected for the past eighteen years, and by which companies he has been retained as consulting engineer, and has opened offices in New York City and Wilkesbarre, Pa.

Commercial Paragraphs.

ROBT. SCHORR, consulting engineer Chas. C. Moore & Co., bas moved his office to 519 Mission Street, San Francisco, Cal.

THE Sullivan Machinery Co.'s general offices in Chicago are now in the new Railway Exchange building, corner of Jackson boulevard and Michigan avenue, at rooms 1502-1514, instead of 135 Adams street, as heretofore.

E. DRYER has resigned his position in connection with the Westinghouse Electric & Manufacturing Co., and has accepted an appointment with the Allis-Chalmers Co. at their offices in the New York Life Building, Chicago. He will give his attention to their engine work, as well as to the sale of Bullock electrical apparatus, which the Allis-Chalmers Co. now control through their acquisition of the Bullock Electrical Manufacturing Co. of Cincinnati.

A NEW COMPANY has been incorporated in New York City to determine for clients in the financial field the condition, financial and otherwise, of mines, railroads, manufacturing and other properties whose stocks or bonds are presented to the public as an investment. To this end they desire to register the best and most reliable men in all branches, and to keep on file a record of each man's specialty, bis prices for work and the locations with which he is familiar. Richard Eames, Jr., managing director of the company, is consulting engineer of the La Fortuna G. & S. M. Co. of Jalisco, Mexico. The firm's headquarters are at 10 Wall street, New York City.

THE Rand Drill Co. of New York has just installed two compressed air plants for the United States Government, one at Fort Stevens, Or., and one at Tuscaloosa, Ala. At Fort Stevens the equipment consists of one Rand Imperial type 10 air compressor, having duplex steam cylinders, 7 inches in diameter, and compound air cylinders, 10 inches and 6½ inches in diameter with 8 inches stroke; several Imperial pneumatic riveting and calking hammers and piston air drills. The plant will be used in the work of improvement of the mouth of the Columbia river. The Tuscaloosa equipment consists of one Rand 8x8x12, class C, straight-line, steam-driven air compressor, a number of Imperial pneumatic long-stroke riveting bammers and Imperial piston air drills.

THE annual meeting of the stockholders of the Joseph Dixon Crucible Co. was held at the company's main office, Jersey City, N. J., Monday, April 18, and out of a possible vote of 7345 shares, there were 7126 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, William Murray, George T. Smith, Edward L. Young, George E. Long and Joseph D. Bedle. President, E. F. C. Young: vice-president and treasurer, John A. Walker; secretary, George E. Long, were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel. H. A. Neally has been appointed manager of the new paint office of the Joseph Dixon Crucible Co., Paddock building, 101 Tremont street, Boston, Mass.

THE Colorado Iron Works Co. of Denver, Colo., was established in 1860 and incorporated for $25,000 in 1876, and after twenty years of successful business they reincorporated for $240,000. The business of the company has expanded to such an extent that another reincorporation has become necessary, and the capitalization has been increased to $500,000. This time the reincorporation took place in the State of Maine, which gives them the advantage of bringing all litigation into the Federal courts. Under the new incorporation the company has dropped the word "the" and in future will be known as "Colorado Iron Works Co." The officers of the concern will remain the same, viz.: John W. Nesmith, president; Mrs. Isabel Nesmith Evans, treasurer and secretary, and John H. Morcom, superintendent. The main office and works of the company will remain in Denver, but they will maintain offices in New York City.

AFTER five years of experiment the Zwoyer Fuel Co. of 25 Broad street, New York City, has produced a system of briquetting waste coal dust, and is about to install two plants for the production of these briquettes in the West. Several large consumers of coal in New York and Jersey City, N. J., have used the firm's products with good results. The Burlington and several of the leading railroads west of the Mississippi are now experimenting with the Zwoyer briquettes with a view to their introduction throughout their systems if the tests come up to requirements. The company's 100-ton plant, now operating in Jersey City, is run at labor cost of 20 cents per ton of briquettes, and the cost per ton for the binder is 80 cents. The system of production is fully covered by patents. J. Forbes Potter, the treasurer and general manager of the company, is confident that the problem has been solved.

Obituary.

CLEMENT LE NEVE FOSTER, a prominent English metallurgist, died in London, England, on the 20th inst.

F. CARNE of Victoria, B. C., a pioneer mining man of British Columbia, died on the 12th inst., at the age of 75 years. His first mining was in the copper mines near his native town in Cornwall, Eng., and afterwards in the lead mines of Devonshire. In 1853 be operated copper mines at Eagle Harbor, Mich., going in 1856 to California. In 1858 be went to the Fraser river, British Columbia, later operating in the Carihoo country.

Trade Treatises.

"Flowing Oil Wells by Compressed Air" is the subject of Catalogue No. 81 from the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York, and gives an interesting description of the Moran-Moser flowing system, a notable application of the air lift.

Their price list of power steel and crucible steel switch ropes is being sent out by the Broderick & Bascom Rope Co., St. Louis, Mo., to the master mechanics and purchasing agents of the different railroads.

Books Received.

"The Sampling and Estimation of Ore in a Mine" is the title of a volume on this interesting and important subject by T. A. Rickard. The work includes, in addition to the personal experience of the author, contributions by other engineers and discussion of some of the more important phases of the responsible task of sampling the ore in a mine and subsequently determining the value of the mine, employing the assays of samples taken as a basis of computation. The book is of value to mining engineers, as it describes a wide range of conditions and various methods of ore sampling and measurement. 222 pages; well illustrated; price $2. The Engineering and Mining Journal, New York.

Latest Market Reports.

SAN FRANCISCO, April 29, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅜d (standard ounce, 925 fine); New York, bar silver, 55c, refined (1000 fine); San Francisco, 55c; Mexican dollars, 44c San Francisco, 44c New York.

COPPER.—New York: Standard, $13.25; Lake, 1 to 3 casks, $13.37½@13.67½; Electrolytic, 1 to 3 casks, $13.25; Casting, 1 to 3 casks, $13.00; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £58 7s 6d spot per ton.

LEAD.—New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £12 2s 6d ℔ long ton.

SPELTER.—New York, $5.25; St. Louis, $5.00; London, £22 7s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.75@28.12½; San Francisco, ton lots, 29½c; 500 lbs., 30c; 200 lbs., 30½c; less, 31c; bar tin, ℔ lb., 32½@35c. London, £127 12s 6d spot.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER.—New York, $45.50@46.50, large lots; London, £8 5s 0d; San Francisco, local, $43@44 ℔ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.10 @14.35; gray forge, $13.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@14 75
Northern 2	14 00@14 25
Northern 3	13 50@13 75
Southern 1	14 35@14 60
Southern 2	13 85@14 10
Southern 3	13 35@13 60
Forge	12 60@13 85
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 45@ 1 50
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, boiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 36@ 2 41
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 50@13 00
No. 1 cast, net ton	11 50@12 00
Iron rails	16 50@17 00
Car wheels	13 50@14 00
Cast borings	4 50@ 5 00
Turnings	8 00@ 8 50

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ hhl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California carload lots, $2.10 f. o. h. at works; small lots, $2.45 ℔ hhl. in sacks, 4 sacks to hhl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulpburic acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Antbracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6¼c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7¼c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 70c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING APRIL 19, 1904.

757,644.—WRENCH—G. S. Andrus, Globe, Ariz.
757,873.—WRENCH—G. Brauer, Sacramento, Cal.
757,437.—TREE PROTECTOR—G. E. Brown, Selma, Cal.
757,882.—HITCHING POST—T. C. Butterworth, S. F.
757,860.—ORE CAR—C. Canclini, Stockton, Cal.
757,599.—POWER TRANSMITTER—J. Coates, Hemet. Cal.
757,887.—GAS HOLDER—J. H. Coke, Black Diamond, Wash.
757,888.—PIPE COUPLING—C. O. Cole, Whatcom, Wash.
757,652.—SAFETY GAS COCK—B. F. Edwards, S. F.
757,444.—AXLE—P. Englund, Chico, Cal.
757,912.—POWDER DREDGER—C. E. Grapewine, Los Angeles, Cal.
757,809.—BINDING POST—S. C. Houghton, S. F.
757,660.—LOOSE LEAF BINDER—J. W. Husing, S. F.
757,857.—SLUICE BOX—W. J. & J. H. Jory, S. F.
757,558.—BERRY BOX—J. E. Lyman, San Jose, Cal.
757,938.—DENTAL APPLIANCE—W. T. Lyon, Portland, Or.
757,823.—BAND CUTTER—J. Manderson, Seattle, Wash.
757,668.—WINDLASS—G. W. Menefee, Berkeley, Cal.
757,764.—WRENCH—J. N. Noyer, Gould City, Wash.
757,639.—STEAM GENERATOR—Geo. L. Rose, Pasadena, Cal.
757,975.—PIPE CUTTER—W. T. Snell, Octave, Ariz.
757,574.—ENVELOPE SEALER—J. N. Stacy, Portland, Or.
757,583.—LAND ROLLER—R. V. Wallace, Alki, Wash.
757,698.—LETTER BOX—H. H. Warner, Tacoma, Wash.
757,699.—CONCENTRATOR—E. R. Week, Spokane, Wash.
757,706.—THEATING FRUITS—C. R. Wilson, S. F.
757,857.—ROCKING CHAIRS—J. F. Yoho, Seattle, Wash.

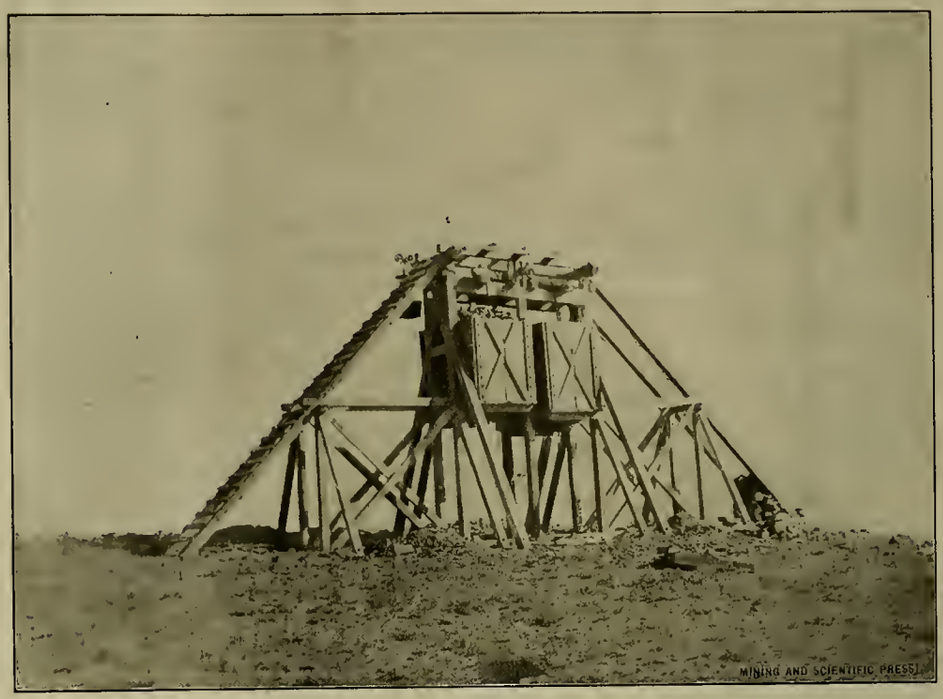
MINING AND SCIENTIFIC PRESS.

Whole No. 2285.—VOLUME LXXXVIII. Number 19. SAN FRANCISCO, CAL., SATURDAY, MAY 7, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Mountain Transportation.

One of the greatest difficulties which besets the development and operation of mines located in rugged mountain regions is the lack of cheap transportation. Mountain roads are commonly carelessly constructed, that is without due regard to grade and the heavy loads that are to be hauled over them. The roads are usually made from the material found along the line of the highway. Often a fine stretch of hard road is made in passing arouud a jutting spur or a point on the mountain side where the roadway is cut in solid rock, but along the straight hillside portions and at the crossing of intersecting side hill gulches the road is likely to be poor at all times and practically impossible part of the time during the rainy mouths. The result is great expense and sometimes a complete tying up of mining operations. A mountain road sbould never exceed a 5% grade, where heavy loads such as mining machinery is to be hauled. It is economy to build good roads, for if there is to be much hauling over them the additional expense, representing the difference between a good and a poor road, will be saved in a short time.

On each 10-mile haul the machinery for a large mill weighing 1,000,000 pounds should not cost for freight to exceed $1250 on a good road, but on a poor one it may cost as much as $3000, beside delay and possible damage to valuable machinery by overturning of a wagon—an occurrence that happens not infrequently.



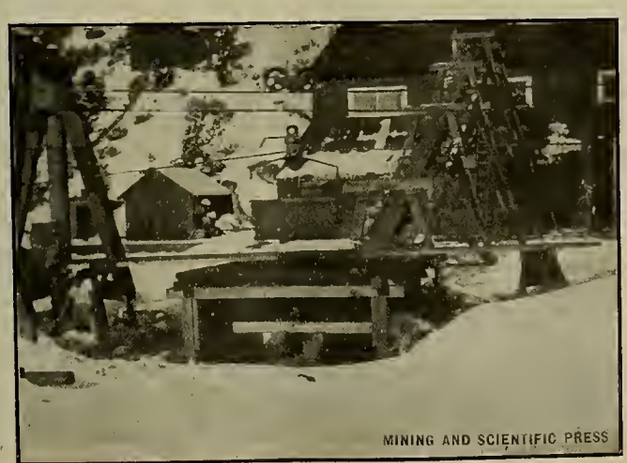
Double Tension on Encampment, Wyo., Tram.

Support at Lower End of a Long Span.

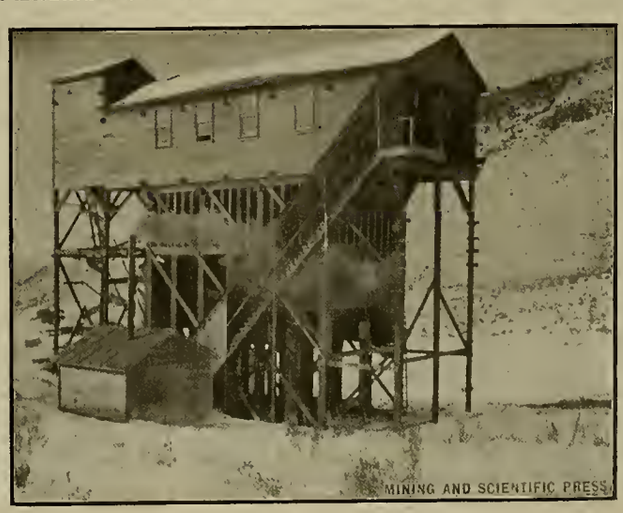
Happily, a solution of the problem of transportation between mine and mill has been solved by the wire rope tramways now found successfully operating in almost all parts of the world. These aerial trams are of various design. Some have tbe buckets secured to a running rope, which makes the circuit at suitable speed, the bucket loaded with ore going down one side and returning empty or carrying mine supplies. Another variety has fixed main cables, the buckets running on grooved wheels, being drawn along by a smaller pulling rope. There are many methods of securing buckets to the cable, and various devices for automatically filling and dumping the buckets at the lower terminal of the tramway, and there are various methods of taking up the tension, controlling the speed on steep grade, or of applying power where the grade is insufficient.

That the aerial tram is a money-saving device in the transportation problem at mountain mines has long since been demonstrated. An instance may be cited where a company built a good road about 3 miles long at a cost of $20,000. The intention was to use wagons aud horses or mules to convey ore from the mine to the mill in the canyon below. Owing to the difficulty in getting suitable wagons to the mine (there being no road connecting the mines with the outside world) and the cost of repairs on the few wagons they did have, the wagons were abandoned for packing on mules, at a cost of $4.50 per ton, wages of drivers, wear and tear of sacks and saddles, keeping of animals and mortality among them—the latter no inconsiderable item. An aerial tram was built at a cost approximating $25,000, connecting mill and mine, and the cost of ore transportation was at once reduced to less tban $1 per ton, the mill handling at that time fifty tons daily. The tramway was direct in alignment, 6500 feet long, and reached an altitude of 1500 feet above the mill at the upper terminal. Since that installation the company has sent more than 200,000 tons of ore over the ropeway. Comment seems needless in a case of this kind.

The accompanying engravings are those taken from two important aerial installations, showing the appearance of upper and lower terminal stations, the supports along the line, and one of them what is termed a double-tension station.



Loading Terminal Aerial Tramway.



Lower Terminal, Grand Central Tram, Robinson, Utah.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1164 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MAY 7, 1904.

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AN industrial exposition for South Africa has been planned to be held at Cape Town in November, December, 1904, aud January, 1905. The object is to collect a representative exhibit of the material resources of South Africa and display the same under the usual conditions. Manufacturers of machinery of every description are likely to avail themselves of this opportunity to display their wares.

A HOISTING ENGINEER occupies a position of great responsibility. It requires a man of nerve, presence of mind, and knowledge of his business. He should always be familiar with every foot of the shaft. It is also desirable to have as few meu below in the mine ringing the signals as possible. The engineer becomes accustomed to the manner of ringing of one or two men, and their signals are more intelligible to him. No two men riug bells exactly alike, either as to spacing time between strokes or in the force of a stroke. Aside from a knowledge of his engine, the most necessary qualification in a hoisting engiueer is that of presence of mind and courage to act promptly in the event of anything going wrong. This was exemplified in a striking manner a short time since at the Lightner mine at Angels, Cal., where, when something went wroug, and the man at the hoist lost control of the engine, in the belief that the lives of men were in great danger, he promptly seized a large wrench lying near at hand and jammed it into the gearing of the hoist. He wrecked one side of the machine, destroying the gearing, but he brought the skip to a standstill. Subsequently it was learned that men who had been at work in the shaft had gone up to a level above, but he acted promptly on impulse, believing the situation demanded strenuous measures and applied them accordingly. A man like this certainly deserves credit, and his example might be followed by others who may be placed in a similarly unfortunate position

Relative Size of Mill Screens.

All mill men are aware that the tonnage of ore crushed per stamp is directly affected by the size or kind of screen used. A coarse screen will afford greater capacity than a finer one, but with chauge in tonnage per stamp is usually noticed a change in percentage of values saved. Elsewhere herein is published some statistical data on this practical and interesting subject, in an article by J. Roskelley, in the Journal of the Chemical, Metallurgical and Mining Society of South Africa. In his experiments various screens were employed, from 600 to 1200 meshes per square inch. Unfortunately, the height of drop, number of drops per minute and volume of water in the battery were not maintained at a constant ratio, and although the results are variable, as might have been expected, there would probably have been shown some further variations had the conditions, aside from the mesh of screen, remained constant. He states that the difference between a 600 screen and one of 1200 meshes resulted in a difference of one-half ton capacity per stamp in twenty-four hours, or 1500 tons per month in a mill of 100 stamps. But the writer further says that the use of the finer screen resulted in saving of 3% more in the mill, and 3% further saving in the concentrates. As the assay value of the ore is not stated, and as the percentage of values previously saved is unknown, it is impossible to estimate the actual saving per month iu dollars as a means of comparison with loss of capacity. The reduced capacity per stamp means the saving of that amount of ore daily per stamp—in this instance one-half ton. It becomes a question as to which is the more economical—the extraction of a higher percentage of values, together with interest on the amount saved, or interest on the lesser amount recovered by coarser crushing. The mill labor will uot differ materially, or at all, in the mill, whether crushing coarse or fine, which makes fine crushing somewhat more expensive, but the relative cost per ton of the two systems—fine and coarse crushiug—can be readily arrived at, and a comparison made with the percentage saved by each method. The tests made by Mr. Roskelley are along practical lines, and are suggestive to mill men everywhere, who may make similar experiments with a view to making a further saving in the mill, if the limit of economy has not already been reached.

A New Mining Law.

As an outcome of the recent difficulties in Colorado with the United States land office, in establishing the position of mining claims patented or sought to be patented, a bill has been introduced in Congress, the object of which is to simplify this matter and to enable claim owners to establish the position of their claims as defined by the monuments on the ground. The bill was introduced by Representative Brooks of Colorado. It is as follows:

The description of vein or lode claims upon surveyed lands shall designate the location of the claims with reference to the lines of public survey, but need not conform therewith; but where patents have been issued for claims upon unsurveyed lands, the surveyors general, in extending the public survey, shall adjust the same to the boundaries of said patented claims so as in no case to interfere with or change the true location of such claims as they are officially established upon the ground. Where patents have issued for mineral lands, those lands only shall be segregated and shall be deemed to be patented which are bounded by the lines actually marked, defined and established upon the ground by the monuments of the official survey upon which the patent grant is based, and the surveyors general in executing subsequent patent surveys, whether upon surveyed or unsurveyed lands shall be governed accordingly. The said monuments shall at all times constitute the highest authority as to what land is patented, and in case of any conflict between the said monuments of such patented claims and the descriptions of said claims in the patents issued therefor the monuments on the ground shall govern, and erroneous or inconsistent descriptions or calls in the patent descriptions shall give way thereto.

While it does not actually change the law in respect to patented claims, it is intended to establish the miner in his rights, regardless of the arbitrary rulings of the general land office, which in some instances have compelled claim owners to establish their rights in the courts. By it the land office will be compelled to accept the position of a claim as marked by monuments on the ground, regardless of erroneous calls of deputy mineral surveyors.

Crediting the Miner.

The manufacturers and dealers in mining and metallurgical machinery have many peculiar propositions made them by those desiring to buy machinery, and these propositions often contemplate credit on the account sought to be opened. Necessarily the dealer iu this class of machinery must be discriminating enough to recognize in his prospective customer the man of honest purpose from the unscrupulous schemer. While machinery manufacturers and their agents, who are usually dealers only, prefer to sell for cash, they cannot always afford to risk offending men who have good standing, and in consideration of the belief that his creditor may secure the business if he himself refuses the desired credit, time contracts are common. In extending the credit of courtesy of credit to this class of buyers, the seller has several matters before him for consideration.

First, the man—his record, reputation, etc.; secoud, the property upon which it is desired to place the machinery, whether its value be real and sufficiently covering the credit desired, or whether it be prospective with a good chance for making a mine, or whether it be purely of a speculative kind with nothing in particular to recommend it other than a prospector, or the enthusiastic talk of the credit seeker. If the amount of machinery required or desired involves a large expense, the risk is correspondingly greater than in the case where only a few hundred dollars' worth is wanted. In the former case it would probably justify an expert examination of the mine on the part of the machiuery sellers. It is a well-known fact that haste to equip a mine with a metallurgical plant before the property is sufficiently developed to require or to determine the character of such a plant has frequently led to disaster. The miner is naturally, and almost necessarily, optimistic, but the machinery maker cannot, for business reasons, be expected to share in the sanguine expectations of the miner to so great an extent as the latter.

Mine Patent Surveys.

The Supreme Court of California has again decided—Galbraith vs. Shasta Iron Co.—that the monuments of mining claims, if they can be ascertained upou the ground, must establish lines which shall mark the boundaries of the claims, whether they conform to the distances and directious of lines connecting the claim survey with the corners of the United States land survey or not. This is a matter over which there has been much discussion within the past eighteen months, particularly in Colorado. It was stated herein sometime since that any doctrine contrary to this principle could never hope to be sustained by the Supreme Court of the United States. The most recent decision in this line is that above referred to, the decisiou being rendered on April 27 last, on an appeal from a former similar decision. It was an instance in which a claim had been plainly marked on the ground, and all the "calls," or descriptive language of the United States deputy mineral surveyor who surveyed the claim for the patent conformed exactly with the monuments on the ground, with the single exception of one line which was erroneous, and, if allowed to control, would place the claim a quarter of a mile distant from its actual location, and it was not even claimed that this line was one which had actually been surveyed, but one which was calculated, and extended 5 miles over rugged mountains, and still the Land Department insisted that this line was important, and caused the patentee to relinquish the title to the Government and make application for a new patent, in which the description was void of any known errors.

THE recent case of poisoning by cyanide at the Exposed Treasure mine, near Mojave, San Bernardino county, Cal., reference to which was made herein in the issue of March 23, seems to have been somewhat magnified. That there is no game on the desert all familiar with the situation are aware, and the company seems to have done all that can be reasonably expected of it to lessen the difficulty, and, in fact, much more than miniug companies usually do in similar cases, as shown in a communication from the superiutendent, appearing elsewhere.

CONCENTRATES.

THERE is no California market for tungsten ore.

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NICKEL ORES in Sudbury district, Ontario, Canada, contain a little platinum, but not in commercial quantity.

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THE next annual meeting of the American Institute of Mining Engineers—the LXXXVIIth—will be held next September in the Lake Superior region.

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ON some bearings, such as the surfaces of cams, grapbite is a good lubricant. This does not refer to stamp-mill cams, but those on lighter machinery.

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ONE objection to housing head frames is the increase of the danger from fire starting on the surface. Also in the event of a fire in the shaft it intensifies the draft.

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REGARDING the pump having a 3-inch discharge pipe being bushed down to 2½ inches, the pressure on the valves remains the same, so long as the diameter of the valves remains unchanged.

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THE principal producer of iron pyrite in California for the manufacture of sulphuric acid is a mine on Leona Heights, near Oakland, in Alameda Co., Cal. There a large vein is stoped and timbered by square-set method.

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TRIPOLI is a slaty variety of infusorial earth. It is soft and easily pulverized and is used extensively for polishing. There are two varieties—one soft and friable, not adhering to the tongue, the other more solid (from opalizing) and adherent to the tongue.

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TO HOLD the unpatented mining claim $100 worth of work or improvements must be annually done until patent is procured; the $300 of work in 1903 has no bearing on the subject; $100 should be similarly expended before Dec. 31, 1904, to legally hold the claim.

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THERE is much difference of opinion among smelters as to the efficiency of hot blast. Some insist that a high temperature—600° and over—is desirable; others say it is unnecessary. The general belief, however, is that the air should be heated to produce the most economic results.

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A KIBBLE is a bucket used in hoisting. It is larger at the center than at either end. It is the least desirable form of bucket except for small rock, for large pieces of rock frequently jam and cause much delay in dumping the bucket. Its only recommendation is that owing to its form it seldom catches under timbers.

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THE windmill, as a dependable device for handling mine water, is limited in its usefulness to a small field. The quantity of water must be small and the workings shallow. Windmills are used to good advantage in pumping water from settling ponds below quartz mills and in pumping salt water at salt marshes.

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THE discoverer, owner or operator of a mining claim to which he has United States patent, has a right to follow the dip of the vein under agricultural or timber land if his is the senior title; that is, if his patent antedates the patent or possessory right of the adjoining agricultural or timber land; otherwise, otherwise.

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MAN ENGINES, a device by which miners can reach the surface, being a sort of movable ladder set in pairs, one of which is stationary while the other moves up and down, were invented by D'Orrell of Clausthal, and soon became popular. They were later introduced into Cornish mines by a Mr. Lorn, for which he was rewarded by the Royal Polytechnic Society.

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ONE of the most essential features of a mine pump is the easy accessibility of the valves and the ease and quickness with which it may be repaired when necessary. When the sinker, after several weeks of continuous satisfactory work suddenly fails, and cannot hold the water and no leak in the suction hose appears, it is probable that the lower valve needs replacing.

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HANGING BOLTS for shaft work may be made of ¾-inch iron rods, though ⅞-inch is better for timbers of large dimensions. The hooks must be so forged that they will not open out when the weight comes upon them. Large sized washers are more economical than small ones, which sink into the timbers. Washers 5 inches diameter and 1 inch thick are good size.

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CORUNDUM is found in veins in North Carolina, and in irregular deposits in Chaffee Co., Colo., the former averaging 15%, the latter 30% corundum. At Sapphire, N. C., the rock corundum is crushed and ground to No. 12; the sand corundum sluiced from the mines, fed to coarse punched iron screens; then reground, washed and dried. The average price at the mill is 4 cents per pound.

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THE lime may at first discolor the plates as it comes in contact with the water in the mortar boxes, and being mixed with ore precipitates certain iron salts from the water and acid ore, thus causing discoloration. Clarifying the water will neutralize such action and keep the plates clean. It is not uncommon on the first introduction of water to have the plates appear dirty and of a greenish-black color.

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A STEAM operated air drill may be used underground, but the use of the steam driven drill is mostly confined to quarry work, and is rarely seen there now. Air is superior in every way, and the loss in efficiency in driving the compressor by a steam engine is more than offset by the facility with which the drill can be handled, to say nothing of the comfort and health of the men.

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DOUBTLESS some of the paragraphs in this column do sound somewhat "abrupt," but it is to be borne in mind that they are mainly answers to questions received, the questions themselves being necessarily omitted for want of space, and the effort to equalize brevity and accuracy precludes possibility of mellifluous phrase. The main effort of "Concentrates" is to answer the questions sent in briefly and accurately.

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THE rock specimen from Tombstone, Arizona, is apparently a peculiar variety of basalt. The microscope shows it to consist of andesine and labradorite (lime-soda feldspars), olivine and augite. These are essential constituents of basalts. While the identification of these minerals indicates the character of the rock, its physical appearance does not suggest basalt, when examined with the unaided eye.

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IT were better and safer if the grantee insisted upon having Government patent for base of title. Of course many mines are securely held and satisfactorily operated under the ordinary location title, but there is a constant possibility of litigation in case of sufficient value being developed to incite such annoyance. The United States patent is the only sure guarantee against blackmail, legal or otherwise.

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"ELBOW GREASE" is the only kind of grease permissible around amalgamating plates, and the more of it the better. It is not enough merely to have the pulp flow over the quicksilver plates—the plates must be thoroughly and systematically rubbed and dressed. Hard rubbing with a rag or a small broom softens the amalgamating surface. Gold amalgam is still the best gold catcher known; hence, in the daily clean-up the plates should not be "robbed."

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IN smelting ores containing arsenic, this undesirable metal and its compounds can be largely gotten rid of by mixing the charges to produce a very siliceous slag. This results in decomposition of arseno-pyrite—the most common form in which the arsenic occurs, and the volatilization of the arsenic, thus avoiding the formation of speiss, which would otherwise occur. This was done by H. Lang near Prescott, Ariz., in treating the complex ores of the Blue Dick mine, 12 miles south of Prescott.

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POWDER should not be kept near the shaft or the buildings about it, at a mine, even in small quantities, for in the event of an explosion great damage is likely to result to the head frame, and the miners below may be imprisoned for some time, if their lives are not placed in jeopardy. In such cases as that from the Burke, Idaho, inquirer, where there are 400 or more cases to be stored, it were well to construct a magazine about 14x16 feet—10 feet in the clear; the bottom row on slats, then slats on top of the first row of cases, and so on.

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MINERAL WOOL is made by forcing a jet of steam or air against a stream of molten slag or molten rock. In nature the same thing often occurs at the time of a volcanic eruption, when a mass of plastic molten slag is sent into shreds by a violent explosion. The hair-like mass is so light as to float away on the wind for a considerable distance. It is known as Pele's hair. It is a fibrous variety of pumice. Blast furnace slag is generally used in the manufacture of mineral wool. It is used in construction for fire-proofing pipe covering, etc., and is a non-conductor of heat and sound.

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WHAT is known as the "inflaming of compressors" is caused by the ignition of the gases created by the beating of the lubricating oils used, and the burning of the carbon deposited there. This is not likely to occur if the compressor cylinder be properly water-jacketed, and where a sufficient supply of cold water is sent through the jacket, to prevent overheating. In compressing air by stages a much lower temperature results than where the operation is performed in a single cylinder. Air compressors require as great care as a steam engine, and some of them even more care.

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WHEN mining work is being done on contract it is not uncommon to have the miners furnish the powder, candles, fuse, caps, etc. The owner or company furnishes timbers, and sometimes puts them in place. These are matters of detail. It would be impossible to venture an idea of the probable cost of breaking any ground without investigation. It is not always the hardest rock that gives the most trouble and expense. Some rock which is comparatively soft is often so tough as to be more expensive than harder ground. "Big ground" is cheaper to break than that which breaks "short."

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DOLOMITE is technically unsuited for use as a flux in the smelting of ores, but dolomite was the only kind of limestone used at the D & D smelter at Deadwood for some years by F. R. Carpenter. By some they were called "Carpenter's impossible slags," but the magnesian limestone worked all right. This is only a single instance where, in the practice of smelting, time-honored theories were destroyed and a newer, broader field opened up. The history of metallurgy at Leadville, Colo., is full of radical changes in methods, in which so-called impossibilities were frequently performed to the advantage of the district and to the lasting knowledge of the business.

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IF too large an area be removed from a wide vein, both walls of which are soft and wet, the probable result will be a cave—a great mass of the overhanging ore dropping in a solid block. This danger is increased should the walls converge upward, leaving a wedge-shaped mass of ore unsupported beneath. Should the walls converge downwardly the danger is greatly lessened. The stope should be timbered as rapidly as consistent with the removal of the ore from the working faces, and filling commenced at once and kept up in such a manner as to support the greater part of the ore or wall above. In a vein of high inclination it is practically impossible to fill right up to the back of the ore, consequently the stope must be worked in sections of relatively small size.

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POSSIBLY it might prove profitable to dredge Rapid and Castle creeks in the Black Hills of South Dakota, but in many places the depth to bedrock would be 50 to 60 feet, and in many places the bedrock would be found to be hard, which is detrimental to the best dredging, much gold being lost in crevices and behind projections of rock which the buckets could not reach. Either drifting or bedrock flume methods seem better suited to the conditions. A number of attempts were made twenty-five years or more ago to work the creek bed through shafts by pumping the water from bedrock, but all of these efforts proved abortive. Notable instances were at Sitting Bull, Castleton and near Wheeler Hill. In the latter instance the shaft was put down to a depth of 30 feet and $110 were said to have been recovered from about 10 feet of drift, but the pumps were unable to handle the water.

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FOR passing ore down an incline of low angle, where the ore will not run, the shaking steel troughs hung from the roof of the raise or stope, as introduced in some of the mines of the Rand, South Africa, seems an economical means of solving the problem of cheap handling of ore in stopes under these conditions. The ore is shoveled into a steel semi-cylindrical trough, suspended by chains from the roof. A laborer shakes or jerks this trough in the direction of its length and the ore moves forward toward the lower end of the trough. The maximum length of the trough must be determined by experiment. Where more than one is required to reach the car on the level below, a second trough must be placed so that the upper one delivers the ore into the head of the next one below, which is cared for by another laborer. It is much cheaper than shoveling the ore over and over.

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A JACKHEAD pump is a type of Cornish pump having the pump rod on the outside of the pump, which works in direct line with the barrel of the pump, being connected with the valve mechanism within, the discharge being connected with the working barrel by a "goose neck." This kind of pump is suited to work in inclined as well as vertical shafts. Those Cornish pumps having the pump rod within the column pipe cannot be economically used in inclined shafts because the weight of the constantly moving rod would soon wear a hole through the casing. Jackhead pumps can only be operated entirely submerged so long as the valves remain in good condition. With the other type mentioned where the rod is placed within the column pipe, the valves may be raised to the surface through the pipe, and necessary repairs made. A plunger pump of Cornish design has only clack valves, and will work more satisfactorily in gritty water than the other types referred to.

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THE greater portion of the borax ore (calcium borate) mined in the Calico district of San Bernardino county, Cal., comes from a vein bedded in the shales and sandstones of a Tertiary formation which have been lifted on the flanks of the Calico range. This vein evidently was once a deposit on the floor of a Tertiary dry lake, and being in time covered with an accumulation of mud and sandy sediment, derived either from the erosion of neighboring hills or from volcanic vents in the region, became intercalated in the formation and with it was lifted by subsequent geologic disturbances. The mineral is crystallized, forming a translucent to transparent rock mass of the mineral known as colemanite. It is mined in the same manner as the veins of metal mines, shafts being sunk on the vein and levels run, from which stopes are carried up. At and near the surface the principal vein dips steeply to the south, but in depth it flattens out considerably and is cut off by a fault. Calcium borate also occurs in "mud" rock—an indurated lake silt or mud in the Calico district—the mineral occurring in the form of finely disseminated crystals throughout the mass, in which it acts as a cementing material. Other sources of borax in San Bernardino county are the dry lake beds in the northeast part of the county. The mineral is collected from the surface and in time it recollects as an efflorescence, coming up from below.

Concentration of Ores.

Written for the MINING AND SCIENTIFIC PRESS.

In most instances the concentration of ores is a process preliminary to some subsequent operation or treatment, as, with few exceptions, the native metal is not produced by concentration. A notable exception is the concentration of native copper from its ores at the Lake Superior copper mines. The sluicing of gold from sand and gravel is a rude concentration, effected by the use of water and the simplest mechanical devices. Diamonds are recovered from their crushed matrix by concentration, and some other gem stones are obtained, like gold, by sluicing. These, with a few others, are the most important exceptions. The metal-bearing ores are concentrated for the purpose of enriching the material to be subsequently treated, by eliminating the less valuable and generally worthless and lighter gangue.

There are two divisions in the concentration of ores—coarse concentration and fine conceutration. That system is employed which seems the best suited to the character of the ore, and with many ores both coarse and fine concentration is practiced at various stages of the process. The selectiou of the method, as above stated, depends upon the character of the ore—not altogether upon its value or the kind of mineral contained, but upon the physical condition in which the mineral sought to be concentrated exists in the ore. An ore in which the mineral it is desired to concentrate occurs in coarse crystals or masses is adapted to coarse concentration, while one in which the mineral appears in finely disseminated grains must be crushed fine in order to free the valuable mineral particles from the matrix. Generally speaking, for coarse concentration at least, rolls are superior to stamps, as the former may be adjusted to crush to any desired fineness. They are often used in series, from coarser to finer.

The process through which an ore must pass is usually about as follows: The ore is delivered to a rock breaker, either jaw crusher or one of the gyratory type. From the breaker it passes through rolls (one or more sets), being crushed either dry or wet. The rolls are of several different types: Those which are run at high speed; those which run at a moderate speed; those having fixed bearings, and those adjusted by means of springs; belt-driven rolls and geared rolls, and other differences iu construction. They all will crush ore and each type has its friends—a condition noticeable in every kind of mining and milling machinery.

From the rolls the ore passes to trommels (inclined, cylindrical or cone shaped revolving screens), which are divided into sections, each provided with a screen of differing mesh, through which both ore and gangue minerals pass, the whole being "sized." That is, the ore is mechanically and automatically divided into a series of sizes, both particles of mineral and gangue in each lot being of approximately the same diameter. The purpose of this sizing is to render the subsequent separation of mineral and gangue more complete and easy of accomplishment.

From the trommel the ore passes to jigs, each size going to a separate jig. It is with jigs as with every other class of mill machinery—there are many types, and all of them are capable of good work in competent hands. The jig is an effective concentrator, and continuously separates the heavy mineral from the gangue, in a rapid and satisfactory manner. The finest material being treated—that passing the finest jig screeus, and the overflow—are known as slimes, and this class of material is treated in the same manner as ores that are crushed fine. The tailings from jigs are usually returned by belt conveyors or elevators to rolls or stamps for finer crushing, and recoucentration, either on jigs or on other concentratiug machines.

The matrix, or gangue, must be crushed fiue enough to free the sulphide or other mineral particles or concentration cannot be effected. In the earlier stages of the process the coarser particles, constituting ofteu over 60% of the entire mineral contents of the ore, are separated, and the remainder is recovered later by recrushing and reconcentration. The degree of concentration is determined as in almost every other phase of milling operations by commercial limitations. Concentration of ores may often be successfully carried to a mechanical point beyond that justified by the economic result.

The cost of concentration per ton of ore is influenced to a great extent by the capacity of the plant, character of ore, cost of water and rate of. wages. It will usually vary between $1 and $3 per ton of ore as it is delivered at the mill. In very large plants, where there are no unusual difficulties to overcome, the cost per ton may be reduced to less than $1, as at the Lake Superior copper mills, where the ore is crushed under steam stamps—over 500 tons per stamp daily—and concentration is effected by jigs with intermediate hydraulic classifiers, to grade the ore to the various sizes, before jigging.

The ores best adapted to coarse concentration are those in which the sulphides of lead, copper, iron and zinc occur in coarse masses, like some of the copper ores of Butte, Mont., the sulphide ores of Leadville, and most of those of the Missouri lead-zinc region, and similar ores elsewhere.

Where the valuable mineral occurs in finely disseminated crystals or grains, constituting a relatively small percentage of the entire ore, coarse crushing is impracticable, as the rock must be crushed fine to free the mineral from the matrix. For fine crushing, either rolls or stamps are employed. Where the former are in use the rock passes through several sets of rolls, the last set being known as the finishing rolls.

In fine concentration, after the ore has been crushed sufficiently fine—generally not finer than through a 30-mesh screen—it is passed over one or more of the various types of belt concentrators, or tables, or buddles, or other rotary, flat, cone-shaped devices for effecting a separation of the lighter from the heavier mineral. To facilitate this, various forms of hydraulic classifiers are employed. There is usually little difficulty in saving the larger particles of this finely crushed ore, but the slimes must be handled with care. Experience has long since demonstrated that both coarse and fine sulphides cannot be satisfactorily separated from the gangue by a single concentrating operation—that is, by concentrating on a single machine, or other device, without first classifying the material to be treated. The classifiers all employ water in their operation, and all are based ou the same principle, that larger and smaller particles of mineral do not settle with equal facility in a current of water. This enables the coarser particles to be taken out or collected at the bottom of a classifier, while the finer slimes flow out at the top. These classifiers are made in great variety of form and size, but, as previously stated, all operate on the same principle. An extensive classifying plant, in successful operation, was described in the MINING AND SCIENTIFIC PRESS in the issue of March 26, 1904, by F. W. Sherman. In this plant seven separate classifications are made and this number could be increased if desirable. This process admits of sending a perfectly classified product to each machine, wheu further classification is uecessary. In considering the above mentioned processes it should be remembered that there is a material difference between sizing by means of graded screens and classifying by water currents. In the former a separation of particles of approximately like size is effected, and in the latter, the particles having been sized by screen, have a tendency to settle in water controlled to a great extent by the relative specific gravity of particles of similar size, the heavier being able to sink down through a gently rising current, while the lighter material held in suspension floats over into the next box or flows away to the waste launder.

Cyanide Poisoning.

TO THE EDITOR:—Your editorial on "Cyanide Poisoning" in your issue of April 23d was evidently based upon a recent article in a southern California paper containing many errors, and which did a great injustice to the Exposed Treasure M. Co. I will explain the situation in some detail. The Exposed Treasure mill is situated on the side of a small butte rising out of the desert. The waters for the mill are delivered through a pipe line under reduced pressure from a source 16 miles distant in the Tehachapi mountains. The water supply is abundant, so that rigid economy is not uecessary, admitting, fortunately. of the use of fresh water for hydraulic classification, and for concentration. The region is destitute of timber and clays, so that no better material than sand is available for dam building. Hence impounding of waste waters would entail an immense original outlay. Extensive settling tanks, however, are used for settling the slimes and a portion of the clarified water is pumped back for reuse, the remainder going to waste. The cyanide plant consists of leaching tanks for the sands and a decantation plant for the slimes. Twice each day about eighteen tons of slimes are discharged, this pulp containing about 60% of cyanide solution titrating from 0.005% to 0.008% KCy. This pulp flows through a ditch to extensive ponds in the desert below the butte. These pouds are securely fenced. The retaining dams for the ponds are made of sand, but no difficulty exists in retaining the small amount of cyanide solution discharged into them. Unfortunately it has been necessary to discharge the waste waters into the same ditch, thus increasing the bulk of water in the ponds. This company has for some time been endeavoring to secure permission to build a separate ditch for the waste water across lands belonging to other parties, in order to discharge it into the desert, but up to the present time permission has not been obtained. The volume of water in the ponds at times causes the breaking of the dams, when for a few days, pending repairs, the waters flow across the desert for a distance of about a half mile. By evaporation in the ponds the cyanide solution becomes slightly concentrated, so that when a break occurs the waters are dangerous for such creatures as cattle, which driuk copiously. Within the past year one cow has thus happened to meet death. The story of destruction of game is absolutely without foundation, and we have yet to learn of any investigation having ever been made by any game warden. In fact there is no such official as county game warden in Kern county. As soon as permission shall have been given to duplicate our present ditch, so as to keep our waste waters apart from the discharge of slime tailings, even the present occasional risk to stray stock will be averted.

I should add that the lands now occasionally overflowed are not owned or leased by cattle men and that there is no stream polluted; so that you will perceive how utterly absurd is this tempest over our mythical "river of death." I must also inform you that at least one of the other mines in this district has experienced a similar difficulty, occasionally causing the death of some cow which has strayed from her range.

COURTENAY DE KALB,
Consulting Engineer Exposed Treasure M. Co.
Mojave, Cal.

Mines of the Cœur d'Alene, Idaho.

Written for the MINING AND SCIENTIFIC PRESS.

One of the most important lead-silver producing regions in the world is fouud in Shoshone county, Idaho, in what is known as the Cœur d'Alene district, in the northeru portion of that State. The country is mountainous, though the slopes are generally not abrupt. Timber is abundant and the country is well supplied with water. This section has long been noted for its mines.

Gold was first discovered at Pierce in this county in 1860, when placers were opened and worked successfully. They are still being worked in a small way.

Wallace is the most important town in the Cœur d'Alene mining district. It is situated in the canyon of the South Fork of the Cœur d'Alene river, where it is joined by Canyou creek and Nine Mile creek. The altitude is nearly 2800 feet above sea level. The rock formations of this region are principally granite and gneiss, but there also occur quartzites and slates, and it is with these latter that the ore deposits are chiefly associated. Most lead-silver ore deposits of magnitude are associated with limestone, but there is no limestone iu the Cœur d'Alene region. The ore deposits occur for most part along zones of fracture in the quartzites. The deposits are mostly large, and usually have a clearly defined foot wall, the mineralization extending out into the hanging wall country without definite limit, but the ore is followed and mined as long as it affords a profit, making the hanging wall limit a commercial consideration and not a geological or scientific one.

The rocks in which these deposits occur are strongly folded in an east-west direction, and this controls the strike of the ore bodies. The strike, however, is not absolutely straight, and this fact, together with the changing direction of outcrops on the surface, due to dip of the inclosing strata and the erosion of the canyons, have led to complicated legal contentions which have furnished some of the most interesting phases of the extralateral right litigation.

The ore bodies range and are worked from 5 feet to over 60 feet in width and from 100 to 2000 feet in length. The gangue is largely siderite (iron carbonate), which being heavier than a siliceous or calciferous gangue, makes concentration somewhat difficult. The dip of the ore bodies is variable, though seldom less than 45° as near Wardner, up to nearly vertical at Mullan and on Cauyon creek.

The greater number of the large producing mines are operated through tunnels, which renders mining much cheaper than where all the ore and water must be hoisted. The tunnel through which the Bunker Hill and Sullivan mines are operated, known as the Kellog tunnel, is 12,000 feet in length, and the Reed tunnel of the same company is 5500 feet long. The Mullan tunnel will be nearly 2 miles long when completed. There are several other tunnels nearly a mile in length, developing various mines.

The only mines in the district operated through shafts sunk from the surface are the Hecla and Tiger, near Burke.

The method of mining is by overhand stopiug, machine drills being extensively used. The stopes are timbered according to their dimensions, and filliug is commonly practiced.

The vertical extent of developed ore bodies is about 4000 feet. That is, the bottom of the Tiger shaft at Burke is 4000 feet below the Hercules outcrop, which is only a few thousand feet distant.

The ore occurs as solid galena in vein-like or irregular masses, and as disseminated crystals through the matrix. In the zone of oxidation are found the usual secondary products of oxidation—lead carbonate and lead sulphate. Zinc and iron sulphides also occur with these ores.

In the several mines are found some interesting geological conditions. The Hercules vein, where cut by its drain tunnel, 1390 feet from the surface, is solid galena 5 or 6 feet thick with a wide zone of low-grade concentrating ore. The croppings of this ore body are described by Robt. Bell, inspector of mines for Idaho, as "an insignificant streak of quartz 6 inches wide, with some spots of iron oxide and lead carbonate, very low grade in lead and silver." The mass of galena above referred to runs 60% lead and

eighty ounces silver per ton, as determined by 10,000 tons shipped in 1903.

Referring to the alteration of the galena in the Hercules mine, Mr. Bell says: "The ore body above No. 2 level exhibits interesting examples of secondary enrichment. Great 'kidneys' of steel galena occur with thick crusts of hard gray carbonate (of lead) and an outer crust of snow-white crystallized lead (cerrusite), often matted with native wire silver."

The greater part of the ores mined in the district are low grade. They are crushed and concentrated and the concentrates shipped. The coucentrating plants handle from 50 to over 1000 tons each per day. The mills are mostly run by water power. The concentratiug equipment consists of rock breakers, rolls, trommels, jigs, conveyiug belts, tables, buddles, vanners and, until recently, canvas tables. There is quite a diversity in the arrangements and operatiou of the several mills, no one mill being supplied with all the devices above mentioned.

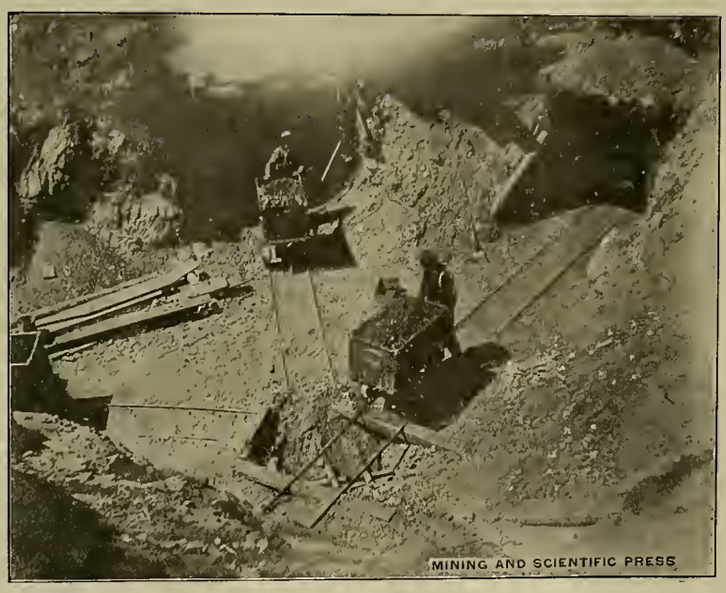
The Cheapest Mining.

Written for the MINING AND SCIENTIFIC PRESS.

In these days when large, but low grade, ore bodies have become popular with investors, it is found necessary to mine these ore bodies at the lowest possible cost, in order that as great a profit as possible may be made from the property. The greatest portion of ore mined is by underground operations, and the science of deep miuing has been so carefully studied and the several methods of mining adapted to suit the various eonditions, that even underground mining is now carried on under experienced management at a cost far below what it was a few years ago; but, undoubtedly, the cheapest mining is that done in open euts, where the ore broken runs by gravity to mill holes. Where the rock is broken in benches and the ore is shoveled into cars and trammed to mill holes, the cost is increased by the expense of shoveling and tramming. If the ore can be broken to run by gravity to chutes, from which it can be delivered to cars, this decreases the expense to the extent of 10 to 18 cents per tòn, according to the wages paid for that class of labor (mucking). Where ore is delivered to a mill hole, as in the accompanying illustration, it is very necessary that large rocks be prevented from going down the ore pass, as they may clog the chute at the bottom, being unable to pass the door. To obviate this, a grizzly should be placed near the top of the mill hole under the tracks, as shown in the engraving. In this instance four old stamp stems were so placed as to form nine rectangular openings, and any rock which would pass the grizzly would also pass the chute door. When the ore is not wet, it is advisable, if the mill hole be vertical or steeply inclined, to allow the ore to accumulate to an extent, at least, which will cover and protect the chute door and timbers at the bottom, and, if the shaft be lined, it is a good idea to allow it to fill to the top, as the ore falling through an empty shaft will quickly cut out the lining and timbers.

In the case of a vertical shaft, it is advisable to have the chute door offset at least 18 inches. It is sometimes desirable to have a quantity of broken ore on hand, that the mill may not be obliged to hang up if there is any cessation in stoping operations from any cause. At such a time a mill hole filled with broken ore is found a convenient thing to have on hand. Such a shaft, 4x5 feet, 100 feet high, will hold 100 tons of broken quartz ore. This amount could be increased largely by first blasting down the upper rim of the mill hole into a hopper-shaped opening. If this "hopper" be made 60 feet square at the top, with a slope angle at the sides of 45°, it will be about 25 feet deep to the rectaugular portion of the shaft. This will reduce the capacity above calculated (100 tons) to 75 tons; but in the hopper-shaped opening at the top will be storage room for nearly 600 tons of ore, if the cars dump at the edge of the pit; but this amount can be largely increased if provision be made to carry the tracks over the pit, so that cars may be dumped at or near the middle of the excavation. If the hopper were level full it would hold about 1500 tons of ore; but this is impossible without, as suggested, bridging over the hopper of the mill hole. Rock running from a car finds a state of rest when the slope angle reaches about 35°. It is evident that unless some provisiou be made for the track to project over the rim of the hole, or extend across it, its capacity will be greatly diminished. In the case here illustrated, the ore is obtained from other cuts situated at a higher level, where the ore runs to chutes, is delivered to cars, trammed to the shaft shown in the cut (an incline), which is temporarily used as a mill hole. From the bottom of this shaft the ore is drawn into cars, again trammed 600 feet to a second (vertical) shaft, down which it falls, to be drawn a third time into 3-tou cars, aud is then hauled by electric motor to the crushers.

Everywhere that it is possible ore should be handled by gravity and as few times then as possible. The writer knew of an instance where ore hoisted from a shaft was trammed 300 feet on the surface, dumped into an inclined wooden chute; loaded into 1800-pound cars, trammed 400 feet, dumped into a vertical shaft 60 feet deep, drawn into 2200-pound cars and trammed 700 feet to the mill. This required on each shift three trammers at $2.25 per day, and often an extra man at the inclined chute to keep the chute clear, as the rock would clog up the chute and refuse to run if the chute became full. The ore contained a large amount of fines, and, being damp, packed hard in the chute. The upper track was extended by a new superintendent around the hillside to a point near the vertical chute, so that ore could be delivered to that chute by one trammer from the shaft. This arrangement dispensed with a trammer and part of the time of a helper on the middle section on each shift, and also the expense of maintaining the inclined chute. The total cost of making the change was $600, the rails on the middle section being used on the new extension of the upper track. The saving effected was for the trammer on the two shifts and the time of a helper part of the time, costing about $6 per day. In less than four months the cost of the change had been saved in wages, beside the annoyance of clogged chutes and consequent delay all along the line. These are small economies, but of a practical kind which a little thought can remedy.



Open Cut, Melones Mine, Showing Mill Hole.

Radium-Bearing Mineral in Quebec.

A radium-bearing mineral has been discovered in an abandoned white mica mine back of Murray bay, Quebec, by J. Obalski, inspector of mines, says the Electrical Review. At the recent meeting of the Canadian Mining Institute Mr. Obalski exhibited specimens of the mineral and gave an account of its discovery. Uranium ores are the only ones in which radium has been found. In the Canadian Laurentian formation uranite composed of oxide of uranium and other rare metals has been met with in the pegmatite dikes, which have been operated as producers of white mica. In certain of the mines monazite, uranite and samarskite have been noticed. About ten years ago Mr. Obalski discovered a remarkable specimen of clovite in a white mica mine. This specimen, which weighs about seven ounces, has been found to contain about 70.71% of uranium. It is well crystallized and has been found strongly active upon photographic plates. It also has a marked action on the electroscope. This specimen was submitted to Prof. E. Rutherford of McGill University, who found that it contained one-tenth of a milligram of radium, making it comparable with the best grade of pitchblende so far operated for radium. Mr. Obalski also found a carbonaceous material, buruing quite easily and leaving a large proportion of ash, which contained 2½% of uranium, based on the original weight of the coal. The color of the ash was an olive green, due to the presence of uranium oxide.

The Use of Cyanide of Sodium.*

Written by ROBERT B. LAWRIE.

Until recently the cyanide generally employed for gold extraction was the standard 98% cyanide of potassium. The cyanide, although sold as "cyanide of potassium," was in reality a double salt, consistiug of a mixture of the cyanides of potassium and sodium, as it was found to be impossible (without an impracticable amount of chemical refining) to obtain commercially even 98% with the use of potassium alone. It is, of eourse, well known that it is the cyanogen contained in the cyanide which is the active gold extracting constituent, and that with a given cyanogen strength it is immaterial whether this cyanogen is in combination with potassium or sodium, so long as the product does not contain any impurities which will act detrimentally on the extraction of the gold. As the chemists at the mines had become accustomed to the use of this double salt, and in some cases objected to any alteration from what they had been in the habit of using, most of the manufacturers were content to continue supplying the usual strength, although they were aware that it contaiued from 15% to 30% of useless though innocuous foreign matter.

The recent development of the electrical industry, especially in its application to chemical manufactures, has, however, almost entirely revolutionized the cyanide trade. The sodium cyanide made at Leven, England, is produced in the form of snow-white flakes which are subjected to a pressure of about three tons per square inch, and are thus compressed into hard bricks of equal weight and reudered free from any objectionable dust. The advantages may be summed up as follows: Higher cyanogen strength, greater extractive power, decreased freight charges, greater solubility, freedom from alkaline sulphides, and saving of labor at the mines.

It is still customary to state the strengths of all cyanides in terms of potassium cyanide, and the sodium cyanide now in use is therefore sold as equal to a given strength of cyanide of potassium, say, 120% or 125% cyanide of potassium, as against the old standard 98%. One hundred pounds pure potassium cyanide (KCN) contain 60.0 pounds potassium and 40.0 pounds cyauogen, while 100 pounds pure sodium cyanide (NaCN) contain 46.9 pounds sodium and 53.1 pounds cyanogen. The sodium cyanide is thus relatively richer in cyanogen than the potassium cyanide, since 100 pounds of it contain 53.1 pounds of cyanogen, as against 40 pounds cyanogen in an equal weight of potassium cyanide. In other words, 100 pounds of pure sodium cyanide will dissolve as much gold as $\frac{53.1 \times 100}{40} = 132.7$ pounds of pure potassium cyanide. Or for trade purposes, where, as already stated, it has always been customary to refer the strength of cyanide to potassium cyanide, the above pure sodium cyanide would contaiu cyanogen equivalent to 132.7% KCN, and therefore 100 pounds weight of pure sodium cyanide would dissolve as much gold as 132.7 pounds of pure potassium cyanide. But, in addition to carrying this greatly increased proportion of cyanogen in a giveu weight, it is also claimed for the new cyanide that, strength for strength, it has a higher extractive power, no doubt owing to its freedom from objectionable impurities.

J. Matthey & Co., of London, recently made some comparative tests between cyanide of potassium (double salt) and the cyanide of sodium. The results showed that, "with solutions of exactly similar strengths, the gold extraction with the sodium cyanide was 5.93% to 7.99% better than with the double salt potassium cyanide." Consequently 100 pounds of cyanide of sodium testing equal to 125% KCN would extract as much gold as 132 to 135 pounds of the usual 98% double salt.

It is evident from the above that purchasers of the ordinary 98% double salt are paying extra freight and inland carriage on impurities instead of obtaining a comparatively pure article of at least 20% or 25% higher strength. Metallurgical chemists report that the average strength of cyanide of sodium is 20% greater than that of cyanide of potassium, so that, even allowing for a difference in price, there is considerable saving of freight on the decreased bulk

* Abstract from London Mining Journal.

of material carried. The first cost, however, strength for strength, is usually in favor of the sodium cyanide, and it will be seen that, with sodium cyanide equal to 125%, the total costs for freight and handling are reduced by one-fifth. This reduction on the heavy freights and inland carriage, along with its slightly lesser initial price, considerably reduces the cost of the cyanide delivered at the mines.

Owing to the double salt being in every case supplied in a fused state, mechanical means must be used for mixing the cyanide in the dissolving tanks at the mines. The cyanide of sodium, being in the form of firmly compressed flakes, dissolves almost immediately upon being brought into contact with the water in the tank. Experiments showed that the time required for dissolving the fused double salt was (1) with agitation 40%, and (2) without agitation 80% greater than the time required for dissolving a similar weight of compressed cyanide of sodium.

It has been found that it is almost impossible to obtain the fused double salt absolutely free from alkaline sulphides. J. Grossmann, in a paper read before the Society of Chemical Industry, in London, on December 7, 1903, stated: "I have never come across cyanide produced in that way which does not contain at least traces of sulphide, whereas cyanide made by the wet process is absolutely free from it." Although it has long been recognized that the presence of even a small quantity of alkaline sulphides has a most prejudicial effect in retarding the action of the cyanide on the gold in the ore under treatment, it is strange that sufficient importance has not hitherto been attached to the selection of a cyanide free from sulphur in this objectionable form. This was no doubt due to the belief that absolute purity in that respect could not be attained. W. Skey, analyst to the New Zealand Government, said: "Experiments showed that while pure 1% cyanide solution dissolved a given weight of gold in ten minutes, a solution of the salt of the same strength, but containing 1-100,000th part of sulphur as a sulphide, required two hours to dissolve the same weight of gold. The speeds were as 12 to 1 in favor of the pure cyauide." As a result it has usually been found necessary to add a certain amount of acetate of lead to the ore in the cyanide vats to counteract the effects of the sulphides in the cyauide used. By the use of the wet process a cyanide is produced which is said to be free from any trace of alkaline sulphides, and the treatment with lead acetate, which is a costly chemical at the mines, can, therefore, be dispensed with, unless such treatment is required for the purpose of neutralizing sulphides in the ore itself. It is, of course, clear that anything that will hasten the action of the cyanide on the gold must tend not only to increase the capacity of the plant by enabling a greater number of charges to be put through in a given time, but also to lessen very materially the loss of cyanide in the course of treatment of the ore.

From the foregoing it will be seen that with high-strength cyanide of sodium the labor at the mines is considerably reduced: 1. The bulk of cyanide to be handled is reduced by at least one-fifth. 2. The cyanide being compressed into bricks of equal weight, any required quantity can be added to the dissolving vats without the trouble of weighing. 3. Owing to greater solubility of the cyanide, the solution can be prepared in a much shorter time and without agitation. 4. Owing to its freedom from alkaline sulphides, the time during which the cyanide solution must remain in contact with the ore is reduced. 5. The time required for washing the gold-bearing cyanide solutions from the residual sands or slimes is also greatly reduced. On this point Johnson, Matthey & Co., referring to their tests, state: "The resultant tailings after treatment with sodium cyanide were much more readily washed than those from the potassium cyanide."

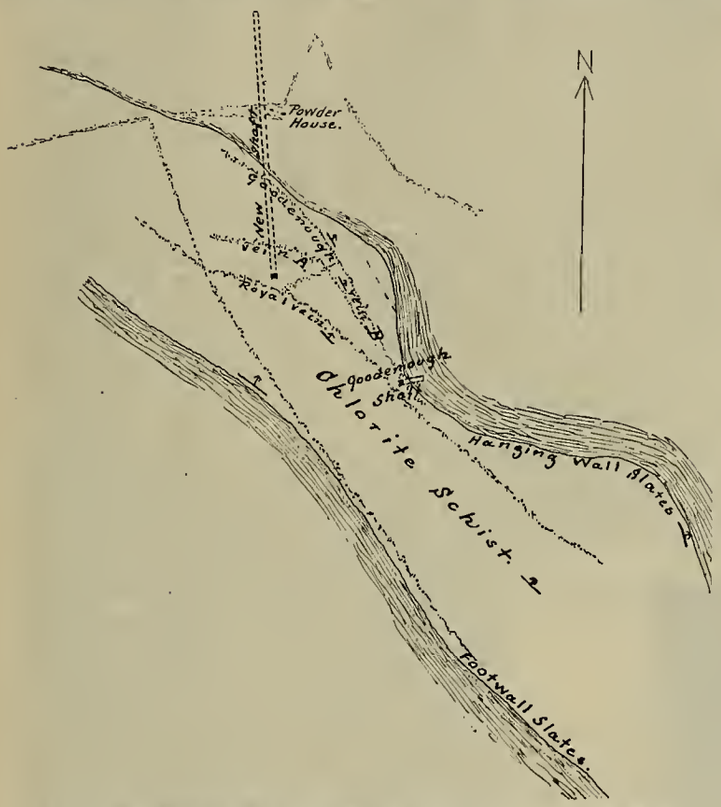


Fig. 1.—Plan Showing Relation of Veins to Country Rock, Royal Con. Mine, Calaveras County, Cal.

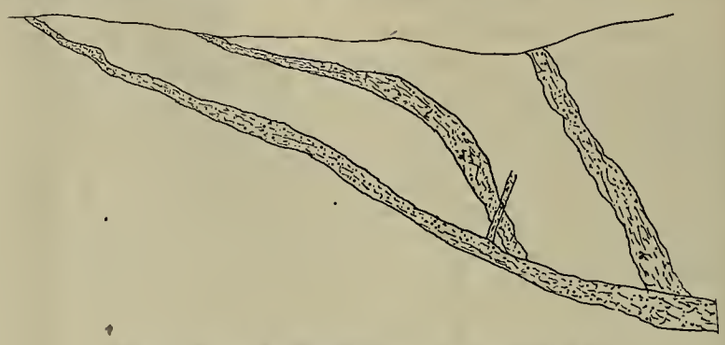


Fig. 2.—Section Showing Relation of Veins in Royal Mine.

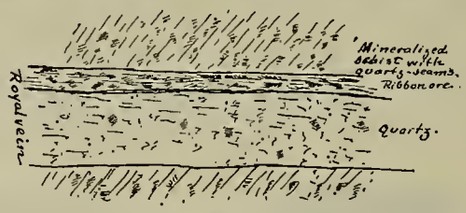


Fig. 3.

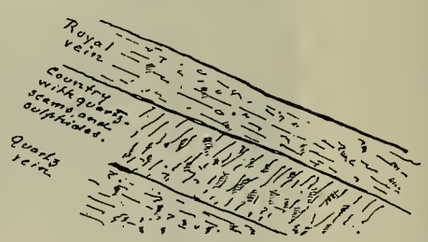


Fig. 6.

Fig. 4.

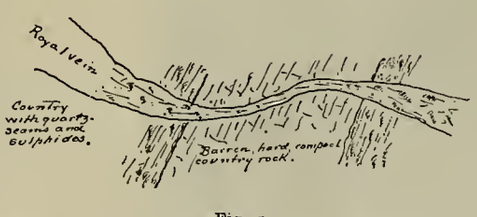


Fig. 5.

Fig. 7.

Uranium in Germany.

The Neue Weiner Tageblatt of Vienna reports that at a meeting of the Mineralogical Society F. J. Becke, professor of mineralogy, spoke of uranium pitchblende. Prof Becke, jointly with Prof. Suess, has made investigations at Joachimsthal, the place where uranium is mined. The places where it is found are the deep workings of the silver mines of Joachimsthal. He mentioned the experiments which were made with uranium pitchblende ores at the Imperial Museum of Natural History. The ores have been in possession of the museum since 1806. The experiments demonstrated that, in spite of their age, they have lost absolutely nothing of their intensity of radio-activity and the energy of their electric properties. They do not differ in any way from the ores now taken at Joachimsthal.

THE cost of freighting should not average more than 25 cents per ton per mile, yet owing to badly constructed roads it is often double this figure. This in time represents a very large amount of money if a great deal of freighting is done over the road.

Genesis of Ore Deposits at the Royal Mine, Hodson, Cal.

Written for the MINING AND SCIENTIFIC PRESS by WM. FORSTNER, E. M.

The Royal mine, Calaveras county, Cal., is about 2 miles west of the large diabase extrusion of the Bear mountains, and several miles west of the mother lode or auriferous slate belt of California. As it lies within rocks of the Calaveras formation, its history is more or less related to that of the latter belt, and the following description by Ross E. Browne can be applied to the vicinity of the Royal mine:

"The belt is composed of more or less conformable series of highly tilted slates and metamorphic schists, with intervening layers and occasional intrusions of igneous rocks. The general strike of the strata is northwest, and the dip to the northeast. The cleavage of the slates corresponds partially with the tilted bedding planes."

The Royal mine (see Fig. 1) lies in an intervening layer of diorite, altered into chlorite schist. Owing to the extremely complicated structural geology of the region, positive assertions as to the relative age of the eruptive rocks are unsafe. There is, however, a great probability that the Bear mountain diabase, which has a general northwest strike, is related to the metamorphism and the resulting fissility of the formations west of it, and is, hence, of a later date than the diorite, which was probably, at the time of this diabase extrusion, altered into the schist wherein the Royal mine deposits were later formed.

This diorite was probably intruded during the first recorded period of dynamic activity on the west flank of the Sierra Nevadas, which occurred at the close of the Paleozoic period, and which caused the schistosity of the older rocks. (See also H. W. Turner, Journal of Geology, volume 3.)

Between the Royal mine and Bear mountain there is a belt of Mariposa slates, unconformable with the enclosing Calaveras. These have probably been folded at the time of the post-Mariposa upheaval, which was

accompanied by the outburst of an enormous quantity of igneous material, and to which belong the diabases and porphyrites of the region, as also, probably, the Bear mountains, which are formed by an intruded diabase dike. (See also H. W. Turner, 14th Annual Report, United States Geological Survey, Part II, p. p. 457 and 471, and 17th ibid., Part I, p. 671, and W. Lindgren, 17th ibid., Part II, p. 31.)

The Calaveras slates on both walls of this belt of altered diorite are similar in texture. They have been explored to a great extent in the underground workings of the Wilbur Wamble mine, a southeastern extension of the Royal mine, but only slightly at a few places in the Royal mine, and their course and extension in the northwestern part of this mine is as yet undetermined. There the slates on the hanging wall form only a narrow belt, to the northeast of which lies another body of schistose rocks intersected by numerous quartz veins. The slates are traversed by quartz seams, sometimes so minute as to be hardly discernible with a strong glass, and always impregnated with sulphides, generally very minute.

The diorite has been thoroughly altered into chlorite schist. Several samples of this material were submitted to the California State Mining Bureau, which gave the following determination: "Chlorite schist altered from diorite, schistose, badly altered, contains abundance of chlorite, altered from hornblende, the feldspar partly changed to calcite and kaolin; belongs to the older (Calaveras) formation."

This belt of chlorite schist is from 400 to 1000 feet wide. The foot wall is much more clearly defined than the hanging wall.

Throughout the belt several quartz veins can be traced at the surface, having varying strikes and dips. The principal strike is, however, to the northwest, with a subordinate north and south system.

The Royal vein proper (see Fig. 2) has a much flatter dip than the other veins, and, being the youngest, it cuts through the others at all intersections. This vein is formed by a band of coarse, white quartz, which has all the characteristics of being the result of the replacement of the schistose country rock by quartz, the texture of the former being often clearly discernible in the latter. There is practically no gouge on either wall.

As a general rule, this coarse, white quartz is only slightly impregnated with sulphides. In many places a ribbon structure can be observed, over a width seldom exceeding a few inches, either on the hanging or foot wall (see Fig. 3). This ribbon structure is due to alternating narrow bands of quartz and country rock, the latter always very highly impregnated with sulphides, which in places nearly entirely replace the rock. These bands of ribbon ore are much richer in gold values than the adjoining quartz layer, but are generally only found near the intersection of the Royal with the older veins. The direction of the bands is generally parallel to that of the Royal vein. Only in one place was this structure observed making an angle with that direction (see Fig. 4).

In the ground at present developed above the 400 level, east, the relation between the Royal and veins 3 and 4 can be pretty well traced (see Fig. 2). On the 200 level, east, veins underlying the Royal have been worked to a small extent. From the 400 to the 600 level, east, the main excavation follows the line of intersection of the Royal with vein 4, and also, probably, partly with vein 3, which, as might be expected, formed a wide zone of strong mineralization. This excavation is so extensive that the relation between the cross veins found above the Royal at the 400 level, east, and below the Royal at the 600 level, east, cannot be fully determined, but the two veins found between the 600 and 700 levels, east, just under the Royal, agree in strike and dip with 3 and 4, and are probably identical with the latter. The line of intersection crosses the main shaft near the 800 level, where a very wide body of ore was found. In the 900 and 1000 levels, west, the Royal vein is narrow until a distance of a couple of hundred feet west of the shaft is reached. The same intersection probably causes this enrichment.

Underground the contact of the Royal vein with the Calaveras slates of the hanging wall is found at three different places, in the 300 level, east, 400 level, east, and 600 level, east, the strike of both making a pronounced angle. The little work done at those points indicates that the Royal vein does not persist past the belt of chlorite schist, but bends along the contact underground, as it does in its southeastern extension at the surface (see Fig. 1). We may, then, assume that the Royal vein fissure is due to earth movements posterior to those which formed the Calaveras slates, and that the latter acted as an impervious stratum.

The system of cross veins to which 3 and 4 belong make a sharp angle with the strike of the Royal vein, and their dip is much steeper. The character of their structure is different from that of the latter. They consist of narrow seams of the same coarse, white quartz as that forming the main body of the Royal vein, having still the texture of the schistose country rock, and occasionally forming bunches of quartz, with intervening bands of country rock, generally wider than the quartz seams. The latter are nearly barren, while the intervening bands of country rock always carry some sulphides, and are very often heavily impregnated with sulphides. The latter, however, are rarely found in bands nearly entirely composed of sulphides, as in the Royal vein.

The sulphides are generally rather fine, and experience teaches that the finer the sulphides the better the values they carry in this mine.

All the rock in this belt of chlorite schist is to some extent impregnated with sulphides and carries some slight values in gold. The zones of higher mineralization are allied, as above described, to quartz bands, and the question naturally arises, What is the genetic relation of the two phenomena?

The sulphides in the schistose rock are independent of the quartz seams, nor are they coated or surrounded by quartz films. Often pieces of rock can be found, apparently barren, which when broken show considerable sulphides without any surrounding quartz.

The above described rich bands of ribbon ore sometimes found in the Royal mine lay in the orientation of this vein, and hence are not the result of the fracturing which caused the cross veins, notwithstanding they occur at or near the intersection of the Royal with those cross veins.

The entire mineralization of the belt must be related to its metamorphism, and probably the iron contained as an oxide in the diorite was changed during the process of metamorphism partly into chlorite, partly combined with sulphur into sulphides. The formation of these iron sulphides may be analogous to the metasomatic alteration classified as propylitization (see Prof. Vogt and W. Lindgren, "Genesis of Ore Deposits," Am. Inst. Min. Engs., p.p. 660 and 565), a solfataric and thermal alteration of metasomatic action, affected by attacks of hydrogen sulphide, or alkaline sulphides, and often also of carbonic acid. The pyrite is derived from the iron-magnesian silicates and the iron oxides of the original rocks.

As to the relation of this alteration with the formation of the quartz veins, the genesis of these sulphides may be related to that of the older type of impregnations in the mother lode, described by W. Lindgren (Bulletin Geological Society of America, volume 6, p. 226) as a zone of iron pyrites disseminated in dynamo-metamorphic schists; older than the principal quartz veins and contemporaneous with the dynamo-metamorphism which produced the schists.

The concentration of these sulphides in certain zones, which clearly are also zones of more intense shearing, may be due either to secondary concentration or to the fact that the hydrogen sulphide, which caused the transformation of the iron from an oxide into a sulphide found easier circulation through the rock mass at those points.

While propylitization takes place at relatively small depths, the transformation of iron oxide into sulphide, being an endothermic reaction, must take place under the influence of great heat, due to the mass-dynamical action which was the cause of the metamorphism. Hence this sulphurization took place under conditions wherein silicic acid is, at least partly, ionized, and less subject to deposition. At a later period, under conditions of less pressure and temperature, silicic acid entering into the colloidal state would be more readily deposited. (See C. R. van Hise, Bulletin Geological Society of America, volume IX, p. 273 and following.) The great uniformity of the chlorite schist would tend to suggest that its deformation took place under great pressure.

In the zone of cementation quartz is the prominent substance of deposition, here carried on by replacement. That the quartz carries so little sulphides may be due to the fact that those parts of the rock mass heavily impregnated with sulphides resisted the metasomatic action of the solutions during the deposition of the silicic acid much more than those less impregnated.

The fact that the habitat of the sulphides is largely restricted to the country rock, and that the quartz is relatively barren of sulphides, precludes the hypothesis that the sulphides have been formed by the ascending solutions which formed the quartz veins. Neither does it seem probable that the quartz veins were formed prior to the sulphides, as the latter demand for their birth greater pressure and temperature than the quartz.

Pyrite is soluble in cold solutions of alkaline sulphide and in hot and cold solutions of alkaline carbonates, partially saturated with hydrogen sulphide, and is deposited from such solutions. At Sulphur Bank, California, this process has been observed (see Prof. J. Le Conte, American Journal of Science, third series, volume 24), but there this deposition is accompanied by that of gelatinous silica.

The nature of the deposits, especially whether they be metalliferous or not, will depend upon the relative proportion of the alkaline carbonates and sulphides in the solutions, the former being the main solvents of gangue minerals, the latter of metallic sulphides. As the maximum capacity of solution for various substances have different temperatures, selective solution and precipitation will very often take place C. R. van Hise, "Genesis of Ore Deposits," Am. Inst. Min. Engs., p. 317 and following), and while admittedly the hot ascending waters will (due to loss of heat and pressure and because of chemical changes) deposit in their course quartz, earthy carbonates, metallic sulphates and sulphides, the character of the ore deposits in the Royal mine, with marked preponderant habitat of the sulphides in the country rock, must lead to the hypothesis that the fissure filling which formed the quartz veins was caused by solutions principally charged with alkaline carbonates, not having the composition required for dissolving the already formed sulphides. The relative absence of alkaline sulphides and hydrogen sulphide, and the preponderance of carbon dioxide in these later solutions, is in accord with the admitted fact that in the upper zone of the underground water circulation carbon dioxide forms an important element, but does not explain why, especially in the cross veins, so very few inclusions of sulphides are found in the quartz seams. The hypothesis that the latter were formed prior to the concentration of the sulphides can hardly be accepted, as the latter would demand a greater heat than required for the formation of quartz deposition, and as this heat could not have been caused by static pressure, there being no evidence of considerable denudation, its presence would demand great dynamic pressure. The continuity and regularity of the veins tend, however, to disprove the occurrence of any important earth movement posterior to their formation.

Concentration of Low-Grade Copper Ores.

Written for the MINING AND SCIENTIFIC PRESS by W. J. ADAMS, E. M.

The writer was selected to make a series of exhaustive tests on the concentration of copper ores from the typical varieties existing in a mine in California by the Elmore oil process, and the following embody the results which were obtained:

Copper mines show clearer characteristics of secondary enrichment than those of other metals, and after the richer surface ores are bottomed the unaltered ores are generally found not only very much poorer in metal, but this metal is combined with iron and sulphur to form a compound much more refractory and expensive to treat. The surface ores are generally oxides and carbonates, which are never susceptible to any form of mechanical concentration, but where they consist of chalcopyrite, bornite and chalcocite can be profitably reduced in weight and enriched in value by several methods, dependent on the distribution of the mineral in the matrix and the character of the gangue, as well as that of any associated minerals. The mineral itself also has an important bearing on the adaptability of any particular process.

Among the very brittle minerals chalcopyrite stands as one of the most brittle and easily slimed of all, equal to the comminution and sliming of the tellurides and molybdenite, and its concentration to a high efficiency has always been a very difficult problem.

The character of this particular ore presented exceptional difficulties to any of the well-known methods of water concentration, and it was so refractory to direct smelting that only the higher grades were capable of standing the high reduction charges incurred. The matrix was slate and amphibole schist, which, though soft, is very tough, and in crushing resists grinding and the enclosed mineral gave a very large quantity of slimes, mainly of the chalcopyrite. The associated mineral is iron pyrites, and though containing very little copper is generally present in great abundance. These minerals occur disseminated through the gangue in specks, seams and bunches of greater and smaller width and size.

In order to acquire a thorough knowledge of the ore, the first step taken was that of concentration by gravity alone, such as is employed to demonstrate very closely the actual results that have been obtained on vanners, tables, etc., namely, hand panning of a weighed quantity, and repanning the tailings till no more concentrates are obtained. Knowing that the concentrates were clean mineral the only assays made were of the ore and tailings, to determine the percentage that could be saved. Many and varied samples from all parts of the mine assaying from a trace to 7½% copper were tested. Over thirty experiments were made; the ore being first crushed to pass a screen of twenty meshes to the linear inch (which was determined to be too coarse). All the concentrates were weighed and the percentage of bulk saved was calculated, but the tailings of only ten typical samples were assayed. These tailings were divided by water separation into slimes and sands and separately assayed so as to determine the proportionate loss in each. The following table gives the results:

No.	Assay Copper in Ore.	Per Cent Weight, Concentrates Sand.	Assay Copper in Slimes.	Assay Copper in Sand.
1	0.10%	12%	0.10%	Trace
2	2.62	49.6	3.55	0.50%
3	7.65	33 1	....	1.90
4	5.04	32.8	5.75	2.65
5	0.90	22 9	2.70	0.65
6	0.60	35.6	2.60	Traces
7	4.10	38.5	5.65	2.05
8	Trace	4.2	0.65	0.55
9	2.70	29.3	4.75	0.95
10	5.90	42.4	6.25	Traces
11	0.65	23.7	0.80	Traces

In the operation of panning it was noticed that there was not only an excessive quantity of slimes, but that these slimes carried the majority of the chalcopyrite, only the coarse particles being saved

with the concentrates and a very small proportion of the slimed mineral. In fact, though only passed through a screen of twenty mesh, nearly every particle of chalcopyrite was slimed.

Judged hy their appearance as well as tabulated results the concentrates are only the iron pyrites carrying a trace of copper, some coarse chalcopyrite and a little slimed chalco. The result of these tests showed that gravity concentration only eliminated the harren minerals and left the copper in the tailings.

The last sample tried showed a content of .65% copper, was screened through a screen of thirty meshes to the linear inch, and though the panning showed a cleaner separation from the coarse hornhlende in the concentrates the results were practically the same. To determine the proportions in the sizing of this material, a screening test of this sample was made and the result added another link in the chain of investigation.

Residue Left on		
40 mesh	26½%	
50 "	15	
60 "	7	
70 "	10	Minerals show it to be all iron pyrites.
80 "	5	
90 "	5	
100 "	2½	
Slimes	32½	Minerals are chalcopyrite and pyrites.

This showed that hy dry screening alone, after crushing to thirty mesh, the copper contents passed off with the slimes; and to definitely determine this another experiment was tried on a number of samples typical of different classes of ore in the mine.

In these tests the ores were crushed to pass a screen of thirty meshes to the linear inch and then were directly sifted through a screen of 100 meshes and the resultant products of sands and slimes weighed and assayed for copper.

It should he explained that the several samples were divided, and the column of original assays of ore represents one portion and the columus of assays of slimes and sands represent those of that half of the sample taken for experimental purposes, and this fact prohahly accounts for the small apparent discrepancy of original assays and those of the treated sands and slimes.

No.	Assay Copper in Ore.	Per Cent of Slimes.	Per Cent of Sands.	Assay Copper in Slimes.	Assay Copper in Sands.
1	3.85%	42.9%	57.1%	5.00%	4.00%
2	10.70	40	60	12.50	10.50
3	1.80	40	60	5.70	4.90
4	6.10	40	60	7.00	5.85
5	2.00	40	60	2.80	2.00
6	1.30	40	60	2.00	1.40
7	7.10	40	60	8.80	8.20
8	3.40	40	60	5.00	4.40
9	3.15	40	60	4.15	3.00
10	2.65	40	60	5.10	3.40
11	4.10	40	60	6.25	4.20
12	6.50	35	65	3.00	1.90
13	1.35	35	65	2.90	1.55

We see here that the slimes constitute 40% of the total, and the sands 60%; hut the former carry an average valuation of 5.40% copper and the latter only that of 4.25%, or the slimes, where the losses occur are over 29% richer, hulk for hulk, over the sands. Had these samples heen screened under water the proportion of chalcopyrite in the slimes would have been more than douhled.

A curious test was made which clearly showed the buoyancy of dry chalcopyrite and the mutual attraction between it and iron pyrites. Ahout a pound of crushed ore carrying 20% to 30% of mineral was steadily, hut rapidly, poured into a tank of water, which was filled 2 feet deep. Innumerahle glohules of dry iron pyrites, coarse and fine, rose to the surface, in size from a pinhead to ⅜-inch diameter. In touching these with the point of a pen knife the iron pyrites dropped off and at once sank in the water, hut the inside lining of the air buhhle was ahsolutely pure-slimed chalcopyrite which entirely floated, spreading out like a patch of gold leaf. Here the chalcopyrite, in falling through the water, enclosed the air mechanically carried down hy the flow of the ore, attracted even moderately coarse iron pyrites and rose to the surface like a halloon, hut even ou reaching the top of the water the air was contained through the adhesiveness of dry-slimed chalcopyrite, and itself would not sink even after the air buhhle was hurst and the slimed mineral wetted.

Following out these investigations that proved the high percentage of copper values held in the slimes it became a matter of economic interest to save the values in these iudependent of the sands, but while still combined in the total pulp the process of segregation by oil, and known as the Elmore oil process, had already heen proved a practical success in Wales.

The Mining Department of the State University of California had already acquired a complete set of the Elmore apparatus, the mixing cylinder, full sized in diameter, but reduced in length for hand power, as well as a full-sized centrifugal separator.

Through the courtesy of President Wheeler and Professor Christy, the writer enrolled as a graduate student and was given every facility possible to carry on the investigations, as it was seen to he of great value to the general copper industry of the entire State.

As the oil concentration is essentially a process ou slimed mineral (though it takes up coarse mineral), it was advisahle to eliminate as much of the coarser sulphurets as possihle. and particularly as these consisted principally of iron pyrites, and in this way reduce the burden on the oil as well as the quantity of pulp to he treated hy it.

The closest-saving mechanical device ohtainahle, which is far inferior to the work of vanners or tahles, was a small model power jig with a hed 2½x4 inches long on a hed screen of forty mesh. With its employment, however, a clean concentrate was obtained in hoth the hutch and the bed and definite facts were estahlished.

Before going into details, an explanation is due in regard to the discrepancy in the assays of these results. The ore was very irregular in its distrihution of the copper minerals and yet could not be crushed fine enough to allow of an intimate mixture and carry on the various steps, so that all the calculations were based on the assays of the final products where accurate sampling could be obtained. Also, the small percentage of copper contained in the sample makes ahsolutely accurate determinations very uncertain, unless several days are employed in the analysis of each sample.

In the same manner as in the previous tests a very large number of samples were taken directly from the mine and dumps, typical of its different characteristic ores, of surface, different depths, and from the dumps as exposed to oxidations and chemical changes from weathering. These were separately assayed and then divided into lots of different grades according to the results obtained. Each grade was carefully mixed together, hut without grinding to a finer state than the two and a half meshes to the linear inch originally employed, was resampled and assayed.

Several experiments were made with the ores of lowest grade before the regular tests were entered on, and the most feasihle size of screen and the general method determined that would he advisahle to employ in actual practice. Ore crushed to pass a No. 8 screen was shown to be the coarsest size possihle to use in jig work, and was adopted in all the tests, except the final one, in which the different products were not dried and reground. In order to determine the quantitative results in each stage of the process, all the products had to he dried aud weighed and then ground and sampled, and this drying oxidized materially hoth the fine and coarse sulphurets, and to such an extent as to reduce the efficiency to a large degree of the subsequent oil treatment.

(TO BE CONTINUED.)

Obtaining Mean Velocity of a Cross-Section in Gaging Streams.

In measuring the discharge of streams of any character, whether rivers, canals or flumes, when using a current meter, I helieve it is the common practice to first make the measurements of depth at regular intervals across the stream, then dividing the width of the stream into sections of greater or less width, according to its size and character, taking the velocity, hy means of one of the recognized methods, either the point, the six-tenths or the integrating method, and taking the velocity for each section as heing the mean of the velocities entertained with the meter at each side of this section. In the case of the two end or shore sections the velocity at the edge is taken to he zero, and the mean velocity is therefore taken to he the mean of the ohserved velocity at the first station and zero, says H. F. Rohinson in Engineering News.

This practice I helieve to he wrong, though as most of my work is to he compared with measurements taken hy others who use that method I, perforce, must also do so. If this end section is a triangle with hank slopes of 45° and smooth sides, this method would he proper. When, however, the slopes are either very flat or nearing the perpendicular, and particularly where the sides are actually perpendicular, as in the case of a rectangular flume, this will certainly not give correct results.

Some time since, the late Benj. F. La Rue, C. E., then professor of civil engineering of the International Correspondence Schools, in connection with this suhject, wrote a private letter to one of his students, which the writer has lately had the pleasure of seeing, as follows:

It is somewhat erroneous to consider the mean velocity for the first section and for the last section to be one-half the velocity at the first and last stations. This is virtually assuming the velocity at the edge of the stream to be zero, which is far from being the case. While no absolute rule can be given for this, I would be inclined to take the difference between the velocity of the water at the edge and its velocity at the first station to be, say, from about 1½ to 1¾ times the difference between the velocities at the first and second stations. I think this would represent the actual conditions with reasonable accuracy. It might be well to make the ratio 1½ in a stream having a reasonably irregular edge, and 1¾ or less in a channel having straight or nearly perpendicular sides.

This rule followed out would make a material difference in the results obtained from that commonly used.

Concrete in Mining and Metallurgical Engineering.*

NUMBER III.

Written by H. W. EDWARDS.

CONCRETE CONSTRUCTION. — Unquestionably, the mixing of the ingredients hy machine is much hetter than hy hand, and in my experience if more than 80 cuhic yards of work be required, it will pay to install a mixing apparatus. My experience has been confined to home-made mixing machines. The apparatus I have used is a cuhical woodeu hox lined with No. 10 sheet steel and having an iron manhole at one corner. The box is mounted on two corners or trunnions, one a piece of 3-inch pipe through which the water is introduced, and the other connected hy means of a gear wheel and pinion to a hand crank. The manhole is turned up to receive the charge from the hopper and is then fastened down. The hox is then revolved a few times to give the ingredients a dry mix. The necessary quantity of water is then introduced hy hose and nozzle through the hollow trunnion and the revolving continued as long as required. The manhole is removed and the hox partly rotated, so that the contents are discharged into a wheelharrow for transportation to the work. Too far a trip for a wheelbarrow is to he avoided, unless precautions are taken, because the liquid separates from the mass, and, if in a leaky wheelharrow, is lost, or if in a tight iron wheelharrow, the workman often empties the "slush," which is mostly cement, elsewhere than where it ought to go. In order to avoid this action it is hest to dump the material onto a small platform of sheet iron, remix it by turning over, and then shovel it to its proper place.

Machines on the pug-mill type, which deliver the concrete after a definite and invariable number of revolutions, are not so satisfactory as those of the hox type, which permit the mixing to he continued as long as desired.

Mixing hy hand consists merely in turning a shallow hed of the ingredients over and over with shovels on a platform. The shovels should go fully down to the platform and the material turned completely over. A sheet iron platform lightens the lahor.

It is also essential to have all parts of the hatch equally wet, otherwise hy having some parts wet and some parts dry, the drier part will set before the wetter and thus cause stresses within the mass, which may sooner or later lead to ugly cracks.

With referencc to the quautity of water required, this depends largely upon the climate and the season. In a hot, dry climate, Arizona for instance, much more water is necessary than in a moist, cool climate; also in summer more water is required than in winter. I have experimentally made the mixture so wet that on stepping on the fresh concrete one would sink in over the shoe tops, yet, on drying, the wet concrete had a smoother appearance than similar concrete containing less water which required to he heavily tamped; furthermore, I have never seen any evidence which led me to douht the strength of the wet concrete. On the other hand in cool, moist weather, I have used the concrete so that it appeared only slightly moist, aud persistent heating was required to force the water to the surface.

In general and within reasonahle limits, the wetter the mixture the easier is the work of thorough mixing. It is best, perhaps, to follow a medium line, hut no fixed rule can he laid down, for the reason that different kinds of rock and cement require different quantities of water. It is easier to make the mistake of having it too dry than too wet. A good rule to follow is to have the concrete so wet that it will shake like a jelly when being rammed into place with a heavy heater, and will only just support the beating tool. In dry weather only should it be fully up to this limit, keeping it somewhat stiffer in wet, cool weather. If spread in shallow layers (floors, for example), the mixture should he much wetter than when laid in a mass, otherwise it will dry up before chemical action begins.

In retaining walls I prefer to use the mixture as dry as I reasonably can, because an excess of water, on evaporatiou, leaves the concrete somewhat porous, and thus allows seepage water to pass through it.

If concrete impervious to water be required (tanks, reservoirs, etc.), it is necessary to use a somewhat richer mixture, i. e., one containing more cement, and to have it thoroughly mixed and tamped. The ideal condition for this class of material is to proportion the coarse and fine ingredients so as to eliminate all the voids.

LAYING AND BEATING THE CONCRETE.—For foundations and walls the material should he laid in layers not exceeding 6 inches in depth; if thicker than this, it is apt to lose a part of the benefit of the labor of beating—the effect of the blows not penetrating to the hottom of the layer. A convenient heater is made of an iron casting, 6 inches square, having a handle of 1-inch round iron, or 1.5-inch pipe about 5 feet in length, which should weigh in all from twenty to twenty-five pounds.

In order to avoid horizontal joints, it is very necessary that each layer should he put in hefore the previous one has set, and that not more than half an

*Abstract Trans. Am. Inst. Min. Engs.

hour should elapse between completing, mixing and depositing. If for any reason, however, the work has to be interrupted, a number of large rocks or old rail ends set vertically should be partly imbedded in the last layer so that the projecting parts will provide a grip for the succeeding layers. Even this, however, should not be permitted near the top of the work. On continuing the work, the layer that has set should be thoroughly swept and wetted, first with water and then with thin cement grout. It is of great advantage to have the work continue day and night until completed—the men working in squads.

In a long and heavy retaining wall, it is best to divide the length into sections, because vertical joints do not affect the strength to the same extent as do horizontal ones. In any event, it is best to divide a large wall into panels, otherwise, owing to the expansion and contraction of concrete under changes of temperature (the co-efficient of expansion of concrete is but little less than that of iron), cracks are apt to develop, and thus spoil the appearance of the work. This division of the work into panels causes the cracking to take place along the vertical joints where their appearance is not so evident nor disfiguring. A panel should be of a size that can be completed in a day's work.

During the progress of the work it is a good plan to embed in the concrete old wire rope, chains or rails, which help to bind the concrete together and strengthen it. Concrete adheres very tenaciously to iron and seems also to preserve it from rust.

The Crib, or Form.—Unless the concrete is being filled into an excavation below the ground level, it is necessary to construct a crib of timber, the interior of which has the shape of the exterior of the completed work. There is scope for much ingenuity in the arrangement of these cribs, not only to produce the necessary shape and size, but to have them so stiff that no amount of beating of the concrete will cause the boards to bulge or to shift. Also, for economy's sake, the work should be so designed that the same lumber may be used repeatedly. I have found that tongue-and-grooved boards are not as satisfactory as plain boards, or planks, with straight, planed edges. Cement works into the tongue and groove and then, when swelling occurs from the contact with the wet concrete, the lumber appears to warp irregularly, and to leave unsightly marks of each plank on the face of the finished work. Unless braces are put in frequently, I have not found any advantage in using 1-inch boards, and I much prefer 2-inch ones.

Rounded corners are formed by inserting strips of "cove" molding in the crib, and for corners of walls around which there is much traffic, it is well to place inside the crib a bent strip of stout, sheet iron, provided with bolts. The concrete is beaten around and behind these bolts embedding them and the sheet iron snugly in place.

Concrete should never be dropped from a height for the reason that, invariably, the mortar and stone separate, and weakness results, an effect which I have noticed to be more pronounced with broken slag. For example, if it be necessary to get to the bottom of a deep excavation, it pays to lower the concrete in a tub or bucket, or if the excavation be large, to lower the wheelbarrow itself. In a case of this kind, I find it pays best to discard the wheelbarrow entirely, mount the mixing gear close at hand, erect a temporary derrick, which will command not only the mixing gear, but the area of the whole excavation, and then carry on the work with a tub.

Strength.—Concrete that has been made with care is superior in strength to the best masonry, but any slovenliness or neglect in the mixing or wetting, or in permitting a separation of the ingredients after thorough mixing will bring its penalty. Poorly proportioned ingredients also lead to weakness, particularly an excess of fine material.

I have tried the following experiment: A square slab of concrete 10 feet by 10 feet and 4 inches thick, having embedded within it old 0.5-inch mesh wire screen, after seven months' seasoning was supported by placing a block under each of the four corners. The slab withstood without apparent bending a distributed load of ten tons, and afterward a load of 3000 pounds concentrated in the center.

The following quotation on the subject of strength is of interest:

* * * A ring of 6 by 6.5 inches angle iron 15 feet in diameter was used as a horizontal circular tie, within which a flat dome of concrete was built. The concrete was 6 inches thick throughout, and was formed of four parts of stone, two of sand and one of Portland cement. The dome rose 6.44 inches at the center, and it stood covered with 2 inches of damp sand for fifty-eight days after it had been completed. A bed of sand was then laid over it to support a circular platform 5 feet in diameter. About 60,000 pounds of bricks were laid on the platform before any deflection could be detected, and 80,000 pounds were supported for six days without any signs of failure. It was intended to test the dome to destruction, but more than 80,000 pounds could not be be applied without danger to the men conducting the experiment.

It is to be noted that the writer of this statement says nothing about having iron or woven wire embedded in the concrete of this dome.

(To be continued.)

Mill Construction, Milling and Amalgamation.*

NUMBER III.

Written by I. Roskelley.

Crushing.—The aim of mill operators should be to crush the maximum quantity of ore to such a degree of fineness that the most profitable extraction can be made. Though many factors go to determine the rate of crushing, the screen is undoubtedly the controlling one; 600 or 700 standard screening has, in the past, been in general use, but although it gives a high rate of crushing, other conditions being favorable, the extraction from the crushed product, more particularly the concentrates, has not been satisfactory, and, in consequence, there is a tendency to adopt a finer screen; 600, 700, 900, 1000 and 1200 standard screening have all been tried on the Robinson Deep. With 600 standard our duty was 5.45 tons; with 1200 staudard it is only 4.95—that is, there is a loss of .5 ton per stamp per day, or 1500 tons per month on a hundred stamp basis. As a set-off against this comes a better extraction all round—3% better in the mill and about 3% in the concentrates. Now, it seems to me that of these the concentrates extraction is the most important. The question then arises—and to which I am not prepared to do more than express an opinion—whether it is more profitable to contiuue the fine screening at a loss of 1500 tons in crushing, or whether it would not be better to return to, say, 700 standard screening, and recrush the concentrates?

Personally, I believe the latter would be the better course, though I am by no means sure about it. Mr. Chester, in his paper on "Crushing by Stages," was decided on the point; H. H. Webb seems to lean towards it when he said: "In the future it is also probable that the scheme of regrinding the coarser pyritic portion of the pulp leaving the mill before cyanide treatment will be adopted in order to obtain better extraction from this rich material by more perfect exposure of the gold." The final settling of this point of crushing is beyond my scope, involving, as it does, the balancing up of many adverse points and much calculation, but it is a question which I should like to see taken up.

Perhaps the results obtained by me with the different screens may interest others who have not yet tried them, but who are contemplatiug doing so.

Fall of Plate. Per Foot.	Screen. Standard.	Slimes. Per Cent.	Height of Drop. Inches.	Speed.	Discharge. Inches.	Water—Tons.	Tons Crushed.
1 1/8 inch	600	25.4	8½	96	2¾	6	5.45
1 1/16 inch	700	29	8½	96	2¾	6	5.28
1 1/16 inch	900	31.8	8½	96	2¾	6½	5.07
1 1/16 inch	1,000	35.3	7½	100	2¾	7	5.06
1 1/16 inch	1,200	35	7½	100	2¾	7½	4.95

Tonnage and percentage of slimes in the above were obtained from the cyanide works by me during respective periods of individual months. It will be observed in the above table that the decrease of tous milled per stamp with decreased mesh aperture is not regular; for instance, the difference between 900 mesh and 1000 mesh is only .01 ton. This is accounted for by the fact the speed has been increased four drops per minute.

The factors determining the rate of crushing are screening, length of drop, order of drop, speed, weight of stamp, feed, discharge, water supply, and last, but by no means least, size of ore fed into the bins.

(a) Screening.—This I have already referred to. Experience teaches me that it is the most important factor, though I believe some other members of this society have come to a different conclusion.

(b) Length of Drop.—The smaller the ore fed into the mortar the shorter this can be made. If 2-inch cubes are fed in and the drop is set at 8 inches, the actual drop will be anything from 6 inches to 8 inches. As long as the drop is sufficient for the stamp to crush the material beneath, all that is required is obtained, and to make the drop greater than this is to do unnecessary work. Great care must be exercised to keep the drop of constant length, otherwise an irregular splash and slow crushing will result. The tappets have to be adjusted about every third day, owing to the wear of the shoe and die, otherwise the drop will become too long. Of course, the wear is far from even, and the adjusting which may be right for one stamp may be too little for the next. It is a great mistake to think that half an inch from the staudard length makes no difference to the crushing power of the stamp, and as soon as any variation is discovered it should be immediately set right without waiting for the time when the other stamps in the battery need adjustiug.

Order of Drop.—The drop of a stamp does two things: (a) It crushes the material beneath it, and (b) it splashes the crushed product against the screen. Were the stamps dropped one after the other, the fall of one stamp, by its splash, would remove much of the material from beneath the adjoining one, and very slow and defective crushing would be the result. To obviate this, millmen arrange so that no two adjacent stamps shall fall consecutively. 1, 3, 5, 2, 4 and 1, 4, 2, 5, 3 are the usual orders in use.

Speed.—Assuming that the drop is not made too short to crush effectively, then a mill running at 100 drops per minute will do one twenty-fourth more work than one going at 96. Coaling cost in running the engines and the greater wear and tear occasioned by high speed are factors which tend to keep the speed within reasonable limits.

Discharge.—One of the greatest objections to crushing with stamps is that particles crushed sufficiently fine for extraction do not immediately escape from the mortar box, but are recrushed and slimed. A high discharge retards the escape of the pulp from the box, since, instead of being splashed against the screen at the fall of the stamp, it splashes against the chuckblock and is driven back under the stamp and slimed. When the discharge is high the mortar box is liable to be filled with several inches of pulp, so that instead of the stamp falling on rock lying on the die, it pounds its way through this pulp.

(To be continued.)

*Abstract Trans. Jour. Chem. Met. and Min. Soc., S. A.

The Elspass Quartz Mill.

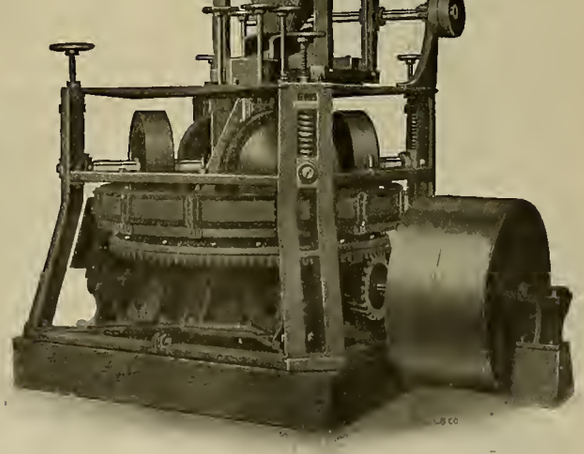
Fairbauks, Morse & Co. now control the exclusive manufacture aud sale of the improved Elspass quartz mill, which has been on the market for two years and is operating in Mexico, Arizona, New Mexico, Colorado and other mining sections. They state that contracts have been made in the last sixty days for twelve mills, to be distributed in the Black Hills, Oregon, Idaho, Colorado, Nevada and Arizona mining districts.

The mill is designed to issue freely, the flow of pulp being directed against the screens by the use of plows between the mullers or rollers; it has 21 lineal feet of screen surface. The die revolves and the rollers or mullers are stationary, with intent to furnish a satisfactory panning motion.

In the treatment of gold ores, the gold settles on the shelf or gold receptacle and is retained there by the action of the wash water, while the gangue and lighter minerals issue through the screen.

The manufacturers say: "The gold saving in the mill, without the use of mercury, freedom from slimes, small cost of renewing tires and dies and uniform product are a few of the features which are commanding the attention of mining men who are interested in up-to-date crushing."

Fairbanks, Morse & Co.'s main office is in Chicago,



The Elspass Quartz Mill.

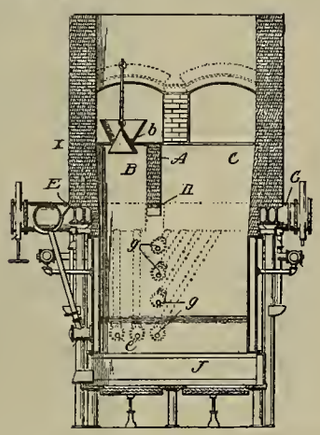
Ill., with branch offices in Denver, Colo., Salt Lake City, Utah, San Francisco, Cal., Portland, Or., and Los Angeles, Cal. They are preparing to furnish complete plans covering all classes of machinery necessary for successful treatment of ores, and would be pleased to furnish information in detail upon receipt of requests therefor.

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 26, 1904.

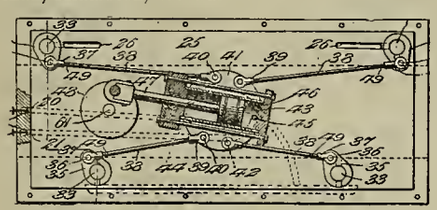
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF TREATING ORES.—No. 758,532; W. F. Hannes, Deming, N. M.



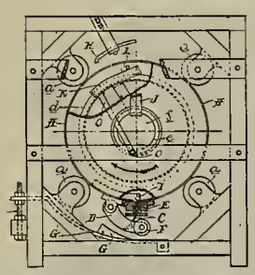
Method of treating metalliferous ores by supplying solid fuel and ore to furnace in separate, vertical strata, supplying oxygen to fuel and ore mixture, leading resultaut gases through ore separated from fuel and there supplying to ore additional oxygen in excess of that required to oxidize ore, and bringing ore thus treated into contact with incandescent fuel.

ENGINE FOR MINING MACHINES.—No. 758,533; J. Heenan, Middleton, W. Va.



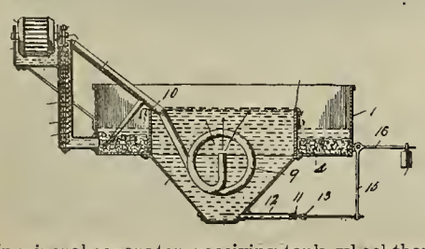
In mining machine of class set forth, combination with main piston chamber, piston therein having stem projecting forwardly therefrom to receive implement, ports in opposite sides of chamber controlling inlet and exhaust in relation to chamber, valves in ports, chest on chamber, and oscillating controller having means adjustably connected to valve aud provided with cylinder and piston operative by motive agent to alternately open and close opposite sets of inlet aud exhaust valves.

ORE CONCENTRATOR.—No. 758,565; J. Shier, Detroit, Mich.



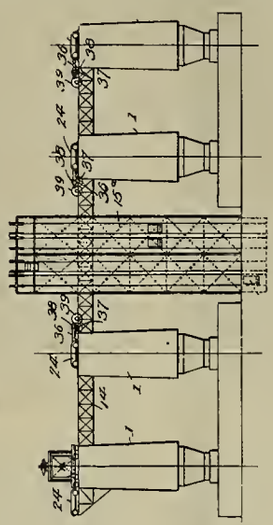
Iu ore concentrator, combination with supporting frame, of revolving drum having cylindrical chamber on the bottom of which material is carried in passage through drum, variable cut off mounted in longitudinal slit iu cylindrical wall of chamber, collecting pan stationarily suspended above bottom of chamber and meaus for actuating cut off and retarding or advancing its action.

MINERAL SEPARATOR.—No. 758,464; H. L. Orr, Greeley, Colo.



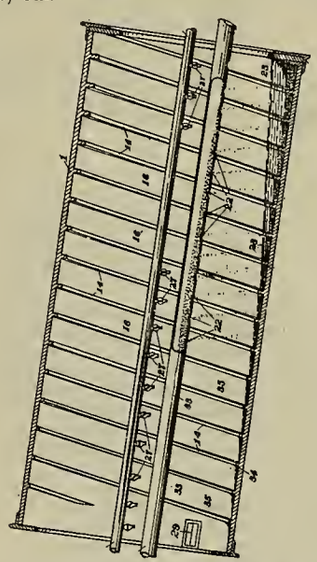
In mineral separator, receiving tank, wheel therein operated by inflowiug water, separating tank and filtering tank communicatiug as described, pipe having pump located therein operated by wheel for returning filtered oil to receiving tank from filtering tank, and counterbalanced valve located in separating tank operated by excess pressure in separating tank to dispose of unfiltered residue.

CHARGING APPARATUS FOR BLAST FURNACES.—No. 758,498; K. Backlund and B. F. Burman, Baltimore, Md.



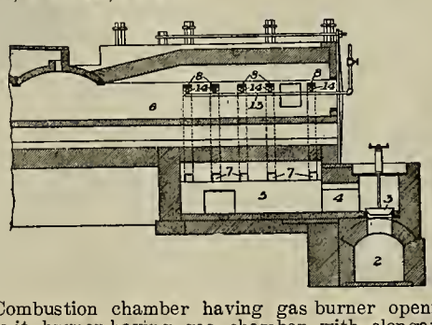
In charging machine for furnaces, combination with movable truck; stock chamber thereon having outlet in bottom thereof and inlet, distributing bell within outlet and adapted to support stock chamber, automatically operated closure for inlet, and means for imparting vertical movement to bell and chamber.

CONCENTRATOR.—No. 758,458; L. C. Graupner, San Francisco, Cal.



In mineral concentrating apparatus, hollow revoluble cylinder set in sloping position, shallow helical riffles on interior surface of cylirder, gradually diminishing in height throughout entire length from lower end to upper end thereof, inclined pipe in cylinder for distributiug ore thereiu, perforated in lower half, and inclined pipe passing through cylinder from upper to lower end, for distributing water supply therein, having series of adjustable cocks by which water supply can be distributively regulated.

GAS BURNER FOR FURNACES.—No. 758,420; N. Cote, Montreal, Canada.

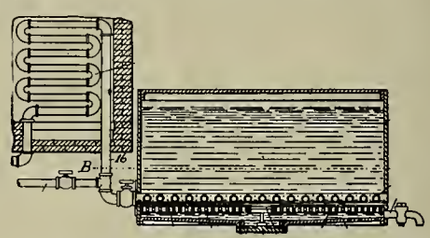


Combustion chamber having gas burner opening into it, burner having gas chamber with elongated opening, separate air chamber having slotted outlet opening into combustion chamber parallel with gas outlet and pipe leading from source of air under pressure to air chamber.

ORE CONCENTRATOR.—No. 758,412; W. L. Card, Denver, Colo., and F. S. Card, Canon City, Colo.

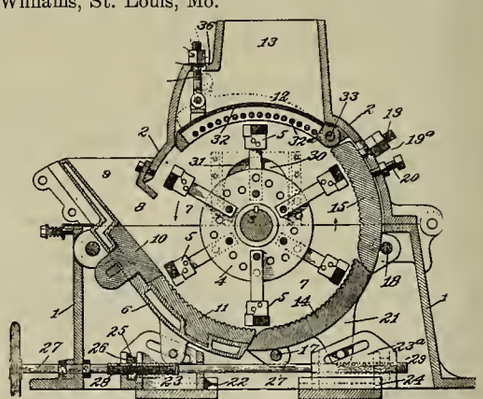
In ore concentrator, combination of concentrating table having longitudinally disposed channels adapted to discharge concentrates at one end, channels having transverse sectiou formed by gentle and abrupt incline which meet at obtuse angle, and means for imparting longitudinal concentrate-discharging vibration to table.

APPARATUS FOR EXTRACTING METALS BY CHEMICAL PROCESS.—No. 758,367; T. B. Joseph, San Francisco, Cal.



Apparatus for extracting metals by chemical process comprising tank provided with filter bottom, and perforated pipe placed within tank above and near filter bottom and connected with air compressor, perforations being directed upward with slight inclination, only to drive slimes upwardly.

CRUSHER AND PULVERIZER.—No. 758,288; M. F. Williams, St. Louis, Mo.



In machine of character indicated, combination with rotatable beaters, of breaker plate, imperforate grinding surface, and perforated grinding surface, breaker plate and grinding surfaces being arranged in order named in direction of travel of beaters, whereby beater commencing its travel in co-operative relation to breaker plate first passes breaker plate, then imperforate grinding surface and then perforated grinding surface, and screen upon outer side of perforated grinding surface and spaced therefrom, there being exit opening for tailings from space between perforated grinding surface and screen.

PREPARING IRON PYRITES FOR DESULPHURIZATION.—No. 757,531; U. Wedge, Ardmore, Pa.

Mode of preparing small particles of iron pyrites for desulphurization by combining particles with sulphate of iron and forming them into blocks or briquettes.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

The Great American Marble Co. has been incorporated in Seattle, Wash. The company owns marble quarries on Prince of Wales Island, Alaska. G. W. Dickinson, J. W. Clise, H. R. Clise, F. W. Relf, O. D. Humphrey, F. C. Harper, J. A. Moore, G. M. Stewart, E. E. Kaine, J. Schram and I. A. Nadeau are incorporators.

A preliminary survey for the railroad between Valdez and the interior of the Copper river country will be made this summer by New York engineers headed by A. B. Iles of Washington, D. C. It is said the present survey is backed by the Havemeyers of New York, who last year bought the Bonanza group and other copper properties on Copper river.

T. D. Drew of Juneau says he is prepared to work 100 men on his Pearl harbor property this season.

Another hydraulic proposition has been located near Valdez. The discovery was made on a stream which flows into Lowe river below Keystone canyon, on the east side, by E. H. Craig. Seventy-two claims in all were staked by Craig and three other men. The stream is said to fall abruptly from the bench to the Lowe river flats, but above the cataract there opens a broad valley or basin. Surface prospects in this basin indicate that it carries gold. They are preparing to open up the group.

Extensive development work will be done this year on the hydraulic properties at the head of Lowe river, near Valdez. The property has been leased by W. Hawkins, who is making arrangements to open them up. The terms of the lease are that 25% of the gross output shall go to the owners and the lessee has an option to buy within two years for $100,000 the amount paid in royalty to apply. The water must be flumed for quite a distance above, over rugged ground. Hawkins expects to have two giants operating on the ground by late in the summer. If conditions warrant, however, the hydraulic machinery will be put on the ground next year.

ARIZONA.

Cochise County.

(Special Correspondence).—The Tombstone Con. M. Co. is shipping about thirty cars of ore per week to the smelters. Some of the waste dumps are being sorted and the low-grade ore obtained is also being shipped to the smelters.

Tombstone, May 1.

Manager Harrington of the Michigan company that has taken over the World's Fair group of claims near Bisbee, is preparing to put down several diamond drill holes on the property. G. Groten et al. of Detroit, Mich., are interested.

Gila County.

The Glasson & Whelan property has been sold to J. Pfister, who for the past year has been developing a gold mine on Tonto. The property is 9 miles northeast of Globe, near Richmond basin. Pfister has also a year's bond on the Weatherwax mine adjoining, which, together with other ground located, gives him a group of twelve claims. The formation is lime and quartzite cut by dyke running 47% in hematite iron and manganese, carrying 3% copper. This is desirable for flux and much of it has been used by the United Globe and by the Black Warrior C. Co.

Santa Cruz County.

R. Ferguson, of Nogales, says three-fourths interest in the World's Fair silver mines in the Harshaw district, in Patagonia mountains, has been sold to J. W. Booth, D. A. Stewart et al. of Winona, Minn., for $450,000. F. Powers retains one-fourth interest in the World's Fair mines. An increased number of men have been at work at the World's Fair for three weeks past and additional machinery will be set up.

Yavapai County.

(Special Correspondence).—Characteristic veins of the Bradshaw mountain district trend north and south, the one exception to this being the east and west ledges on the Oro mine, 8 miles west of Crown King. In past years the property has been worked by leasers and stopes opened from the 150-foot level to the surface, in the 1800-foot tunnel on the vein. The present company, headed by B. Heller of Chicago, Ill., has taken up development of this property. A 20-stamp mill and concentrating plant have been built, with eight cyanide leaching tanks to extract values not plated. From the 150-foot level of the tunnel a double-compartment working shaft has been raised to the surface, a head frame built and self-dumping skip put in. With this the shaft is being sunk on the vein, which dips north at an angle of 45°. It is also expected that the shaft will make sufficient water to operate the plant. The ledge crops with a width of 4 to 10 feet, the vein matter being white quartz, carrying oxides and iron sulphurets and occasionally galena. Superintendent O. Stein recently took up the tunnel work at the point where it was abandoned by the lessees and in a short crosscut north again came into the pay shoot, showing a width of 7 feet. At three different points on the Beatrice claim (the location of mill and principal workings) the vein is faulted and thrown to the north from 30 to 60 feet, and at these points wherever opened the ore body is said to be larger and values concentrated. A wagon road connects the camp with outside points. An assay office has been equipped. A 120 H. P. compound steam-driven air compressor has been put in and development is being increased. Bins will be placed below the hoist and the ore crushed and conveyed by gravity to the mill below. An electrical plant supplies light for the camp. Two other ledges parallel this main one on the property, but as yet little has been done to develop them. The group contains a total of twenty-two claims.

Crown King, May 2.

Near Mayer the Treadwell M. Co. has begun relaying tracks of the narrow gauge railway to the Hackberry mine, the Boggs smelter and the Boggs mine. Work is progressing on the Hackberry and the Boggs mine, in each of which the shaft is being sunk. There are seven bridges to be constructed along the Big Bug and elsewhere and a timber crew is at work.

J. S. Johnson, of the Copper Queen M. Co., near Mayer, says the work they have been doing has opened up ore and the showing justifies them in putting in heavier machinery.

C. W. Platt says the hoisting plant on the Illizona M. Co. at Kirkland is in operation and he will start two shifts of men to work in the mine sinking the shaft, and expects by May 15 to increase the working force to three shifts.

Prescott reports say E. Foltz and F. Giroux, who have a lease on 100 feet of the north tunnel of the Great Peck mine, have made a strike. They opened a body of ore, 14 inches in width, which goes 1600 ounces in silver. They are sinking on the ore body.

J. Carrol has put men to work on the Iron King Extension property, belonging to Douglas, Lacey & Co., near Prescott.

The sale of the Cactus group of gold mines on Cherry creek, near Prescott, includes thirteen claims, and the work done on this property amounts to over 3000 feet. C. A. Chambers has bought the group for the Keystone Investment Co. of Indianapolis, Ind. They will put in machinery for mining and handling the ore and also put in a mill. The ore is free milling.

H. L. Hall, superintendent of the United Mines G. & C. Co., whose properties are 2 miles from McCabe, says arrangements are completed for resuming operations next week.——B. F. Switzer, superintendent of the El Dorado group, near Prescott, is awaiting the arrival of a hoist. He has completed sinking a 50-foot working shaft and as soon as the hoist is in place drifting and other development work will be done.

Groom Creek reports say work will be started on the Pacific G. Co.'s Nevada mine, which adjoins the Home Run mine. It is also stated that the company proposes putting up a mill.——C. B. Genung says a gasoline hoist is being set up on properties of the Rincon M. Co., near Prescott, and that another strike of ore has been made in that company's Welcome claim.

The pipe for the Oro Grande mine pipe line, north of Wickenburg, is being laid, and the site for the extra five stamps is being graded.

T. C. Archer of Prescott, who owns a group of prospects in Agua Fria section, which show outcroppings of ore, has arranged to explore these ore bodies by diamond drill work.

It is reported C. T. Kennan of the Sun Cloud M. Co., on the Colorado river, near Signal, has an option on the Jorsey Lily mine, south of Prescott, and that operations will start this week.

ARKANSAS.

Boone County.

J. H. Bartles of Dewey, I. T., manager of the North Star mine, east of Harrison, is arranging for the summer's work on that property.——The Susquehanna mill is again running. The ore bins were so full that work underground has been temporarily suspended until the bins are empty.

CALIFORNIA.

Amador County.

Ehlers and Williams are sinking a shaft at Clinton on a 3-foot vein which assays $4.90.——The Amador Climax mill, near Jackson, is running steadily on $7 rock, and as soon as the roads are good a larger hoist will be installed and sinking resumed.

The Lagomarsino M. Co. shipped seventy-five ounces of gold from their Volcano claim, near Volcano, last week. They have taken out pieces from the sluice boxes of $30, $25 and $20, but have not made a general clean up.

The Liverpool Tunnel Co. has lines surveyed and stakes set and the tunnel is in 40 feet. They expect to reach the main ledge of the East Belt within 200 feet. This tunnel will tap the Clinton, Paugh, Union, Gouge, Spagnoli and Edinburgh ledges, 6 miles east of Jackson.

Calaveras County.

D. Ross, superintendent of the Union copper mine at Copperopolis, says he is preparing to put in power for mining machinery. Electricity can be furnished from the same line which supplies the Royal mine at Hodson, while if water is furnished it will necessitate building a pipe line from Angels to Copperopolis.

Near Murphys, at the Red Gold mine, a small 4-stamp mill, with water power, is kept running daily on high-grade ore. The mine is 2 miles west of Murphys.——The May Day mine is being opened at the top of the mountain at the shaft. Work in the tunnel on the grade has been discontinued for the present. —— It is said work will be started next week on the Mayflower and the Beatrice mines.——The Hercules-Horseshoe mine has a 2-stamp mill at work and ten tons of high-grade ore is crushed daily.

The Utica M. Co. at Angels will start the installation of forty additional stamps at its Stickle mill this month. The stamps will be taken from the company's Utica mill, which is idle.

Del Norte County.

T. W. M. Draper and associates are preparing to put in a 100-ton matting plant at the Monumental mines.

Kern County.

H. H. Blodd, at Amalie, operating the Zada mining property, says he is preparing to increase development work. It is intended to run a tunnel to cut the ore body at 1000 feet. The tunnel is in 475 feet. The Gold Peak M. Co., which owns the Zada mine, intends to put up a 20-stamp mill. R. Lang is superintendent.

Mono County.

I. N. McKean and M. J. Cody have bonded the Carter group of seven claims at Antelope, near Bodie. They have started development work. The property adjoins the Golden Gate mine.

Nevada County.

A strike was made last week at the Murchie mine, near Nevada City, in the west drift, at a depth of 600 feet, in a part of the mine hitherto unexplored. It shows 2 feet wide, carrying free gold, says Superintendent Maltman.

At the Central shaft of the North Star M. Co., near Grass Valley, work on the 40-stamp mill is progressing. The batteries, stamps and their accessories are in position. Work on the rock breaker is under way. The grading has been completed. The building is of steel.

The Slide mine, near French Corral, is being reopened, and U. B. Bishop and C. D. French are driving ahead the tunnel along the ledge. They report getting out ore.

The mineral claim of Walling & Muller on the Newtown road, 1½ miles from Grass Valley, has been bonded to a San Francisco company, headed by A. P. Redington. The mine adjoins the Nevada City mine on the north and the Spanish on the south. The Redington company will begin sinking a shaft.——The Gold Tunnel mine will be reopened. B. F. Hall of the Pioneer Reduction Works has men to work cleaning out the drain tunnel, preparatory to opening up the property.

T. F. McAvoy, part owner in the Standard mine, near Grass Valley, is arranging to reopen that property. McAvoy has bought the interests of the late H. J. Thomas and is negotiating for the other interests held in the Standard. He will use water power, with an auxiliary steam plant. A road is now being built from the Standard mine to the Jenny Lind, as it is intended to haul ore from the former mine to be crushed at the Jenny Lind mill.

The Gold Blossom mine, near Grass Valley, is being reopened by the owner, R. Jeffrey. The wet spell this spring resulted in both tunnels being caved in places. Men have placed the upper one in repair again and are at work in the lower one. It is Jeffrey's intention to run the lower tunnel 150 feet farther to tap the shoot cut above. A raise will then be driven.

Placer County.

The Turkey Hill Con. G. M. Co. has been incorporated, with principal place of business in Sacramento, to operate in Placer county. The directors are W. C. and W. W. Chapin of Sacramento, W. C. and W. Muir of Michigan Bluff, and J. D. Meredith of Auburn.

Plumas County.

At Johnsville the Jamison mine has usual number of men at work running regularly.——Manager McLaiu, of the Continental mine, has fifteen men operating the mine. The deep banks of snow on the surrounding mountains will insure a long water season to the owners.——The Bluenose M. Co., W. Passetta, manager, reports having made progress with development work, and is preparing to make a raise from the tunnel.

Shasta County.

The Gambriuus group of claims near Redding have been sold to a Montana company represented by A. J. Glass for $40,000. The company has taken possession and will build a 20-stamp mill this season. The Gambrinus group consists of five claims—the Gambrinus, Temperance, Gilt Edge, Steam Beer and Bohemian.

The Bowery Belle mine, 3 miles west of Keswick, has been bonded to E. A. Braddock of Boston, Mass. The quartz vein shows in places 25 feet wide and carries free gold.

Sierra County.

The Sierra Buttes mine, near Sierra City, is under management of Superintendent Pinkstone, who is making a number of improvements in the workings. Ten stamps will be added to the present plant as soon as the roads are in condition to haul in the machinery. More men are being put on.

Trinity County.

One mile of the channel of Trinity river near Douglas City will be laid bare by turning the stream through a tunnel excavated across Horseshoe bend. Work on the tunnel will be begun next week. The surveys are completed. The tunnel will be 800 feet long, and will lead from an open cut 300 feet in length. It will be 11 feet wide and 7 feet high.

Tuolumne County.

At the Street mine, at Tuttletown, the pump placed in the shaft is in steady operation. Two shifts are at work on the 300-foot level stoping ore for the mill, which began dropping the stamps last week.

The Waif, a patented mine on the Mono road, 5 miles from Sonora, will be reopened. It is owned by F. A. Hanko, and has lain idle for several years. Two shafts were formerly sunk to a depth of 50 feet showing a vein 4 feet thick, assaying $10.

It is reported that a 14-foot ledge of $14 ore has been struck in the App mine, at Quartz.

Sinking has been discontinued at the Black Hawk mine, near Soulsbyville, and a station and sump are being cut. Drifting has started.——Superintendent A. Bryant of the Prudhomme put men to work last week unwatering the Prudhomme mine at Arrastraville. Sinking and crosscutting will be done. The mill is running on Cordova rock. The number of men will be doublod at the Cordova mine this week. The drift from the lower level is said to be showing up high-grade ore, that averages 7 feet in width.

Work will be resumed at the Contention mine on Knight's Creek, near Columbia. The vein on the Contention has been tapped by tunnel and drifting has been done to extent of 250 feet. The vien is a foot in width, carrying values in gold. Some molybdenite is found in the claim. The surface improvements consist of a light 5-stamp mill. The Summer Bros. own the mine.

Work is progressing on the Mountain Lily mine, near junction of Five-Mile creek and the South Fork of the Stanislaus river, near Columbia. The 5-stamp mill is now crushing ore. This mine has been almost continuously worked for several years past. The vein is a foot in width botween slate walls. The tunnel has been run 1200 feet.

The engine at the Republic mine, near Columbia, was started up last week, and the 4-stamp mill is in operation.

COLORADO.

(Special Correspondence).—A preliminary meeting was held April 29th in the Chamber of Commerce building for the purpose of discussing the advisability of organizing a society composed of Western chemists, assayers and metallurgists. At this meeting a committee of three was appointed to correspond with various assayers and metallurgists for the purpose of obtaining their views as to the best method of procedure. The committee is composed of H. C. Parmelee, 1755 Arapahoe street, Denver; Guy M. Vail, Denver,

and Chas. D. Test, Golden. It is believed that such an organization would be of material benefit to all members.

Reports from the different mining camps throughout the State would indicate that mining conditions are improving over the past few months. The Leadville and Cripple Creek districts are both up to standard in production and the outlook for the future is much brighter than for some time past.

The north end of Gilpin county will soon be enjoying renewed activity. The Moffat Railroad has reached Rollinsville, which will give the mines in this locality an outlet for their ores. Heretofore the ore has been hauled to Black Hawk or Central City, which made it rather expensive mining.

A large number of mining men from different sections of the State attended the third annual meeting of the Colorado Mine Operators' Association held in Denver to-day. Resolutions were passed commending the action of Governor Peabody on the labor situation in different parts of the State. Also adopted resolutions thanking Senator Teller and Congressman Brooks for their work in getting through House Bill No. 13,298, to amend section 2327 of the Revised Statutes of the United States. A number of matters of importance were brought before the meeting and discussed by the members of the Association. The following officers were elected for the ensuing year: F. J. Campbell, president; L. P. Martin, T. W. Beam, E. A. Colburn, vice-presidents; W. E. Passmore, secretary and treasurer. The office of the Association will be retained in the Boston Building. The Association includes members from all over the State. Nearly all the mining camps have a local organization of their own which works in conjunction with the head office.

Denver, May 2.

Boulder County.

In the Grand Island district, near Eldora, the Gold Coin mine on Spencer mountain has been bought by W. M. Williams, who has a bond and lease on the Terror.

Clear Creek County.

(Special Correspondence). — The set of lessees on the Sunhurst mine of the Red Oak G. M. & M. Co. property are shipping 100 tons of ore per month. Thirty lessees are at work on the properties and Manager A. B. Montgomery expects to have fifty working in the next few months. He also expects to rebuild the mill which was destroyed by fire some two years ago. All of the mill ore is being thrown on the dump.

Georgetown, April 30.

Work is under way retimbering the Torpedo shaft in Spring gulch, near Idaho Springs. The shaft is vertical, being 100 feet deep, and when the timbering is completed, a crosscut will be run south to cut the vein. The work is under J. C. Hull, manager. Work was being done in the tunnel last fall, when the property was shut down, due to lack of water for boiler and compressor. The machinery will be started up again as soon as there is sufficient water in the gulch, but in the meantime work will be done by hand. There is said to be an ore shoot showing in the bottom of the tunnel level.

The Yankee Con. M. Co. is arranging for starting up the Lombard mill at Yankee next week, says H. I. Seeman, manager. The mill was closed down during the winter months on account of lack of water.

Silver Plume has 200 men working day's pay and also employs fifty more men who live at Georgetown, aside from the many leasers at work from both camps, says the Silver Standard. The coming summer promises to be the best in the camp's history. The new railroad to be built, the Pelican Dives Co. to extensively operate their many properties and erect a mill, the Stevens mine will be worked on a larger scale, the Terrible mine will be working 250 men before June 1, the Silver Plume M. & T. Co. expects to install machinery and increase work, the Indiana M. & M. Co. intends to fully develop its group this season, the Southern M., M. & D. Co. will thoroughly develop its claims, a company has been formed to work the Bertha mine in Grizzly gulch, and every property in the gold belt will do a larger amount of development work during the summer months.

The Pelican-Dives M. Co. are said to be preparing to build a concentrating mill near Silver Plume this summer. About 600 tons of concentrating material, taken from old stopes and the dumps of the Seven-Thirty, Zero, Pelican and Diamond tunnel levels, has been shipped to Idaho Springs for treatment as a trial lot, and the entire tonnage has brought favorable returns.

Chaffee County.

(Special Correspondence).—Preparations are being made for a season of activity here. Good finds are reported from the Bowerman and Sherod camps, west of here. At the Monarch there is great activity and ore shipments are increasing. At Turret the Vivandiere mill has just been started and is producing a good quality of concentrates, which is being shipped to the smelter here. Five hundred tons of ore are being reduced to bullion every twenty-four hours at the Ohio & Colorado smelting plant. An average of three carloads of bullion is daily shipped. During the year 1903 Chaffee county produced in gold and silver $550,000.

Salida, April 30.

The Baalbec M. & M. Co. at St. Elmo will build a concentrating mill of thirty tons daily capacity.

Fremont County.

The Page mill at Florence has been bought by the Florence M. Co. and will be used to treat the low-grade ore of the Dexter mine, on Bull hill. The mill will have a capacity of 100 tons a day and the cyanide process will be used. Development work has been in progress in the Dexter for several months and the body of low-grade ore has been opened down to a depth of 520 feet. The ore is said to average $10 per ton in gold. In the junctions the ore shoot is 15 feet wide.

Gilpin County.

(Special Correspondence).—The Michigan Hill Tunnel & Mining Co. has recently opened up a 2½-foot body of copper and iron ore which carries some gold and silver. They have a crosscut in over 600 feet, which has cut 3 feet of free milling ore. The property is located at the junction of Clear creek and Silver creek. H. Deitz is president and manager.

Apex, May 1.

At Rollinsville last week, the Happy Hollow group, in Gamble gulch, was sold to L. E. Grimm and J. R. Keefe of Chicago, Ill., for $12,000. The Happy Hollow group consists of seven unpatented claims, 1 mile south of Rollinsville, which will be reached by the new Moffat road. The group has been developed by a number of shafts ranging from 10 to 65 feet in depth and by a tunnel which has been driven 100 feet. Some surface work has recently been done by the owners. O. J. Duffield of Rollinsville is manager with G. Churchill as superintendent.

The Penohscot M. Co. operating near Rollinsville, in which Valley Falls, Kan., parties are interested, are figuring on building a stamp mill to treat their ores, says the Register-Call.

It is reported operations will be started at the Benton mine on War Eagle hill this month. The property is equipped with plant of machinery, has a shaft down 150 feet, showing surface ores carrying values. It is claimed operations were suspended until the arrival of the railroad at Rollinsville.

The Colorado Tellurium G. M. Co., operating the Freedom mine on Winnehago hill, near Central City, has men at work repairing the main shaft. The work of repairing the shaft has been done to a depth of 500 feet and when 570 feet is reached, which is at the pump station, the company will proceed to unwater to the bottom of the shaft, a total depth of 822 feet, after which it is intended to start sinking operations. Green & Co., who are working the Freedom No. 2 shaft under sublease, are sinking and have reached a depth of 115 feet. In sinking they took out mill dirt which brought returns of three ounces of gold to the cord, besides a ton of concentrates. Manager Borcherdt has just completed arrangements for purchase of the Oliver mill in Chase gulch, near Central City, which will be known hereafter as the Freedom mill. This mill was built three years ago. It is the intention of the company to drive the tunnel in on the Freedom extension from Chase gulch towards the Freedom shaft, and when connections are made they will handle the milling ores by taking them through the tunnel direct to the Freedom mill. The company has increased its capital stock and its holdings in this and Boulder counties are to be operated on a larger scale and the company will buy some of the properties which it is now operating under lease and bond, says Manager Borcherdt.

Gunnison County.

The production of the Crested Butte mine, near Crested Butte, for the month of March was, coal 13,000 tons and coke 5500, says the Elk Mountain Pilot.

Hinsdale County.

Work at the T. C. M. tunnel of the Hinsdale M. & M. Co., near Lake City, is said to show that the tunnel is on the edge of the No. 2 vein. The tunnel cuts this vein at depth of 500 feet.

Lake County.

Preparations are being made for the development of the northern section of Leadville, says the Carbonate Chronicle. The first work will be done in the Poverty Flats district. S. M. and J. K. Carleton have taken up the work on the Casco Co.'s properties, and have put men to work overhauling the machinery at the shafts on Poverty Flats. The shafts will not only be sunk lower than was possible before the Coronado pumps drained that territory, but much drifting will be done.

Work has resumed on the Belvedere Nos. 1 and 2 claims in the St. Kelvin section, near Leadville. Some work was done there last fall, showing a streak of silver ore. This was caught in a shallow tunnel. The lessees intend to start the tunnel farther down the mountain.

With the payment of the judgment held by H. Head against the Sedalia G. M. Co. comes the report that preparations are being made to resume operations. The Sedalia mine is on Little Ellen hill, near Leadville. It is reported that the other claims will be satisfied, and the property will resume full operations. Owing to its prolonged idleness, considerable work will be necessary to get the plant into working order again.

Shipments are again regular from Ibex No. 4 shaft at Leadville, in addition to considerable exploration work going on below the 1200-foot level in virgin ground. Manager J. F. Campion says the matter of leasing the remaining territory will be taken up this week, and within thirty days it is expected quite a number of lessees who are waiting to get hold of this ground will be at work.

Ouray County.

The Bullion King M. Co., operating in Porphyry basin, near Red Mountain, 1½ miles west from the Silver Ledge property, is increasing work. The holdings of the company consist of two groups of claims, eighteen in all, six of which are patented, and a tunnel site. A tunnel driven on the Oliver Twist claim is 500 feet long, and at 600 feet farther it will cut the Bullion King, running at right angles with the Twist, and of a good shipping record from upper workings. This tunnel, which is to be the main working tunnel, will cut consecutively the entire group at depth. The product of the King and the Twist consists of lead and copper sulphides, carrying gold and silver values. Next week the gasoline engine, of 2-drill capacity, also for furnishing electric motor for lighting the mines, will be set up. Electric drills will be used. New buildings are to go up, and a gravity tram line will be put in place, connecting mines with the railroad, a distance of 1½ miles. The president is H. N. Timolat of Brooklyn, N. Y., and the manager is A. J. Aurand of Silverton, Colo.

Rio Grande County

(Special Correspondence).—The Golden Income Co. at Embargo has a 196-foot incline shaft dipping at 80°. A 50-foot drift on the 50-foot level is showing sulphide ore, and a 40-foot drift on the 100-foot level is also showing ore. Most of ore shoot has been stoped between the 50-foot and 100-foot levels. A drift from the bottom of the shaft shows ore and in one place about ¾ inch of petzite (silver-gold telluride) shows. The value of this streak is about $350 per ton. Massive sulphides are said to carry from $30 to $50 per ton and the vein material $7 per ton.

The Tornado M. Co. property is owned by Terra Haute, Ind., men. The incline shaft is down 130 feet, with some drifting. Galena ore carrying both gold and silver has been opened up, and so far as shown is a milling proposition. The Tornado Co. has put in a gasoline hoist of 15 H. P.

——The Comet Co. is owned by Smiley & Freeman of Del Norte, Colo. Development consists of a 100-foot incline shaft with a 10-foot drift. The average value across vein is said to run $19 per ton. A small streak of quartz on hanging wall carries horn silver. There are a number of promising prospects in this camp, with 10-foot holes on them—a few are deeper. Development work is showing improvement. The camp is 19 miles from Del Norte and 9 miles from Granger siding, on the Creede branch of the Denver & Rio Grande Railway. Summer Coon camp, 6 miles north of Del Norte, shows values in small streaks. Hubbard & McFadzean have a 60-foot shaft on the Quien Sabe that shows values in gold, silver and lead. Cochran on the Iron Hat has a showing of hematite.——Jones et al. have a good showing in some small streaks at 25-foot depth in a short crosscut. There is water in this claim. Water is handled by a windmill, which makes a cheap power. In that part of Colorado winds are prevalent during the spring months. The old camp at Summitville is quiet since the failure of the Schuch cyanide plant.——There is high-grade copper ore showing in the lower workings of the Golconda.——Little work is being done in Jasper, since the failure of the Moody mill and the Herr mill. Lack of values is said to be the cause.

The camp of Carnero, 22 miles north of Del Norte, is quiet. There is ore in this camp, but it is a camp that will require treatment on the ground to make a pay camp.

Del Norte, May 1.

San Juan County.

The Royal M. Co., operating on Sultan mountain, near Silverton, has started operations with an increased force of seventeen men. The work for the greater part will be done on the King and the Mazeppa veins, consisting of a raise on the King to connect with the upper workings, a vertical distance of 600 feet, and the running of a drift on the Mazeppa. Power drills are being used in drifting. One of the workings is in 7 feet of mill ore. The property represents 3000 feet of development. Manager W. Pyke says a concentrating plant is proposed.

The Kendrick smelter of the San Juan M. & S. Co., near Silverton, blew in last week, and the first two hours' run resulted in three tons of matte. The ore bins are stocked and there are ample reserves at its Henrietta mine. The smelter started up with forty-one men, which has been increased to about sixty. The plant will treat 150 tons of Henrietta ores per day, exclusive of custom ores, which it is buying.

The North Star mine, on Sultan mountain, near Silverton, is shipping 1259 tons of ore a month.——The Sunnyside is shipping two cars of concentrates every three days. The capacity of the cars is twenty tons.——Work was resumed on the Big Colorado mine last week with two shifts of miners. Electric drills are employed in continuing the main tunnel on to certain ore zones on Boulder mountain.

Summit County.

The Ten Mile Co., at Robinson, under management of M. Shepherd, reports having opened up a body of ore rich in lead and silver. The ore body is 25 feet wide and 15 feet high. It assays $35.

It is reported that the Washington property, on Nigger hill, near Breckenridge, has been sold to Lennox & Co.——The Puzzle Leasing Co. is working mine and mill steadily.——About forty men are employed at the Gold Pan mine and everything is in shape for an early start at placering. The ditch is open from end to end, the pipe line filled with water, and they are unwatering the pit.

At the Oro Grande mine at Dillon, pending the arrival of Manager Griffin, W. H. Foster has twenty-five men putting equipment in condition for resuming gravel washing. The 11-mile ditch from the Snake is free from ice and attention is now directed to freeing the Straight creek ditch from its winter's accumulation of snow. The entire plant will be working and washing gravel next week.

The Monte Cristo mine, near Breckenridge, will be added to the shipping list by the Quandary Mountain M. & M. Co., which owns it. The principal values in the ore are gold and silver, besides lead and copper. These are associated with iron and zinc. The copper and zinc are not saved by the present machinery, which produces a grade of iron-lead sulphide running up to 50% lead and containing the bulk of the gold and silver values. On the first 500 tons to be run through the mill the value of the concentrates made by putting about six tons into one is estimated at $35 per ton. The second lot of 900 tons is expected to run up to $50 per ton of concentrates, as it carries more lead and has not been leached so much by exposure to the elements. The ore is broken, quarry style, by contract, and costs about $1 a ton to mine and stack ready for hauling. From the ore quarry to the mill is a down grade and short haul. Later a hucket tramway will be built to transport the ore to the bins at the mill. The mill is 100 feet long by 33 feet wide, having five floors. The boiler room is an annex 25x25 feet.

Teller County.

The total production from the mines of Cripple Creek district for the month of April was 41,900 tons, that had a gross value of $1,268,300, says the News. Of this quantity of ore, 35,900 tons, that had a coinage value of $908,300, was treated at the reduction plants. The following is the record of each plant:

Plant.	Tons.	Value.
U. S. R. & R. Co.	15,000	$375,000
Portland	7,500	210,000
Telluride	2 500	62,500
Dorcas	2,200	154,000
Economic	3,000	84,000
Cripple Creek Homestake	3,600	14,400
Sioux Falls	2,100	8,400
Smelters	6,000	350,000
Totals	41,900	$1,268,300

Superintendent Waldron of the Last Dollar mine at Cripple Creek has started crosscutting to the ore body from a depth of 1320 feet. Only a few buckets of water have to be brought to the surface each shift. About two years ago work had to be stopped at the 1200-foot level on account of water. The flow disappeared with the advent of the drain tunnel.

J. Hostetter, F. Hangs, F. Pitney, T.

Terlau, owning ten acres 2½ miles southwest of Cripple Creek, claim to have uncovered a deposit of mica 2½ feet in thickness. The sheets up to 6x12 inches in size have been taken out. It is reported a grindling mill will be built on the ground.

Gradually the reduction plants are getting more ore than formerly, both of high and low grade, from the smelters. The average grade of the ore treated in April at the Dorcas mill was $70 a ton. Heretofore it has been supposed that no ore running better than $40 a ton could be handled at a profit by the cyanide and chlorination plants.

On account of a lawsuit between the Golden Cycle and Theresa mines, at Cripple Creek, 125 men were laid off last week on both properties. Work will not be resumed until the case is settled in court. ——The new cyanide plant at Gillett will be started about May 15. They expect to be able to handle ore running as low as $3 a ton. The mill has a capacity of 200 tons a day.

The Cripple Creek & Colorado G. M. Co. has been incorporated by R. Campbell, A. P. Kennedy, D. J. Duncan, R. G. Mullen and E. H. Teats. Operations will be carried on in Teller and El Paso counties.

Secretary Lloyd, of the Stratton & Cripple Creek M. & Dev. Co., says, relative to the holdings of the company on Bull hill, that until the Globe and Gold Hill leasing blocks have been disposed of no applications for leases in Bull Hill section will be considered or granted.

IDAHO.

Blaine County.

J. Peterson, superintendent and part owner of the Argosy M. Co., is preparing for increased operations at his company's Muldoon property, near Hailey. He expects to haul ten tons of ore a day from the mines to the railroad. There is said to be 2 feet of solid lead carbonates in the Argosy, and a good-sized dump is ready for hauling to the railroad, thence to Salt Lake City, Utah.

Boise County.

It is reported work will be resumed in the Gold Hill mine at Quartzburg by G. W. Grayson and W. C. Ralston of San Francisco, Cal.

Custer County.

Work is progressing on Alder creek, 8 miles southwest of Mackay, 3 miles from the White Knob group and ¾ of a mile from White Knob Peak. It consists of four full claims.

Manager J. A. Czizek of Salt Lake City, Utah, of the Lost Packer M. Co., operating on Loon creek, says he has arranged for the construction of 25 miles of wagon road over Mt. Estes. Czizek reports physical conditions at the mine satisfactory.

Idaho County.

H. O. Nevin and J. A. McKay of Pittsburg, Pa., have bought the Yellow Boy mine, known as the Wundram strike, in the Cave Gulch district, and the property will be developed and a mill built. The shaft will be sunk 100 feet with drifting. The plan is to open up the ground and block out the ore, when a mill will be built. One and one-half miles of wagon road have been built, which, with little additional work, will connect with the boat landing on Snake river. The mine is 3½ miles from the river. Manager Nevin will make his headquarters at Lewiston.

Shoshone County.

H. F. Samuels, manager of the Stewart mine near Government gulch, near Wardner, states they are completing a tramway to carry the ore to the O. R. & N. spur.

Washington County.

E. D. Ford, manager of the Gold Coin M. Co., whose plant at Black Lakes, near Council, was destroyed by fire last month, says he is putting in a 100-ton cyanide plant. The Gold Coin Co. had miners employed all winter developing the mine and arranging for putting in the plant.

KANSAS.

Cherokee County.

Work at the Sunny Side mill at Baxter Springs is progressing satisfactorily. The plant was put in operation this week. A new shaft is being sunk south of the Sunny Side mill. When the ore level is reached a drift will be cut to connect with the drifts from the other shaft. —— J. E. Putman & Co. of Joplin, Mo., are still prospecting the Charters ground and are making good drill strikes.

On the Gaines-Brewster lease, near Baxter Springs, where Ford, Goodwin & Co. are mining, work is progressing. Two new shafts are sinking on some of the ground they have sub-leased. The mill of Ford, Goodwin & Co. will be ready to run by May 17th. The boilers are set, foundations for the mill and adjacent buildings are in, and machinery is being set up. The mill will have a capacity of 150 tons daily. The Gaines-Brewster people have 160 acres under lease.

KENTUCKY.

Christian County.

Near Gracey, a few miles north of Clarksville, Tenn., samples of fluorspar and evidences of zinc and lead have been found. The Gracey M. Co. has been incorporated to carry on mining operations on several tracts of land. It will begin operations as soon as the machinery can be set up.

MICHIGAN.

A Calumet report says Lake Superior copper production for the current year may fall considerably short of the earlier estimates, says the New York Commercial. For the first quarter of 1904 the output of the Lake mines was 47,230,900 pounds of refined copper, or at the rate of a little less than 190,000,000 pounds for the entire year. The strikes at the Quincy, Baltic, Tri-Mountain and Champion properties had an adverse influence on the production of those mines, and cut the yield for the entire district considerably below the amount expected. Production, however, will show an increase over the figures for 1903, although the growth will not be so large in proportion as last year's.

Houghton County.

The Calumet & Hecla C. Co., at Calumet, has begun crosscutting from No. 20 shaft. This is one of the two shafts on the Kearsarge lode, and the crosscut is being driven westward to cut the lode. When the bed is located an upraise to surface, at the proper angle of dip, will make a permanent No. 20 shaft. No. 19, the north shaft of the Kearsarge bed, is drifting and shows payable ground.

For several years the residents of the Quincy location and the city of Hancock have been disturbed from time to time by air blasts. These, says H. J. Stevens of Houghton in the Daily Mining Record, are caused by the settling or caving of old workings in the Quincy mine, and are similar in general effects to light shocks of earthquake. Calumet seems slated for a similar series of shocks, the first happening last week. With more than 100 miles of worked out and abandoned mine openings, it is not strange that such a subsidence should occur in the Calumet & Hecla. While unpleasant, they are not considered dangerous to the mine or to the city.

The fourth level of the Champion mine, at Painesdale, is 5000 feet in length. The third and fifth levels, when rendered continuous by completing the driving of short connecting sections, will be about same length. These are opened on the Baltic amygdaloid bed.

The Elm River mine, near Winona, is reported drifting in encouraging ground on the Winona lode. As settled weather is at hand, it is expected work will be resumed on the sinking of the new shaft of the Winona, which passed through good ground in the four levels already sunk.

The diamond drill borings of St. Mary's Mineral Land Co. near the Winona mine, near Winona, are reported progressing, and as the Winona lode has been located and identified by these borings, it is thought a shaft will be started by summor. Nothing has been heard recently of the proposed shafts on the Globe tract, south of the Champion mine.

The Old Colony mine, near Calumet, reports cutting another of the cupriferous amygdaloids located by drill borings in the crosscut driven westward from No. 1 shaft.

July 1 the Centennial mine, near Calumet, expects to begin production, with one head, at the Arcadian mill at Grosse Pointe. The Arcadian mill has three heads. It is thought the Centennial will begin stamping with a single head only. Two heads might be started, but it is doubtful if enough stopes are opened ahead to allow a proper selection of rock to the extent of 1000 tons daily. The principal shaft of the Centennial is 2850 feet in depth, and good stopes have been opened, especially in the lower levels.

Keweenaw County.

This month the Ahmeek mine, west of the Mohawk mine, near Allouez, will be added to the present list of producing Lake Superior copper properties. The Ahmeek will supply one head at the Tamarack mill with rock.

The new shaft of the Allouez mine, at Allouez, is 650 feet in depth and should cut the Kearsarge bed by fall. This shaft is sunk at an angle of 80°, but will take the angle of the lode's dip when the copper-bearing amygdaloid is reached.

The management of the Phœnix mine, at Phœnix, is considering the plan of extending its railway to Eagle river and building a pier and coal wharf at that point.

Ontonagon County.

The Mass mine, at Mass City, is sinking two shafts—"A," which is 1300 feet deep, and "B," which is 1250 feet in depth.

MISSOURI.

Jasper County.

The Jubilee mine, ¾ mile southwest of Carl Junction, is making progress. It is joined on the east by the Des Plaines and on the west by the Lehigh mines. The company has sixteen lots, with the main shaft down 127 feet in pay dirt, and to reach the bottom of the ore the shaft will have to be sunk to a depth of 142 feet. Their drill holes, eleven in number, show ore from 106 to 142 feet, giving them a face of 36 feet. The present pumps are not large enough and they are preparing to put in two walking-beam pumps, an air compressor and a large boiler. Arrangements are being made for building a mill. The property is under management of H. Smith, president, and E. S. Keskeys, superintendent.

Near Diamond, 14 miles southeast of Joplin, is reported development of a zinc prospect. The ore has been found on the Lovo land, leased by M. Byers and Kelley Bros. of Diamond. A drill was put down on the land and zinc struck at a depth of 35 feet, and the drill continued in ore to a depth of 130 feet. A shaft was then sunk 12 feet from the drill hole and the body of mineral opened.

The Gih Wommack lead mine has been sold to Ross & Alexander of Kansas City. The mine is ½ mile east of Duenweg, on the Gage & Carrick mine, and the sale carries with it the mine and a 40-acre fee for $100,000.

MONTANA.

Beaverhead County.

At the Ajax mine, near Dillon, the ore is free milling and is said to average $10 per ton, and the concentrates run $35 in gold and 33% in lead. The 10-stamp mill has been shut down because of the great amount of snow which interferes with transporting the ore from mine to mill. The company expects not to start the mill again until the aerial tramway, which the company will begin building next week, is completed. It is expected this tramway will be finished by July. When the improvements now being made are all completed three shifts of forty men each will be kept at work. While the mill has been stopped for improvements, development work in the mine continues. The principal work being done is the driving of tunnel No. 4, which will tap the vein at the lowest point.

Broadwater County.

Rossberg & Sutton, who have bought the supposedly worked out Stray Horse mine, near Winston, report having struck gold ore below the old workings, and have begun shipments to East Helena.

Cascade County.

E. W. King of Bozeman, of the Barnes-King M. Co. of Fergus county, has bought mining properties on the Dearborn river. The claims are accessible either from Craig or from Great Falls, via the Montana & Great Northern.

Jefferson County.

The Basin-Comstock M. Co., composed of H. Layne, A. S. Ray, C. Sturtevant, W. Bauden and W. Kidney, is preparing to continue equipment and development of the Comstock mine, near Basin. Last fall, as the roads were not in condition to allow the hauling of the necessary material, operations were suspended until spring. Up to the time of the closing of this mine considerable development work had been done, there being a shaft 315 feet in depth and 1200 feet of crosscuts, drifts and raises. This work was done with a 60 H. P. boiler and a 45 H. P. engine. The company intends to sink the shaft 200 feet deeper and will put in more boilers and two heavy pumps. The Comstock mine is 4 miles from Basin.

The Pennsylvania-Montana M. Co., operating the Hattie Ferguson mine, near Basin, has started shipping ore again. The company has been working the mine all winter, but stopped shipping the product a month ago, as the teams could not get over the roads.

Powell County.

The Gold Creek-Montana Co., Ltd., has been organized for working the bars of Gold creek, 60 miles northwest of Butte. The company has bought from C. Bergstrand et al. 1500 acres of ground along the creek. It has also ordered machinery for a dredge boat and lumber for building the boat. T. Clearage and T. Sletter are interested. The point at which the boat is to be built is 6 miles from Gold Creek station, or 2 miles west of Pioneer.

NEVADA.

Nye County.

In the Montana Tonopah, at Tonopah, the main shaft has reached the 750-foot level and the crosscut north to the ore bodies has been started. The 50 H. P. hoist is in full operation and progress is being made in raising to the surface the ore and dirt which had accumulated in the drifts and crosscuts which the former gasoline hoist was unable to handle.

Superintendent Tripp of the Tonopah railroad says the line will be completed and in operation by June 20th if the C. & C. road can deliver material in time.

NEW MEXICO.

Colfax County.

The Ponil Placer Co. has been incorporated and owns a 4-mile strip of placer ground along the South Ponil in Colfax county. South Ponil creek has its source in the Copper Park basin. The Aztec gold mine is above the ground of the company and the placers receive the drainage from Aztec hill. H. Brainard of Raton and E. S. Douglas of Chicago, Ill., are interested. The property is supplied with an abundance of water and the fall of the stream makes the location favorable for hydraulic mining. There is also plenty of timber on the ground. Douglas says the Grand Duchess tunnel is in 290 foot. Ore has been struck in tunneling. J. Bidwell has the contract for running the tunnel. It is the intention of the company to drive in 800 feet, cutting the main vein of the Grand Duchess at a depth of 800 feet.

Grant County.

The business men of Silver City have subscribed $2200 as a bonus to secure a smeltor, says the New Mexican. Johnson & Atkinson have been offered a bonus of $2500 to move their Burro Mountain smelter to Silver City.

The Scotch Lassie mine at Central City will again be operated now that the litigation which involved title to it has been settled in favor of Mrs. J. Hutchinson.

I. H. Rapp, owner of the Roosevelt group at Silver City, is doing development work. The claims are said to be on same vein as the Paymaster. There are five shafts on the group from 20 to 40 feet in depth and the ore averages $10 per ton.

The owners of the Boston Bucket mine at Central City are preparing for work. The pay streak runs in gold.

Sixty-five men are at work on the mines of the Southwestern C. Co., under management of T. W. Carter. Twenty-five men additional are removing the machinery from the properties of the Pinos Altos G. M. Co. at Pinos Altos, which has been bought by the Burro Mountain C. Co. The grading for the mill is completed and the work of building is under way. A road has been built from Sheridan Camp around St. Louis hill. The double-compartment shaft, which is to be sunk to a depth of 130 feet to make connection with the workings in the St. Louis and Sampson mines, has reached a depth of 50 feet. When completed the shaft will be equipped with cages and other machinery. As soon as the surface improvements are completed, men will be put on to take out ore, and the mill will be started.

Sierra County.

The station on the 200-foot level of the Empire mine at Hillsboro has been completed and sinking resumed. Considerable water has been encountered.——The mill on the El Oro mine at Andrews has been cleaned and is ready to resume operations.

It is expected the Richmond M. Co. will build a 50-ton mill near Hillsboro on its millsite on Percha creek. The company has during the past year shipped $250,000 worth of high-grade ore to El Paso, but the lower grade was kept on the dump and in the workings. This ore runs $4 per ton, and on one dump there are 60,000 tons. The development work on the Richmond continues, the entire development aggregating 7000 feet, with a depth attained of 450 feet.

Taos County.

The Rio Colorado M. & M. Co. has been incornorated to operate at Red River.

Valencia County.

The shaft of the Fourth of July of the Montezuma group at Copperton is down 100 feet on a 6-foot vein of high-grade copper ore, says the New Mexican. A Los Angeles company is 40 feet down on the Compromise and is in ore. F. R. Rogers as well as Eldridge & Richards and others are doing assessment work. A drill hole 400 feet deep on the property of J. L. Leavitt & Co., passed through several feet of copper ore that runs 10%, besides one ounce of gold. An iron ledge in the camp shows gold values.

OREGON.

Baker County.

D. L. Choate says that on the Banzette group of claims, near Greenhorn, of which he is owner, development will be taken up again this week. The Banzette group consists of six claims. About 1500 feet of development work has been done, besides sinking several shafts, and from this development $50,000 is reported to have been cleaned up. The ores from the different veins on the group range from $40 to $60 per ton in gold.

Manager F. T. Kelly's second battery

of steam stamps for the I X L mine at Greenborn is in operation. The additional steam power required is furnished by the Don Juan boiler, placed alongside of the old one. The two batteries do not tax the leaching plant, as it is capable of handling thirty tons. The two batteries handle sixteen tons daily.

Surface improvements are to be increased at the Gold Bug mine, near Sumpter, as soon as snow permits the work, says Manager O. C. Wright. When the other buildings are finished the number of men will be increased and the crosscut hastened to completion, that the vein might be opened on the lower level early in the season. At the same time this work is being done, arraugements will be made for a milling plant.

Development will be resumed on the Grand Union mine, near Sumpter, says G. Barrett, manager. The crosscut will be completed to the Concord vein.

Jackson County.

F. Jordan, of Cottage Grove, operating on Thompson creek, is associated with W. Jordan, of Merlin, and R. Thompson, of Grants Pass. The mine is 1½ mile from Applegate and shows a vein of ore from 8 to 18 inches across, which has been traced for 400 feet and carries values. There are 200 feet of tunnel besides other improvements, and it is the intention of the owners to equip the mine with machinery and develop it during the summer.

SOUTH DAKOTA.

Lawrence County.

The Imperial M. Co., near Deadwood, is arranging for entrance into the McGovern claims through the abandoned workings of the Horseshoe M. Co. on adjoining property. The Horsesboe and other companies owning claims next to the McGovern claims have worked the ore shoots to the boundary line. —— The Oro Hondo Co., near Lead, has been getting ore in the bottom of its shaft at a depth of 900 feet. The property adjoins the Homestake on the south. The shaft is intended for a depth of 1100 feet before any lateral work is attempted.

UTAH.

Beaver County.

C. Rae et al. of Chicago, Ill., who had an option on the Talisman mine, the Roosevelt Hot Springs and other properties near Milford, have bought them. The same men own the Gilt Edge mine in Montana. It is intended, says Manager Rae, to put men at work in the Talisman next week. A hoisting plant will be put in and railroad siding built 3 miles from Solus, and ore shipments started. There are bodies of shipping ore exposed.

Juab County.

The Eagle & Blue Bell shaft, near Eureka, has been finished to a depth of 500 feet below the tunnel, and when the 600-foot level is reached the new boist will be put in position and stoping on the fourth, fifth and sixth levels will start. The management expects to be ready to break ore by July 1st. The compressor, which will furnish air for the hoist and drills, is being set up. It will be driven by electric power.

The Eureka Hill mill, near Eureka, has been cleaned out and will be started up next week. About one-half of the one hundred stamps will be startod on the low-grade ore.

Salt Lake County.

Work on the Flagstaff mine at Alta, which produced ore in the early days, will be resumed this month.

A strike is reported from the Alta-Quincy mine at Alta. A body of ore averaging 11% copper, 30 ounces in silver and $180 in gold per ton is said to have been cut at the contact of the limestone and porphyry formations.

The management of the Yampa mines at Bingham will forward to the furnaces of the Bingham Con. smelter in the valley 200 tons of ore daily while the equipment of its own plant in Bingbam is being completed. Meanwhile the smelter, which has been reducing 175 tons of ore a day, will have its capacity increased and at the resumption at loast 300 tons of ore will be daily reduced. To do this the plant will bo blowu out for about sixty days, says Manager Robinson.

Work was resumed in the Mascot (Dalton & Lark) tunnel at Bingham last week, and it will be extended under the D. & L. incline and into Brooklyn ground. —— A consignment of Utab C. Co. concentrates marketed last week contained 40% copper, $10 gold and 5 ounces silver per ton, according to mill assays, says Superintendent Janney.

Summit County.

J. Allen, T. Bell and A. E. Raleigh have a three-year lease and bond on the Sunrise claim, adjoining the Woodside mine, near Park City and have men at work sinking a shaft.

Tooele County.

Last week the Sacramento mine at Mercur made a sbipment of 350 flasks of quicksilver, worth $16,000. The Sacramento Co. is now a regular producer of this metal. It is also producing its usual output of gold.

WASHINGTON.

Columbia County.

J. R. Tbronson et al. are arranging to operate the Mayflower mine, near Dayton, and will build a mill and cyanide plant.

Ferry County.

(Special Correspondence).—The Republic mill may start up again this summer. The Golden Eagle is sinking. The bottom of the shaft is 80 feet from the ledge. A station has been cut and a cross drift started for the ledge at the 400 level. It is believed that the crosscut will encounter another ledge lying between the shaft and the main or Quilp ledge. It will probably be July 1 before either of the ledges is cut.

The Quilp mine is still closed. The Knob Hill is stoping and driving on the 230-level. A winze is also being sunk at that level. The ore is of good shipping grade and maintains its width of from 7 to 8 feet. It will resume shipping next week.

Republic, May 1.

The House of Representatives at Washington last week passed a bill to permit the Keller & Indiana Con. S. Co. to construct a smelter near the San Poil river, near Keller, and build a flume, and grants the company six acres of landsite for the smelter and a strip of land of sufficient width for the flume. This company must pay the Colville Indians for the privileges thus granted.

Kittitas County.

A smelter and other equipment will be installed by the Gallagher M. & M. Co. in Cle Elum district, near Roslyn.

Stevens County.

The Paragon M. & Dev. Co. of Spokane has bought the Lucky Boy mining claim for $10,000. The Lucky Boy lode is 5 miles south of Boundary City, and was formerly the Bald Eagle claim. The Paragon company has taken charge and will put men at work taking out ore for shipment.

Whatcom County.

J. Siegfried of Bellingham, president of the North American M. Co., says the company's stamp mill will be increased from ten to fifty stamps.

WYOMING.

Bighorn County.

Prospectors are going to the canyon of the Shoshone river, 5 miles west of Cody, where it is reported telluride ore assaying in gold and silver has been found. All available ground for several miles up and down the river from the scene of the reported discovery has been located.

FOREIGN.

AFRICA.

Rhodesia.

The Rhodesian Chamber of Mines reports the following analysis of gold production for month of February: Matabeleland, 19 mines (336 stamps); Mashonaland, 6 mines (78 stamps); total, 25 mines (414 stamps).

	From Mill. Ozs.	Dwts.	Tailings. Ozs.	Dwts.
Matabeleland	14,079	2.03	1,261	6.00
Mashonaland	2,396	11.29	250	0.00
Totals	16,466	13.32	1,511	6.00

	Concentrates. Ozs.	Dwts.	Other Sources. Ozs.	Dwts.	Total. Ozs.	Dwts.
Matabeleland	....	....	149	11.16	15,480	19 19
Mashonaland	545	18.00	....	....	3,192	9.29
Totals	545	18.00	149	11.16	18,673	8.48

SUMMARY OF PRODUCTION.

Gold—	Value.
From mill	£59,846
From concentrates	2,111
From tailings	4,754
From other sources	517
Total	£67,228
Other Metals—	
Silver	3,461 ozs.
Lead	29 tons

Transvaal.

Tho Transvaal Chamber of Mines at Johannesburg reports tbe figures for tbe gold output of 1904 to April 1st:

	Witwatersrand. Ozs.	Outside Districts. Ozs.	Total. Ozs.
January	278,867	9,957	288,824
February	282,436	7,066	289,502
March	299,625	8,617	308,242
Totals	860,928	25,640	886,568

AUSTRALIA.

Queensland.

The Lancelot Freehold Tin & Copper Co., at Newellton, reports during March eighteen tons of 65% tin-bismutb ore were produced and twenty-five tons shipped. Tbe 5-stamp mill is becoming defective. The mine is looking well. There is a supply of ore to provide for the 20-stamp mill in course of construction. Tbe main sbaft has been sunk to a depth of 250 feet. The lode improves with sinking. The lode in the end is 5 feet wide, and carries 15% tin oxide. G. Waller is manager.

The Mount Morgan G. M. Co., at Mount Morgan, reports March results: Tons chlorinated, 20,636; gold returned, 9618 ozs.

Western Australia.

The following tablo of working costs has been compiled by W. Sutberland of tbe Golden Horseshoe M. Co. at Kalgoorlie, based on tbe latest annual reports of tbe leading mines, and sbows tbe last year's total costs:

Company.	Cost Per Ton.	Cost Per Ounce Extracted.
Associated Northern	$32 44	$ 8 11
Oroya-Brownhill	24 43	11 52
Lake View Consols	18 15	14 87
Golden Horseshoe	16 81	9 74
Kalgurli	16 47	14 65
Boulder Main Reef	15 93	17 23
Great Boulder	13 14	8 21
Great Fingall	11 94	7 19
Westralian Mount Morgan	11 90	11 92
Cosmopolitan	11 60	13 20
Boulder Perseverance	10 96	7 13
Ivanhoe Gold Corporation	10 82	10 02

Under bead of working expenditure are included development, diamond drilling, ore reduction, depreciation, maintenance and management expenses (in fact all expenditure incurred in Western Australia).

The Ivanboe G. Co., at Kalgoorlie, reports output for month of March: 14,400 tons of ore crushed, yielded 3238 ozs. (100-stamp mill running 30 days 1 hour); 7430 tons of sand treated, yielded 2337 ozs.; 6100 tons of slimes treated, yielded 2552 ozs.; 880 tons of concentrates troated, 2347 ozs.; 320 tons of telluride ore treated, yielded 436 ozs. Total, 14,720 tous (2000 lbs.) yielded 10,910 ozs. fine gold. Expenditure: Working expenses (= 23s 2d per ton), £17,100; mine development, £4300; machinery and plant, £500. Estimated profit for month, £22,995. Total estimated profits from January 1 to March 31, 1904, £64,955. Expenditure on new plant, etc., from January 1, 1903, to February 29, 1904, £51,190: ditto, during Marcb, 1904, £3800. Total, £54,990.

Tbe Chamber of Mines at Kalgoorlie reports that the scale of wages fixed for the Kalgoorlie field by the Court of Arbitration in September, 1902, will, by agreement, be continued for eigbteen months from April 1st, with the following exceptions: The hours of labor underground will be forty-seven per week; mechanics and laborers will receive 11s per day; oilers will receive 10s 6d per day; riggers will receive 11s 8d per day.

BRAZIL.

Tbe State Government of Minas Geraes has abolished the direct tax on diamonds, which are now free of duties, whetber cut or uncut, says the Brazilian Mining Review. A system of claim taxes, more easily applied and causing less annoyance, as well as being impossible to evade, bas been substituted.

Tbe President of the State of Rio de Janeiro has issued a decree fixing tbe duties payable on monazite mined on State lands at 20%. The deposits are at Saquarema and Safrucaia.

The statistical returns of tbe Bureau of Statistics of Brazil for 1903 give the export of gold in bars at $3,846,324 or £192,316. and that of manganese at $1,966,792, or taking the Minas Geraes official value of $20 per ton as a basis, 98,340 tons. The average output of tbe S. Joao d'El-Rey Co. is said to be £250,000 per annum.

BRITISH COLUMBIA.

A number of American companies have acquired deposits of free-milling ore on Siwash creek, 6 miles from Yale, and since coming into possession a year ago they bave made important improvements in the district. They placed a cable across the canyon of the Fraser river, built a 4-mile trail at a cost of $5000 and have landed fifty tons of macbinery via the Canadian Pacific Railroad at tbat point, ferried it across the river and are transporting this machinery to the mines on Siwash creek. I. L. Cole will start erection of this 10-stamp mill this week.—— There are tbree American companies on this creek, including the Mount Baker & Yale M. Co., composed of Bellingbam, Wash., men. The ore body at tbis point consists of three parallel dykes, and in each is exposed a body of free-milling ore. They will put in forty stamps.——The International M. Co. is putting in a 5-stamp mill on its claim adjoining the Mt. Baker & Yale and is also putting up two hydraulic giant plants. H. Sayers of Seattle, Wash., will put in two hydraulic pumps in Hill's Bar, and Mr. Stanazloski will put in 2 miles of flume to work Boston Bar. Other smaller workings will be taken up.

Rossland District.

The Le Roi mine at Rossland, says Manager J. Mackenzie, shipped to the company's Northport, Wash., smelter during the month of March 21,545 tons of ore, containing, according to smelter assay (which is below mine assay), 7425 ounces of gold, 11,200 ounces of silver and 548,700 pounds of copper.

Slocan District.

G. D. Potter et al. of Spokane, Wasb., and W. E. Zwickey of Kaslo bave bought tbe property of the Queen Bess Proprietary Co. comprising tbe Queen Bess, American Girl, Mentor, First Extension, Young Dominion, Concord and six fractional claims above tbe Alamo concentrator, near Three Forks, near Kaslo. Tbey bave organized the Queen Dominion M. Co., Ltd. Tbere are known to be tbree leads on the Queen Bess ground. Tbe lead ou tbe Idaho is said to strike into tbe property and outcrops at two or three places. The bulk of the values bave been taken out of lead A, on which 3000 feet of work bas been done in tunnels, crosscuts, etc. A small amount of work has been done on load C. Potter & Zwickey are driving a tunnel to tap lead B, on whicb there has been no work done. Ore shipped from the Queen Bess has averaged 100 ounces in silver with 50% lead. The owners bave granted a loase of a block of ground embracing part of tbe old workings to McDonald Bros., who have started to open up some of their drifts. There is a warebouse at the Alamo siding, on the Canadian Pacific Railway, to whicb point ore can be brought by wagon or over the Alamo gravity tram by arrangement with that company.

Vancouver Island.

The new owners of the Britannia C. Co. mine at Howe sound have organized tbe Howe Sound Co. with the following directors: E. Dewdney, G. H. Robinson, F. M. Leonard, C. H. McMeekin, D. G. Marsball, H. C. Bellinger and J. W. Lee. Tbe second vice-president and manager at Vancouver is F. M. Leonard, and managing director, G. H. Robinson. Tbey are preparing to equip the mine on a shipping basis. Plans for the contemplated works are completed. It is estimated that wben the plans are carried out there will be a daily output of at least 500 tons. Tbe capacity of the tram will be 2500 tons of ore per day of twenty-four bours, but at the start it is not expected more than from 500 to 1000 tons of ore will be handled over it. As the line is located the tram will be about 3½ miles in length. A wbarf will be built at tbe water front. The output will be in the meantime shipped to Crofton smelter. Later a concentrating works may be established on Howe sound for preliminary treatment of tbe ore.

Tbe Tyee C. Co. at Ladysmith during month of March reports following smelter returns: Smelter ran twenty-one days; 4701 tons of Tyee ore smelted, giving a return, after deduction of freight and refining charges, of $55,565.35.

West Kootenay District.

With completion of the Great Western silver mill at Five Mile, which will be put in operation next week, the silver and gold ores of the Silver Cup and Nettie L mines, near Ferguson, will be reduced to bullion. The mill is of twenty stamps.

CANADA.

Ontario.

Manager E. Hall of the Gold Standard mine, near Wabigoon, reports satisfactory progress in tbe lower workings of company's property on Nelson bay. From the crosscut at the 80-foot level 116 feet have been drifted, tbe ore maintaining high grade throughout. Until navigation opens this portion of development will be continued, when sinking below the 140-foot level will be resumed.

A. B. Hermann, manager of the Redeemer M. & M. Co., near Dryden, is arranging for building a 10-stamp mill on the lake front this spring.——At the Gold Coin M. & M. Co.'s property, near Dryden, Hutchinson Bros. have done considerable surface work in the way of clearing the ground and erecting camp buildings preparatory to starting mining operations.

The 60 H. P. boiler, 3-drill air compressor and other machinery for the Little Master mine, near Wabigoon, are on the ground. says Manager Halsted.—— Samples of ore containing visible gold bave been obtained at the Baden Powell property, near Eagle lake, of which J. Higbee is manager. These samples were obtained from the north and south drifts and the vein is said to be 3 feet wide.

Yukon Territory.

Miners working in the paystreak of an ancient river channel, 38 feet below tbe surface of the ground, where the frost is practically permanent, found last week tbe complete form of a mastodon at Hillside, opposite No. 5 below A. Mack's dis-

covery on Quartz creek, near Dawson. The flesh of the animal was partially decomposed, but the hair and skin remained intact. Owing to the frozen ground the work of excavating was difficult, and it was only by the use of steam thawing plants that it was completed. The tusks of the animal are intact.

MEXICO.

It is reported that for the eight months ending March 1, 1904, Mexico bought from the United States electrical machinery of $333,027 value.

Aguas Calientes.

G. A. Marquez is preparing to open up an iron mine near Aguas Calientes.

A group of copper properties near Topezala have been taken over by A. Cruz, and he will start development this month.

The American S. & R. Co. is making additions to its plant at Aguas Calientes. New furnaces are being built. The company employs 1564 men at that point and has an annual payroll there of $700,000.

Chihuahua.

There are fourteen diamond drills in the Santa Eulalia camp in operation on nine different properties.

The Terronates Con. M. Co., operating in Parral, has been reorganized as the United States M. Co., and J. P. Elkin of Pennsylvania is president, with J. W. Marshall as manager. The 600 H. P. electric plant is up and in operation. The power is used for lighting and hoisting and later will be applied to the pumps. The stationary pumps are on the ground and the others are to arrive.

D. R. Jackson, manager of the Santa Eulalia Exploration Co., has boilers and heavy hoisting machinery and air compressors and drills on the ground for the company's mines at Santa Eulalia.

In the district of Hidalgo, which includes Parral, Minas Nuevas and Santa Barbara, and the district of Jimenez, there are 1200 different mining properties or denouncements paying taxes to the Federal government, says the Chihuahua Enterprise. The last named district includes the new district of Sierra Almaloya.

An electric plant of 100 H. P., with a 150 H. P. gasolene engine to generate electricity, is being installed for the Alferencia mine of the company that owns the San Francisco del Oro mine at Santa Barbara. The plant is to furnish power for hoists, pumps, drills and lights.

The Tecolotes M. Co. at Santa Barbara has resumed development work while waiting arrival of electric machinery which is to be used for generating power for the 450-ton concentrating plant. The mine and mill have been closed down for several weeks to substitute electric power for the gas engines which have been in use heretofore.

G. C. Beckman of Parral, A. Longere and A. G. Galan have bought 55,000 acres of land near Sabinas and have started prospecting for coal under encouraging circumstances. The lands are 10 kilometers from the Mexican International railroad. The coal is said to be of coking qualities. The owners are sinking three prospecting shafts. One shaft is 20 meters deep and shows a vein 3 feet thick. They also have three diamond drills at work.

Durango.

The Velardena M. & S. Co.'s property, near Velardena, has been bought by the Guggenheim Exploration Co. on a valuation basis of $10,000,000 gold, the Guggenheim Exploration Co. acquiring a 60% interest in all the company's holdings, paying $5,000,000 in cash and guaranteeing to expend $1,000,000 more in improvements and developments. The other 40% is held by the Velardena Co., in which F. W. Nash, M. Dahlgren, C. Wilhelm and the estate of J. N. Matthews are stockholders. The mining claims comprise 6000 acres.

The Torreon smelter will build roasters at its plant in Torreon for treatment of the ores of the San Francisco del Oro mine in Santa Barbara district of Chihuahua. The smokestack of the smelter at Torreon, which is 235 feet high, has been finished and another 100-ton furnace is in process of construction.

Guanajuato.

W. H. McCord of Guanajuato and L. M. Fairbanks of Chicago, Ill., have bought the Peregrino and the Tajo de Dolores mines, near Guanajuato. They propose to build a mill and cyanide plant at the Peregrino mine to be run by electricity.

The Guanajuato Power & Electric Co., owned by Bonbright & Co. of Colorado Springs, Colo., has been merged into a new corporation, known as the Guanajuato R. & M. Co. The officers are C. L. Kurtz, H. Hine, L. E. Curtis and I. Bonbright. The power company last November completed the erection of a plant and transmission line in Guanajuato district at a cost of $1,500,000.

Jalisco.

N. Z. Seitz of Philadelphia, Pa., vice-president and manager of the Central M. Co., says he will put in machinery at their mines, near Ixtlan del Rio, and begin development.

A lead mine on Cuyutlan hacienda, near Mascota, will be developed by F. Mendez.——F. Hernandez has a gold and silver group, near Navidad, which he will develop.——A. Quesada has bought the Santa Isabel silver mine, near Ojuelos, and will start development this month.

Near Lagos, E. A. Durst and M. A. Algelt, of Irapuato, are preparing to develop cinnabar deposits.

Lower California.

It is reported the Evangelina Copper Co. has struck a 5-foot vein of copper glance on its property near San Julio. Manager Wilder of Los Angeles, Cal., has men doing development work on the mine.

Mexico.

A 100-stamp mill will be built at El Oro by El Oro M. Co. In same camp the Dos Estrellas M. Co. also proposes building a mill.

Nuevo Leon.

The Compania Minera de Naica, owning the San Pedro mine at Naica, has its 16-mile narrow gauge railroad in operation and a train of eight cars making three trips with ore every day. The cars are of two tons capacity, but the carbonate ore being shipped runs a little over a ton and a half to the car. Smelter No. 2 of Monterey is still shipping from the district and is hauling ore by wagon to Conchos station on the Mexican Central. Four or five companies are operating in the district.

Oaxaca.

The Escuadra M. Co. is working a property on Escuadra mountain in Taviche camp of Ocotlan district. The mine is well equipped with machinery and compressed air plant for drills. W. J. Cartin of New York is president of the company and E. G. Hart is manager.

La Providencia mine, C. A. Hamilton, Jr., manager, is preparing to build a 50-ton mill.

Sinaloa.

Deposits of gold are reported found at Choix and prospectors are going to the district.

Sonora.

The Gold Coin M. Co. at San Javier has completed and blown in its smelting furnace at the Santa Rosa mine.

The reduction plant of the Yaqui S. Co. at Toledo is running and shipments of lead and silver bullion are being made.

The Hayes Con. M. Co., near Casita, is preparing to add a cyanide plant to its 20-stamp mill, which is under construction.

J. R. De Lamar of New York has an option on the Anita copper mines near Alamos, in southern Senora. T. Douglas is in charge of the mines and has started development.

NEW ZEALAND.

The mine development and dead work carried out at the Waihi mine, at Waihi, during the past year, says the Mines Record, was equal to about 3½ miles, as follows:

	Feet.
Crosscuts through country	3,733½
On course of lode	8,563½
Crosscuts in lode	530
Winzes sunk	5,921
Shafts sunk	289
Total	19,017

The total product from the mine was 214,508 tons, nearly one-half of the ore having been obtained from the Martha reef and a quarter from the Empire reef. The ore, the whole of which was wet-crushed, yielded 677,873 ounces of bullion, valued at £519,445. This was exclusive of concentrates and slag tailings, about 1785 tons of which were shipped for treatment, and gave assay value of £82,402 for concentrates and £1320 for slag tailings. Total value of ore treated, £603,167. Average value of bullion was somewhat lower than in year 1902, but a better extraction of silver was obtained. Twenty-eight vanners are in use and five filter presses.

W. T. Glasgow, secretary of the New Zealand Department of Trade and Customs, reports the following comparative return for the years ended December 31, 1903 and 1902:

	1903		1902	
Districts.	Quantity. Ozs.	Value. £	Quantity. Ozs.	Value. £
Auckland	232,681	832,334	201,583	721,977
Marlborough	972	3,845	601	2,404
Nelson	7,962	31,710	5,947	23,649
West Coast	125,241	501,090	118,796	475,272
Canterbury			2	7
Otago	166,458	668,852	181,116	728,124
Totals	533,314	2,037,831	508,045	1,951,433

TASMANIA.

The Briseis Tin Co.'s Melbourne office reports for period ending March 31: Black tin cleaned up, 35 tons (February 35 tons 13 cwts.). Average total sluiceheads of water available from all sources, 149 (February 145). Rainfall during period, 126 points (February 947). Overburden removed, 45,800 cubic yards, in addition to 15,501 from No. 1 Co. (February, Briseis 44,930, No. 1 Co. 13,000). Drift sluiced, 13,400 cubic yards.

The Mount Zeehan Co., at Zeehan, output for month of March amounted to 375 tons of silver-lead ore, containing 206 tons of lead and 30,000 ozs. of silver.——The Zeehan-Montana Co.'s output for March amounted to 245 tons of silver-lead ore, containing 147 tons of lead and 20,000 ozs. of silver.

Personal.

G. A. PACKARD is examining mines at Baker City, Or.

W. A. DOBLE of San Francisco, Cal., is in St. Louis, Mo.

J. C. HULL is manager of the Torpedo mine near Idaho Springs, Colo.

THOS. J. BARBOUR returns next week from London to San Francisco, Cal.

W. C. RALSTON has returned to San Francisco, Cal., from an Idaho visit.

JAMES LAWLER, a mill builder of Deadwood, S. D., is in San Francisco, Cal.

GEO. S. RAYMER is now assistant mining professor at Harvard University.

R. GUENTHER is manager of the Martha Washington mine, near Eureka, Utah.

O. J. DUFFIELD of Rollinsville, Colo., is manager of the Happy Hollow group of mines.

B. E. SHEAR of Denver, Colo., is in Tonopah, Nev., where he has mining interests.

K. E. KELLER is now superintendent of the Pan-American M. Co. at Guadalajara, Mexico.

C. P. CRAWFORD of Santa Rita, N. M., is in San Francisco, Cal., on mining business.

CHAS. W. PAULY has resigned the receivership of the Free Gold Mining Co., Hedges, Cal.

W. E. THORN has returned to Denver, Colo., from mine examinations in southwest Colorado.

G. W. MILLER, Denver, Colo., is examining mining property in the Silverton, Colo., district.

R. HERRON of Los Angeles, Cal., interested in oil properties, is in San Francisco, Cal., on business.

THOS. B. COE has resigned the superintendency of the Magnolia mine, Miller Mountain, Idaho.

O. J. MCSORLEY of San Andreas, Cal., interested in Calaveras county mines, is in San Francisco, Cal.

W. J. BARNEY succeeds Percy Williams as superintendent of the Imperial mine, Tucson, Arizona.

F. OLIVER is general superintendent of the mines of the Waldorf M. Co., near Georgetown, Colo.

GEO. JOHNSTON, proprietor Johnston Concentrator, has returned from Arizona to San Francisco, Cal.

F. C. FINKLE, chief engineer of the Edison Electric Co. of Los Angeles, Cal., is in San Francisco, Cal.

ARTHUR WEST has resigned as assistant to the chief engineer of Allis-Chalmers Co., and goes to Europe.

A. P. SMITH of Sumpter, Or., has resigned as superintendent of the Victor mine, Baker county, Or.

G. CHURCHILL is superintendent of the Happy Hollow group of mines, near Rollinsville, Gilpin county, Colo.

O. H. FAIRCHILD AND C. E. BRAINARD have removed their offices to 202 Mining Exchange building, Denver, Colo.

H. W. TURNER of San Francisco, Cal., has gone to Seven Devils district, western Idaho, to make mine examinations.

T. CLARK of Placerville, Cal., superintendent of the River Hill mine, is in San Francisco, Cal., on mining business.

J. NEWELL, manager of the Fryer Hill M. Co., Leadville, Colo., is also manager of the Fortune mine for J. McNeece.

V. H. ROOD, vice-president and general manager of the Jeanesville Iron Works, Jeanesville, Pa., is visiting California.

T. DOUGLAS is superintendent of the Anita copper mines, near Alamos, Sonora, Mex., for J. R. de Lamar of New York.

F. L. SIZER has returned to Montana from New York and has assumed the management of the new Whitlatch Mining Co., which will operate in the vicinity of Helena.

J. W. CULBERTSON, interested in oil properties at Coalinga, Fresno county, Cal., is in San Francisco, Cal., on business.

S. B. WELD of the firm of Parmlee & Weld, chemists and assayers, Denver, Colo., has returned from Albuquerque, N. M.

C. F. GODDARD of Prescott, Ariz., has taken charge of the properties of the Goddard M. Co., near Wickenburg, Ariz.

G. SNYDER of the Western Exploration Co., operating the Balaklala copper mine at Kennett, Shasta county, Cal., is in San Francisco, Cal.

JESSE J. MACDONALD of Los Angeles, Cal., is examining the Mendoza mines, La Paz, Baja California, with a view to the use of cyauiding.

ROBT. L. WARNER has been appointed New England manager Westinghouse Electric Manufacturing Co., with headquarters at Boston, Mass.

W. B. DEVEREUX of Colorado Springs, Colo., consulting engineer for the Melones M. Co., operating in Calaveras county, Cal., is in San Francisco, Cal.

P. E. MURRAY, manager of the Humboldt M. Co., operating in Santa Cruz county, Ariz., returned to Nogales, Ariz., last week from San Francisco.

W. GLEASON has resigned as mill foreman at the Gold Reef mine near Gilt Edge, Mont., and has gone to Seattle, Wash. P. Burchie succeeds him.

J. L. PARKER goes as superintendent of the Brown Alaska Copper Co., Ketchikan, Alaska, where Paul Johnson is building a smelter for that company.

C. DE KALB, superintendent of the Exposed Treasure M. Co., has returned to the company's mines near Mojave, Kern county, Cal., from San Francisco, Cal.

G. WALLER, Tasmanian government geologist, is manager for the Lancelot Freehold Tin & Copper Co., operating near Newellton, Queensland, Australia.

J. DERN of Salt Lake City, Utah, president of the Mercur G. M. Co., returned there last week from an examination of mines in Mexico in which he is interested.

J. H. FENNESSEY, president, and A. H. Seep, vice-president, of the Mine & Smelter Supply Co., Denver, Colo., have returned there from the City of Mexico.

MANAGER BORCHERDT of the Colorado Tellurium G. M. Co., operating the Freedom and other mines, near Central City, Colo., is in the East on company business.

GEO. S. BINCKLEY, engineer in charge of the Puyallup River Power & Development Co., has returned from San Francisco, Cal., to his headquarters at Electron, Wash.

L. CUMMINS will resign the superintendency, metallurgy and milling, American Copper Co., Blanchard, Ariz., May 10th, and will open engineering offices in San Francisco, Cal.

H. I. SEEMAN, president of the Yankee Con. M. Co., at Yankee, Clear Creek county, Colo., returned there last week from an Eastern trip and has taken charge of the company's mines.

CHAS. H. FARROW, mill superintendent for the San Rafael M. Co., Ameca, Jalisco, has resigned and taken a similar position with the Keystone Copper Smelter Co., Tapalpa, Jalisco, Mexico.

R. E. DOUGLASS, late manager of the Choix Con. M. Co. at Choix, Sinaloa, Mexico, has taken the position of assistant consulting engineer of the Rhodesia Goldfields at Bulawayo, South Africa.

E. L. DUFFOUR has resigned as manager of the Montezuma Lead Co., at Santa Barbara, Chihuahua, Mex., and has gone to New York City, where he will open an office as consulting mining engineer.

J. A. DIGGLES has resigned as metallurgist for the Melones M. Co. at Melones, Cal., and has gone to Leonora, Western Australia, to take charge of a 60-stamp mill and reduction works for Bewick, Moreing & Co.

GEO. D. JAMES, mining engineer, Denver, Colo., has returned there from Boulder and Gilpin counties and will leave shortly for Sonora and Chihuahua, Mexico, to investigate some properties for Kansas City men.

H. S. WATERMAN of Berkeley, Cal., has received the appointment of resident engineer of the Northeastern Siberian Co., which has mining interests in Siberia. He will leave for the trading post of the company at St. Nicholas in June.

J. M. GARRISON, for several years fore-

man at the works of the North American Dredging Co., at Breckenridge, Colo., and later at the property of the Nevada C. Co., at Lovelock, Nev., has taken charge at the Athens gold mine in Rhodesia, South Africa, one of the properties being developed by T. F. Van Wagenen, consulting engineer of the Rhodesia Goldfields.

LAFAYETTE HANCHETT of Idaho Springs, Colo., manager of the Newhouse tunnel, has been appointed general manager of all the mining properties, mills and reduction works owned by S. Newhouse in Colorado, Utah and Montana. He will remove to Salt Lake City, Utah, July 1st, where he will establish permanent headquarters. He is credited with having an annual salary of $25,000.

THE following officers have been elected by the Canadian Mining Institute for the ensuing term: President, Eugene Coste, Toronto; vice-president, E. B. Kirby, Rossland; treasurer, J. S. Brown, Montreal; members of the council, J. M. McEvoy, Fernie; W. F. Robertson, Victoria; A. W. B. Hodges, Granby; W. G. Miller, Toronto; R. G. Leckie, Sudbury; J. Blue, Eustis; F. D. Adams, G. Fraser, North Sidney. The death of B. A. T. Bell was so recent that under the constitution it was impossible to elect another secretary, but the council will appoint one.

Commercial Paragraphs.

F. A. EARLS, Boston Block, Denver, Colo., is manager Dearborn Drug & Chemical Works of Chicago, Ill.

THE Gardner Electric Drill & Machinery Co., Denver, Colo., branch has recently shipped a complete plant, comprising generator, drill, engine, blower, etc., to the Stony Pass Mining Co., Silverton, Colo., and a drill equipment to the Golden Link Mining Co., Hillside, Ariz.

ABBOT A. HANKS AND FRANCIS L. BOSQUI have established in San Francisco, Cal., metallurgical and engineering offices, in conjunction with ore testing works, at 531 California street, and will make working tests on ores, devise methods of treatment, and design and install milling plants.

THE Broderick & Bascom Rope Co., 805 N. Main street, St. Louis, Mo., have issued a complete and authentic vest pocket map of the World's Fair as an aid to visitors to the fair, showing the methods of reaching the fair from any point in the city, location of all buildings and other points of interest on the ground, etc., a copy of which will be mailed free upon receipt of a 2-cent stamp for postage.

CROCKER-WHEELER CO., manufacturers of electric generators and motors, will on May 10th open a branch office in the Hibernia Bank Building in New Orleans, La. Mr. W. P. Field of the St. Louis office of the company, will be the representative in charge. There are fifteen Crocker-Wheeler branches from Boston to San Francisco, including St. Louis and Atlanta, but the company states the establishment of this new office has become necessary to accommodate the steadily increasing market for electric machinery in the South and Southwest.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CAPPED BOTTLE OPENER AND TEMPORARY CLOSURE.—No. 758,235. April 26, 1904. Charles Cady, Berkeley, Cal. This invention relates to a combined opener and stopple for soda bottles, beer bottles and the like. Its object is to provide a simple device for removing the metal sealing caps from bottles, at the same time affording means for interengagement with the external annular flange on the bottle neck to close the bottle and render it air tight, in order to preserve the unused contents of the bottle.

HERMETICALLY SEALED METAL BOXES.—No. 758,255. April 26, 1904. S. Jacoby, San Francisco, Cal. This invention consists in the employment of a plurality of overlapping hermetically sealing covers soldered to the top of the can and normally covered and protected by what is known as a "slip cover," these slip covers being so disposed as to be successively removed for the purpose of obtaining access to the contents of the box.

GARMENT SUPPORTER.—No. 758,201. April 26, 1904. F. S. Boedefeld, San Francisco, Cal. One-half assigned to Wm. L. Spencer of same place. This invention relates to a device for supporting hose and other garments. It is also applicable to corsets and may be used for all purposes where a garment-supporting device is required. It consists essentially of a loop or link having a coating of yielding material, the upper ends of said loop being made divergent and slidable in a corresponding guide, so that when tension is brought upon the article supported by the loop it will also act to contract the loop and cause it to bind upon the button or part with which it is connected. There is also means for locking the loop in its extended position.

Latest Market Reports.

SAN FRANCISCO, May 6, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25½d (standard ounce, 925 fine); New York, bar silver, 54⅝c, refined (1000 fine); San Francisco, 54⅝c; Mexican dollars, 44½c San Francisco, 43½c New York.

COPPER.—New York: Standard, $13.50; Lake, 1 to 3 casks, $13.50@13.67½; Electrolytic, 1 to 3 casks, $13.25; Casting, 1 to 3 casks, $12.87½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £58 6s 3d spot per ton.

LEAD.—New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¾c; pig, $4.85. London: £11 12s ℔ long ton.

SPELTER.—New York, $5.25; St. Louis, $5.00; London, £22 7s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.95@28.12½; San Francisco, ton lots, 29½c; 500 lbs., 30c; 200 lbs., 30½c; less, 31c; bar tin, ℔ lb., 32½@35c. London, £127 5s spot.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $45.50@46.50, large lots; London, £8 5s 0d; San Francisco, local, $43@44 ℔ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.00c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.00@14.35; gray forge, $13.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ℔ lb.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ℔ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7¾c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11¼c ℔ set; 14 oz., 40s., 10c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 25½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 85c; cs., 90c; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 60@65c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 50@55c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7¼c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANCANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Trade Treatises.

Circular No. 52—B, from the Sullivan Machinery Co., Chicago, Ill., is the avant courier of Catalogue 53, illustrating and describing the Sullivan air compressors and rock drills, going into the subject in detail. A copy of No. 52 or No. 53 will be sent anywhere on request.

"Electric Mine Locomotives," from the power and mining department of the General Electric Co., Schenectady, N. Y., is a fine illustration of the present state of the art in that line and gives in its 70 pages much of value and interest in connection therewith.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING APRIL 26, 1904.

758,291.—SPINNING TOP—F. Ansley, Spokane, Wash.
758,292.—LOOSE LEAF LEDGER—H. W. Ayers, Los Angeles, Cal.
758,042.—WOOD CUTTING MACHINE—A. A. Bartlett, S. F.
758,500.—BUILDING CONSTRUCTION—G. A. Behrud, S. F.
758,201.—GARMENT SUPPORTER—F. S. Boedefeld, S. F.
758,046.—FENCE—G. Bronson, Seattle, Wash.
758,235.—BOTTLE OPENER—C. Cady, Berkeley, Cal.
758,298.—BOTTLE—D. S. Cooke, Los Angeles, Cal.
758,203.—BEEHIVE—H. Davenes, Sierra Madre, Cal.
758,241.—HARVESTER REEL—Friend & Bolton, Kingsley, Or.
758,356.—DRIVING BELT—A. Fritz, Portland, Or.
758,438.—CONCENTRATOR—L. C. Graupner, S. F.
758,530.—BOX COUCH HINGE—C. W. Gross, S. F.
758,206.—OIL BURNER—Grundell & Tucker, S. F.
758,209.—TIRE—A. Hendey, Jerome, Ariz.
758,255.—METAL BOX—S. Jacoby, S. F.
758,367.—EXTRACTING METALS—T. B. Joseph, S. F.
758,200.—GRIPPING DEVICE—F. H. Lamb, Hoquiam, Wash.
758,583.—BOTTLE—G. W. Lovejoy, Tehachapi, Cal.
758,263.—RIVETING MACHINE—M. C. Macbado, Morro, Cal.
758,375.—UNDERGARMENT—G. A. Mattern, Berkeley, Cal.
758,271.—BUCKET DUMPER—J. McKinnon, Prescott, Ariz.
758,461.—TRACK GAGE—A. P. Nichols, Tacoma, Wash.
758,462.—TRACK CLAW—A. P. Nichols, Tacoma, Wash.
758,215.—MATCH SAFE—Sarah Quee, Pasadena, Cal.
758,600.—TOWEL RACK—S. A. A. Stenberg, S. F.
758,224.—OIL BURNER—Tucker & Grundell, S. F.
758,578.—MECHANICAL MOVEMENT—F. A. Yokoum, Seattle, Wash.

Dividends.

The Bunker Hill & Sullivan M. & C. Co. paid dividend No. 79 ($60,000) on the 4th inst., a total paid since Jan. 1, 1904, of $213,000 and a total to date of $1,739,000.

SITUATIONS WANTED.

ANALYTICAL CHEMIST AND ASSAYER DESIRES position with a reliable company. Address "Analyt. Chemist," this office.

ASSAYER AND CHEMIST DESIRES POSITION at mine, mill or smelter. Is competent. State salary when writing. Address C. A., this office.

ASSAYER, WITH KNOWLEDGE OF BOOKkeeping, wants position with mine or mill. Address J. L., this office.

ASSAYER AND CYANIDE MILL MAN DESIRES position with established company. Address "Assayer," care Mining and Scientific Press.

EXPERIENCED ASSAYER AND CHEMIST DESIRES change of position by May 1st, preferably with smelting company. At present employed in Mexico. Best of references. Address E.T.A., care this office.

EXPERIENCED SUPERINTENDENT, ENGINEER, Metallurgist; technically and liberally educated; 15 years handling men and machinery of smelters, mills and mines. See testimonials. Address Prof. Stickney, Mountain View, Cal.

YOUNG MAN, A LICENSED SURVEYOR, wants position—field or office. Address J. P. Ryan, St. John Cal.

WANTED.

WANTED—TO CONTRACT HAULING OF 15 tons daily of matte from Takilma to Crescent City; 10 tons coke daily Crescent City to Takilma. Distance about 50 miles. To commence about July 1st. Will guarantee tonnage sufficient to warrant reliable parties to bring in outfit. Also require guarantee of fulfillment of contract. TAKILMA SMELTING CO., Albert I. Goodell, Mgr., Takilma, Josephine County, Oregon.

HELP WANTED.

The Business Men's Clearing House, Century Building, Denver, Colorado, furnishes mining companies in United States and foreign countries with managers, superintendents, engineers, mill men, assayers, electricians, bookkeepers, stenographers, etc.; good positions for competent men.

WANTED—COMPETENT ASSAYER WHO also understands bookkeeping. Address R., care of Mining and Scientific Press.

FOR SALE.

For Sale---Elevator Gold Dredger,
Electrically operated. Bucyrus make. Five-foot ouckets. Practically good as new. For full particulars, write
Bedrock Dredging Co., Placerville, Idaho.

200 SECOND-HAND TRANSITS AND LEVELS, CHEAP.
ARCHITECTS' & ENGINEERS' SUPPLY CO.
1010 Grand Ave., Kansas City, Mo.

PLACER PROPERTY.
One of the largest and best placers in California. Superb water rights; good flumes, ditches and dams. Entire acreage patented. Splendid timber; all facilities; complete saw mills. Good buildings and animals; abundant supplies. Whole plant self-contained. Never freezes; rainfall five years averaged 58.52 inches. Everything in perfect running order.
Grand promotion project; tremendous possibilities. Distant affairs requiring attention, will sell at fair price on reasonable terms. Address GOING PROPERTY, care of this publication.

Quicksilver
BY THE FLASK OR CARLOAD.
WEIGHT AND QUALITY GUARANTEED.
THE EUREKA COMPANY,
OF SAN FRANCISCO.
320 SANSOME STREET, - SAN FRANCISCO.

THE CALIFORNIA DEBRIS COMMISSION having received application to mine by hydraulic process from Vacinda Mining Company in Vacinda Mine, near Indian Diggings, El Dorado County, Cal., draining into Cedar Creek which reaches Cosumnes River, gives notice that a meeting will be held at Room 96 Flood Building, San Francisco, Cal., May 23, 1904, at 1:30 P. M.

MINING AND SCIENTIFIC PRESS.

Whole No. 2286.—VOLUME LXXXVIII. Number 20. SAN FRANCISCO, CAL., SATURDAY, MAY 14, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

High Duty Pumping Engine.

Herewith is illustrated what the manufacturers say is the largest and most powerful high duty pumping engine built on the Pacific coast. The halftone engraving represents one of the two engines furnished by the Geo. E. Dow Pumping Engine Co. of San Francisco, Cal., for the Honolulu Plantation Co. of Honolulu, H. T. The entire plant was contracted for, including boilers, piping and all auxiliaries, by this firm of pump builders. The combined capacity of the two engines is 14,000,000 gallons of water each twenty-four hours, raised to an elevation of 450 feet, when running at normal speed. This water is taken from wells and is intended to irrigate about 1200 acres of sugar cane which is now being staked out by the plantation company. This increased acreage will add about 50% to the present output of the company, which will then be one of the largest plantations on the Hawaiian Islands.

The pumps are to be set side by side in the same pit and will be supplied with steam from a battery of 1000 H. P. Babcock-Wilcox water tube boilers at 180 pounds pressure at the pump through a 10-inch steam pipe. The pumping engines are of the horizontal, duplex, four cylinder, triple expansion pattern, with the Dow standard design of Corliss valve gear. The steam cylinders are all steam jacketed, with reheating receivers placed overhead. One of the most important new features of this design is the method of holding the steam and water ends together. Each side has two steel rods running from the crosshead yokes along the side of the steam cylinders, inside the valve gear, to the water end. This will allow for a free expansion and contraction of the steam cylinders without disturbing the alignment of the engine as a whole.

The sizes of the engines are as follows: Diameter of H. P. C., 22 inches; diameter of I. P. C., 38 inches; diameter of L. P. C. (two), 44 inches; diameter of plungers, 14¾ inches; length of stroke, 48 inches.

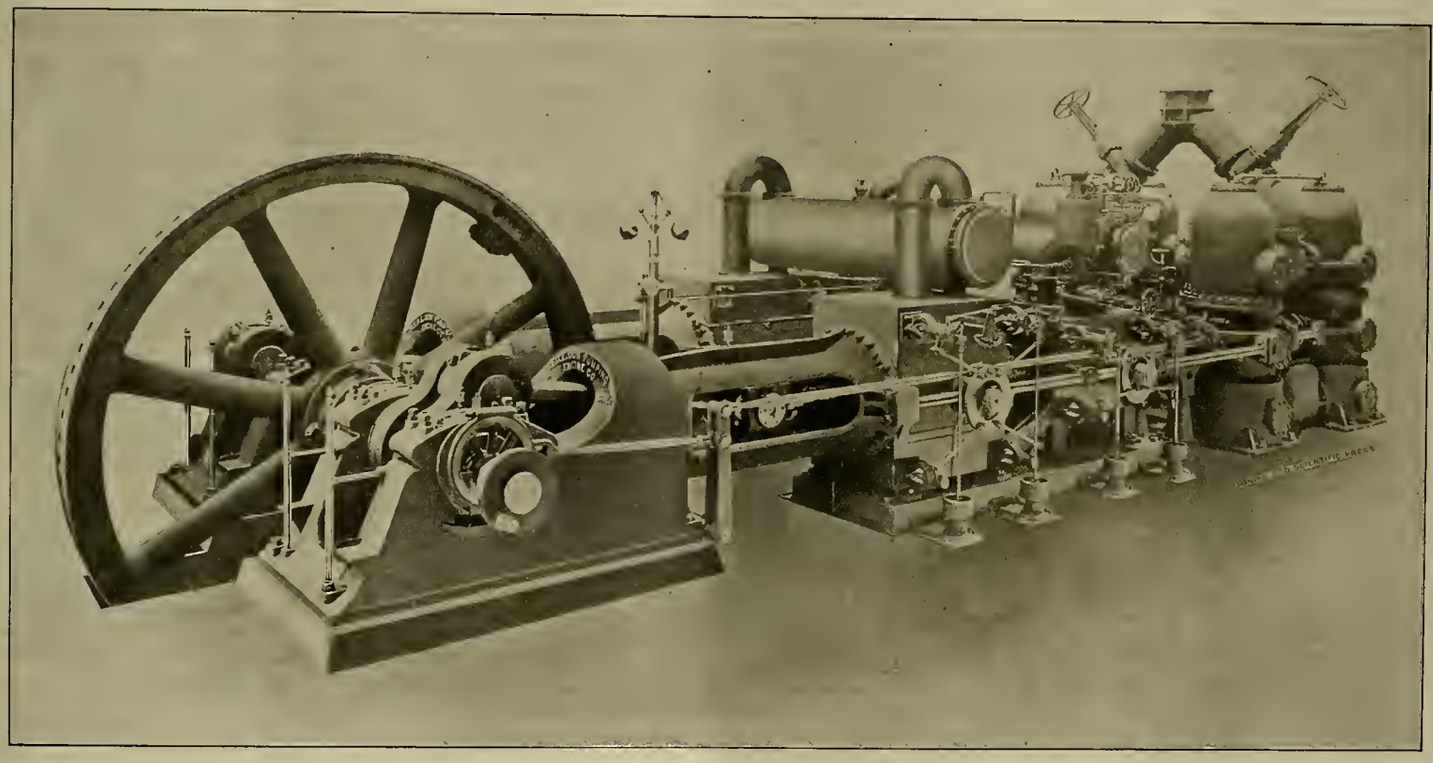
Each engine has one surface condenser of 1400 square feet of cooling surface of the Dow standard pattern. The air, circulating and feed pumps are operated from the crank pin and disc-keyed to the main crank shaft, as seen in the accompanying cut. The crank shafts are of the double-throw, built-up pattern, made of high-grade nickel-steel, and weigh fourteen tons each. The flywheel is 16 feet in diameter and weighs twenty-five tons. The pump end is of the outside center-packed pattern, with removable valve decks. All parts are made extra heavy, well braced, with shrink bolts and ribs to withstand the heavy duty to which it is to be subjected.

The metal used in the construction of the water end aside from the bronze is a special mixture of close-grained cast iron, the same as the Dow Co. put in all their hydraulic pumps, and has tensile strength of 28,000 pounds. The delivery chambers are made in the form of large domes that they may act effectively as air cushion spaces to ease off the flow of water and eliminate the presence of any shock or water hammer. Relief valves are fitted to all the chambers as an element of safety, should the engine be started with the delivery valves closed.

The suction opening of each pump is 30 inches in diameter and the delivery 24 inches. The plungers are cast of close-grained bronze. The valves, seats, guards and all parts subject to wear are of the same material. Piston rods are of solid Tobin bronze.

Mechanics are now working day and night getting this machinery into position, and by June 1 the big engines will be ready for their initial trial for efficiency, capacity and durability. The Geo. E. Dow Pumping Engine Co. will send their mechanical engineer to conduct the test in the interests of the builders. They expect to make a record with this engine that will prove satisfactory to themselves and gratifying to the owners of the Honolulu Plantation Co.

The builders predict that with such a high class engine and skillful handling they will be able to obtain 152,000,000 foot pounds for every 1000 pounds of dry steam used in the cylinders, or about 130,000,000 to 135,000,000 foot pounds for every 1000 pounds of steam used by the engine—that is, the cylinders, jackets, and all the leakages.



High Duty Dow Pumping Engine.

Our National Advertisement.

The Louisiana Purchase Exposition at St. Louis, Mo., has been formally opened by President Roosevelt, who set the machinery in motion by touching an electric key of gold, in Washington—which in itself is an index of the progress of the new century. This Exposition, though following so closely on the Columbian Exposition at Chicago and the large, but lesser, Pan-American Exposition at Buffalo, is said to surpass anything heretofore undertaken in this direction in the world. It is an opportuuity to exhibit to the entire world the tremendous strides being made in industrial progress.

The exhibition buildings themselves, while of magnificent appearance, are with few exceptions similar to exhibition buildings elsewhere—built for show and short duration. They will no doubt answer every requirement, but no one will criticise the construction nor the architecture of the buildings. It is the exhibits themselves that will attract the greatest attention, for it is these which form the feature of real value. Every conceivable phase of industry is represented, affording unsurpassed opportunity to compare the past with the present, and one country or section with another. In no branch is this more noticeable than in machinery. The old locomotive engines in use half a century ago standing beside the magnificent machines used on modern railroads forms an object lesson in material progress which few who see will forget. It is pleasing to note that large space has been devoted to a display of mining and metallurgical machinery and methods, and to an exhibition of the raw and finished products of the mines. Each mining State has awakened to the value of a representative exhibit, and it is safe to say that the mining exhibit at St. Louis is superior to any heretofore made in the world. There is more that is new to display than at any time in the past, and the world is eager for knowledge and that which is new. Electricity forms a most important feature in the exhibition as a means of power, light and heat.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1164 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MAY 14, 1904.

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LESS than thirty years ago equatorial Africa was a great terra incognito. From time to time small and unsatisfactory bits of information concerning the great unknown interior has come out from various explorers, among whom were Livingstone, Grant, Du Challeau, Baker, Speke, Gordon and Stauley. To the latter, who died on the 10th inst., is the greatest early knowledge of the "dark continent" due. It is a region of great mountains, great lakes, great forests, great rivers and great animals. Nature seems to have formed everything on a gigantic scale. This vast wilderness is now in a fair way to be opened to the knowledge of the world, and possibly become no small factor commercially. The construction of railroads is progressing spcedily. Civilization is encroaching on "Darkest Africa" very rapidly. From the southward in Rhodesia the miner is extending his explorations northward. On the east coast the tide is slowly setting westward through Uganda, and in the Congo State the recent mineral discoveries promise to do more than any other thing for the development of the country. Thus far these discoveries are chiefly of copper ores. but gold is also reported in paying quantities. Should valuable gold deposits be discovered and developed it will settle the country more quickly than anything else, for the pursuit of gold stops at neither arctic cold nor tropical heat, and neither the barren wastes of western deserts, nor the swamps, jungles and forests of Central Africa offer a material barrier to the occupation of the country by white men once, it is known that gold exists there in paying quantity.

THE recent publication by the United States Geological Survey of Professional Paper No. 12, entitled the "Geology of the Globe Copper District of Arizona," by F. L. Ransome, is one of the most interesting and valuable contributions to mining geology that has been issued by the Survey in some time. The large economic interests of the Globe district, together with the present interest shown in the copper mining industry, makes this publication both timely and welcome.

The Value of Advice.

The professional man, whether lawyer, physician or engineer, necessarily considers his knowledge as his capital. He gains it at the expense of years of study in college, and by practical application and experience later. Every class in the business world expects to pay for professional advice when they appeal to the lawyer or the doctor, but the mining engineer is generally looked upon as a generous-hearted individual whose knowledge is at the disposal of all who may desire it without price, and sometimes without thanks. Advice which costs nothing is valued lightly, but that which "comes high" is treasured as among the good things of this world. There are hundreds of people who do not hesitate a moment to impose upon the mining engineer, taking up his valuable time asking questions, a correct answer to which may save the questioner thousands of dollars, and which it has possibly cost the engineer years of experience to learn, and still the questioner would not only be surprised, but be indignant if a bill were presented for professional advice. Notwithstanding this, these people would not think of visiting a lawyer and asking for professional advice without expecting to pay for it, any more than they would expect a physician to prescribe for them without charge. There is a class who are willing to pay, but their idea of pay is on a basis of time at a wage rate such as miners receive. Five dollars is considered a reasonable fee for half an hour's "conversation," and a hundred dollars is extortionate, while anything more than that is criminal. There is another class who expect to pay and do pay to engineers fees commensurate with the value of the advice received. They have learned that it pays. It is not a rare instance for mining companies to place a successful business man, but one without experience in mining, in charge of their affairs, and are surprised to learn later that had they employed a competent engineer to simply advise at the beginning they might have been saved many thousands of dollars. An instance may be cited where a company bought a mine and built a stamp mill. The mill was located in the middle of a flat, while there were hills about within a short distance, on any one of which the mill might have been placed to advantage. The result was that in a few weeks after starting up the mill the tailings were running in on the mill floor, and soon thereafter an expensive bulkhead was constructed and an elevator installed to lift the tailings high enough to run away from the mill. All ore treated in the mill had to be pulled up an inclined tramway to the breakers, when the ore might have run in on cars from the mine by gravity. These were only a few of the mistakes made by this company.

The employment of a competent engineer at the cost of possibly $5000 would have saved this company over $50,000 in the first two years of its operation. This is only a single instance. Such mistakes are being made constantly by companies who undervalue the services of mining engineers of experience.

THE ingenious handling of difficult mining problems in the lead-silver mines of Santa Eulalia, Chihuahua, Mexico, as described elsewhere herein, is an instance of the versatility of American engineers. Not infrequently it becomes necessary to sink shafts through running ground, quicksands, etc., but to build shafts through the air is somewhat of an innovation, but this is what the peculiar conditions at Santa Eulalia have required. The ore extracted by the Mexicans years ago has left great open stopes like caves. Shafts now being sunk are likely to be in line with one of these old workings, but the unusual difficulties have thus far been overcome by the various applications of engineering skill.

THE outlook for copper is more promising than for some time past. It is stated by authorities that the surplus has been entirely absorbed and that the present output of the mines of the world scarcely keeps up with the demand and actual absorption of the metal by the industries. Whenever copper reaches a low price the result is heavy buying by consumers, and also the introduction of the metal into new uses, and into channels where its use is prohibitory in the time of high prices. In view of the present situation, a firm market for copper is anticipated, with possibly a somewhat higher price.

Economize Time.

In superintending the practical operation of a mine it is necessary to see that men economize time. There are those who claim that hand drilling is more economical than machine drilling. There may be a few instances where this is true, due to the character of the ground through which the work is being done, or to other local conditions, but such instances are rare if the superintendent sees to it that the machine men put in their time drilling and not in attempting to recover a fitchered drill, which it is evident cannot be removed before blasting. In the first place, the chances are such a condition may have been avoided by the exercise of care on the part of the driller. Too much time is often wasted in setting up and taking down machines; delays are caused by waiting for the water can when it should be at hand. There is no economy in having the drillers running about the mine in search of drill bits, oil cans, wrenches and other paraphernalia of the drilling outfit. But men often find these excuses for stopping work. Expenses are going on continually. The power, wages and many other expenses operate continuously while the drills run and while they are idle, consequently it is economy to keep them running during shift as much as possible, striving in every way to facilitate the work by seeing that the men are supplied with all essentials. "Half the battle" lies in the selection of the drill runner. A man who has "tended chuck" for a fortnight, with no further experience, cannot be expected to make an expert drill runner, and yet it is no uncommon thing to find such men thus employed. It is an easy thing for a drill runner to waste from half an hour to an hour on a shift, and this means a like time for his assistant. If a dozen drills are at work in the mine and each one is idle this length of time, it means the idleness of twenty-four men for half an hour to an hour, or the equivalent of over two shifts work for a man—say $6.00 per day. In many mines the loss of time is much greater than this—and it is not always the fault of the miners either. The superintendent should see to it that no such loss of time occurs without a good reason, and then to see that it does not occur again from the same cause.

The Utilization of Waste.

In many directions new economics are sought and are being worked out in the industrial world. In mining and metallurgy there is a promising field for discovery and adaptation. Gold mining is one of the industries that is without a competitor, yet it is as desirable to recover gold from its ores at as little cost as possible, as it is necessary to eliminate extravagance from other branches of the mining industry. The utilization of waste products is one of the forms of modern economy. In mining an effort is being made to reduce expense by utilizing natural forces and such waste materials as may be the result of the operation. Barren rock through which the workings are driven is no longer hoisted to the surface and thrown on the dump, at a well-managed mine, if any place can be found underground to economically dispose of it. At some smelters the sulphurous gas resulting from the reduction of the ore, which has heretofore passed off into the air, is now being conducted to lead-lined chambers and made into sulphuric acid—a valuable and useful by-product. In smelting the pyritic method utilizes the sulphur of the sulphide ore as fuel, thereby reducing the cost of carbonaceous fuel. The slag of smelters is being utilized in a variety of ways—in the manufacture of concrete and of Portland cement; it is being cast into paving and building blocks and for other structural uses; it is employed as railroad ballast and as macadamizing material. The waste heat and gases of blast furnaces are being turned to good and economical use, in running gas engines, etc. The tailings from stamp mills, heretofore considered absolutely worthless, after extraction of the valuable metals, are in some instances being used to fill old stopes—a practice permissible in dry mines, but inadvisable where there is water, as it would be found difficult, if not impossible, to control them. The onward march of progress constantly aims at new achievement, and seeks to convert to usefulness everything that comes before it, making the obstacle of yesterday the useful agent of to-day.

CONCENTRATES.

COKE is brought to San Francisco, Cal., mostly from British Columbia; a little from England, Australia and Antwerp. The British Columbia coke contains about 17% ash.

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IN Cripple Creek district, Colo., tellurido ores assaying less than $10 per ton are said not to pay a profit after paying mining, transportation and treatment charges.

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THE striking of illuminating gas in boring a well is not a certain evidence of the existence of petroleum. Natural gas is often found in quaternary deposits in which no petroleum exists, so far as known.

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A MILL may save enough from ore to make the operation of the mine profitable, and still a large percentage may be lost. Daily assays of tailings are as necessary as the determination of the value of heads.

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THE Brooks-Teller bill, amending the mining laws with reference to the proper marking of boundaries of mining claims, became a law in the closing hours of the late session of Congress and is now in effect.

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THE selling of stock of a newly organized company would not be considered by the courts as "being in operation." The company must actually engage in the business for which it was incorporated, the selling of stock being merely incidental.

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BLOXAM'S CHEMISTRY states that the only single acid which attacks gold is selenic ($H_2 Se O_4$), which it reduces to selenious acid ($H_2 Se O_3$). A gold crucible is useful in the laboratory for effecting the fusion of substances with caustic alkalies, which would corrode a platinum crucible, which they attack more strongly than they do gold.

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WHEN mine samples are taken in duplicate from the same places, or when the samples are divided after breaking down to small pieces like hazel nuts and smaller, and the respective duplicates do not agree within reasonable limits, these samples should be rejected for the time until the cause of the discrepancy is investigated.

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GOLD SULPHIDE is formed by precipitation, together with sulphur, from solutions of gold salts by means of sulphuretted hydrogen. In color it is brownish black. Chloride of gold is formed by dissolving gold in aqua regia. It is known as auric chloride $Au Cl_3$. Text books generally do not contain the specific gravities of gold sulphide, oxide, bromide, chloride, etc.

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NITRO POWDERS are graded as follows; No. 1 = 70% nitro-glycerine; No. 1* = 60%; No. 1** = 50%; No. 2 = 40%. Other grades containing 35%, 30% and 20% are also made, for earth work and loose rock. A 5% powder, known as "low powder," is also made for shaking up large rock masses, where it is desired to break large tonnage without throwing the rock, as in open cut, millhole work.

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IF the four claims located by A and B in California are contiguous, a tunnel which will aid in the development of all the claims may be charged to annual assessment work, $400 worth being done each year. This credits each claim of the group with $100 worth of work. A notice to this effect should be posted at the mouth of the tunnel. No assessment work is required in a newly located claim between the date of location and the succeeding first of January.

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THE field notes of a survey are not limited to the courses and distances set forth therein, but include also the monuments referred to, and all the objects mentioned by which the lines of survey can be ascertained. If there is any discrepancy between the monuments and the courses and distances, the monuments must prevail; and if these monuments can be ascertained the lines connecting them will be the lines of the tract, irrespective of their variation from the lines given by the courses and distances. Los Angeles vs. T. Thompson, 117 Cal., 594.

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A BODY falling in a medium like air is retarded in its fall by the medium, but moves downward with a constantly accelerating velocity. An object offering little resistance to the air, like a sphere, should fall 4650.9 feet in seventeen seconds. At the Red Jacket shaft of the Calumet & Hecla mine, on Lake Superior, nearly 5000 feet deep, this experiment was tried, but the sphere did not reach the bottom, being deflected from a vertical course. Some suppose it to have been due to air currents and others to the rotation of the earth, and that, if the latter, the sphere swerved to the eastward in a curve and struck the timbers and was lost.

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MINERS striking double-handed can put in 10 to 12 feet of holes in a shift of ten hours in hard granite. Two men drilling single handed, if expert, can put in about 15 feet of holes in the same time. The reason that in practical mining holes are never drilled at anything like the rate at which holes are put down in exhibition drilling contests is accounted for by the wide difference in conditions. On the exhibition platform all holes are drilled straight down; the cuttings are generally removed from the hole by water under pressure; the drills are each forged and tempered with the greatest care; the men are working under high nervous tension, and under a strain which could not long be endured, and everything is done in the broad light of day. These are conditions which never obtain underground, even under the most favorable circumstances, but miners have occasionally performed astonishing tasks when working to relieve comrades imprisoned by a cave or otherwise cut off from the outside.

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A LARGE AMOUNT of salt is made annually in Utah and California by evaporating natural saline waters—in the former from Great Salt lake and the latter from San Francisco bay. The salt is produced by evaporating the waters pumped from the natural lake or bay. This is accomplished in a series of ponds. The water of Great Salt lake contains over 20% sodium chloride; that of San Francisco bay is about that of the ocean. The gypsum is precipitated at the bay works. At Great Salt lake the "mother liquor" is not allowed to evaporate, as it contains nearly all the magnesium and sodium sulphates and practically all the magnesium chlorides. It is returned to the lake. Sodium sulphate when formed floats on the surface and is driven by the wind to the leeward shore, where it is collected. After drying and crushing, the salt is further purified by rotary fans, which blow out a large amount of the remaining magnesium and sodium sulphate, which is lighter than the sodium chloride.

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WHEN drifting with machine drills, it is advisable that the machine men do no more mucking than is necessary to place the bar horizontally across the drift at a proper distance from the face and mount the machine, or two of them, if they be in use. This may require the removal of a small amount of rock near the top of the pile lying against and near the face as a result of the last round fired, but it will enable the machine men to more quickly get at work drilling, while the muckers work behind them, loading the ground already broken into cars. By the time the upper holes are drilled the shovelers will probably have removed sufficient rock to enable the machine men to make a new set up. This method saves much time that in some mines is daily lost. If there is a lack of machines to work at every face, or a lack of air to run them, the drill may be moved to another place while muckers are clearing out the rock broken down, and, when clear, bringing the machine back to this face and continue drilling there while the other excavation is cleaned out. In this way, working alternate shifts, little time is lost.

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THE heat in some mines is caused by the rapid oxidation of sulphides in the ore. This usually takes place near the surface, as at the Daulton copper mine, in Madera county, Cal., where at a depth of 100 feet the temperature approached 100° F. At this mine and at some others in that vicinity it was not uncommon for the sulphide ore to ignite spontaneously, owing to rapid oxidation. In some of the Butte, Mont., mines the great heat is largely due to oxidation of the ore; but this occurs at a depth of hundreds of feet. The heat in the Comstock mines is apparently due, to a great extent, to the large volume of hot water coming up from below in various parts of the mine workings. Whether the water is being heated by the heat generated by the decomposition taking place in the minerals occurring in the workable zone, or whether it comes up hot from profound depths, is a question on which all who have investigated do not agree. The rotting of a large amount of timber in the stopes of a mine produces appreciable heat and also gives out a large quantity of CO_2, which is detrimental to health and, in excess, is deadly.

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THE placer law includes as "placers" all forms of mineral deposit, subject to location, except veins of quartz or other "rock in place." These shall be subject to entry and patent under the Act under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; provided that where the lands have been previously surveyed by the United States the entry in its exterior limits shall conform to the legal subdivisions of the public lands, no further survey or plat in such case being required, and the lands may be paid for at the rate of $2.50 per acre; provided, further, that legal subdivisions of forty acres may be subdivided into ten-acre tracts; and all placer mining claims hereafter located (May 10, 1872) shall not include more than twenty acres for each individual claimant. The limit for each claim is twenty acres, but the law makes no restriction as to the number of claims an individual may take. On each claim of twenty acres held by an individual $100 worth of assessment work must be performed annually. An association of eight or more individuals may locate a claim not to exceed 160 acres, and this constitutes one claim, on which only $100 worth of assessment work is required annually.

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UNDER no circumstances can an electric dynamo be placed between an engine and machinery it is desired to run without loss of power. If the dynamo could be run at a distance by water power, or at some point where fuel were cheaper than where the engine and mine are located, it might be more economical to install the electric plant and transmit the electricity to motors in the mine and mill, but if the power must be originated by the engine apply it direct by means of shafting and belts in the usual way. The mine pumps may be run by steam conducted into the mine by pipe (these should be carefully covered to prevent condensation as far as possible), or a Cornish pump could be put in which is actuated at the surface. A third expedient is the driving of a dynamo by the engine to supply electric power to the pumps in the mine alone, running the surface plant by steam. If this latter suggestion is not found to require too much of the 100 H. P. of the engine it may be found more economical than any other way to handle the water. Bailing by skips may obviate the necessity of pumping if conditions are such that this method can be employed.

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THE following gives the steps in the calculation for the quantity of water carried by a flume 28½ inches wide, pitch ¼ inch to 16 feet, water running 6 inches deep, flume made of unplaned lumber: Width of flume, 2.35 feet; depth of water, .5 foot; therefore cross section of water = 2.35 × .5 = 1.175 square foot; the wetted perimeter = 2.35 feet + (2 × .5) = 3.35 feet; the hydraulic radius, or the area divided by the wetted perimeter, will equal 1.175 ÷ 3.35 = .35; the slope of the slope = the drop divided by the length, or ¼ of an inch divided by 192 inches = .0013; the velocity in feet per second of the water will then be C multiplied by the square root of the product of the hydraulic radius, and the sine of the slope — or $V = C \sqrt{(.35 \times .0013)}$. The constant C for a flume made of unplaned lumber varies according to the hydraulic radius from 100 when the hydraulic radius = .3 to 166 when the hydraulic radius = 10, so that our correspondent can figure out any other size flume he may wish from the above calculations. In his case the answer is 2.2 feet per second velocity, which will give him a capacity of 155 cubic feet per minute, equivalent to about 100 miners' inches.

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AN automatic tally for checking the number of cars of ore run into a mill can be made by the blacksmith at the mine, it only being necessary to have a flat disc provided with teeth somewhat like those on a circular saw. These teeth must be of uniform depth and spaced exactly the same distance apart. This wheel may be placed beneath the track on which the car runs, the best place being in the trestle, which is found at most mills. It should be so arranged that by shimming up under one of the rails, at two cross ties, the rail may be slightly raised above an intermediate third tie. Beneath the rail and at the side of the tie should be fixed an upright rod which connects with a lever below. On one end of this lever is a pawl which engages the toothed disc, causing it to move forward one notch whenever a loaded car passes by. The notches being numbered consecutively, the number of loaded cars passing over is registered and may be read off by the superintendent. The rail must be sufficiently stiff to support the empty car without bending enough to cause the device to register on the return trip. Where it is considered advisable, the counter may be enclosed in a locked box, with a glass front.

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A FRACTIONAL mining location has no greater nor any less rights than those of a full-sized claim, and for that reason there is no law particularly referred to fractions. Where two fractional claims are located by the same person, with an intervening space between them owned by another locator, as in the Tonopah, Nev., case, the locations cannot be amended to constitute a single claim. Each fraction remains a single location. They may be held under separate amended locations, however, so formed as to secure parallelism of end lines, if this can be done without conflicting with others, and, consequently, the exercise of the extralateral right privilege, presuming that the fractions are located on a vein or veins, a prerequisite to location. The only conditions under which fractional claims may be included in a single location, in the manner described, is in the case of fractional placer claims occurring within the same 40-acre tract and separated by a quartz location. In such cases the land department has permitted such consolidation, though there is nothing in the statutes referring to anything of the sort.

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THE Federal statutes, Section 2336, says: "Where two or more cross veins intersect, or cross each other, priority of title shall govern, and such prior location shall be entitled to all the ore or mineral contained within the space of intersection; but the subsequent location shall have the right of way through the space of intersection for the purposes of the convenient working of the mine. And where two or more veins unite, the oldest or prior location shall take the vein below the point of union, including all the space of intersection." This statute has been the cause of a great amount of litigation, and many opinions have been rendered by State Superior and Supreme courts, as well as by the Supreme Court of the United States. Lindley on Mines says re. this matter: "All courts now agree upon the following propositions: (1) The grant to the senior locator is of all veins found within his location, regardless of their course, and whether they were previously known to exist or were blind and undiscovered. There is no limitation implied and the grant is exclusive. A junior cross-lode locator has no right to any ore found upon the cross vein within the boundaries of a senior claim. (2) The owner of a junior tunnel site cannot by means of a crosscut tunnel penetrate within the boundaries of a senior claim for any purpose."

Concentration of Low-Grade Copper Ores.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by
W. J. ADAMS, E. M.

The oil used was the residuum oil from Pennsylvania petroleum, having a paraffine base and of the consistency and color of cylinder lubricating oil; but the California residuums are just as efficient, though having an asphalt base, provided they have a specific gravity of 13° to 14° Baume, and are freed from the lighter oils of naphtha, gasolene, etc., the so-called distillates. On this ore no doctoring of the oil is required, as it contained only iron pyrites and chalco; but as in water concentration generally, higher or lower grade concentrates can be made at will if the resultant loss is not considered. The first application of oil, with a slight agitation, absorbs only chalcopyrite; but with greater agitation takes up the iron pyrites and particles of the gangue mechanically forced into the oil. Each succeeding application takes up more of the pyrites and the gangue, so that in these tests on a small scale the concentrates are much poorer in quality than in regular work, in order to find the real loss in the tailings that would occur in actual practice. As in testing in water concentration operations by hand, even though repeated over and over again, do not by any means come up to the efficiency of mechanical handling of the same material, either in cleanness and consequently higher value of the concentrates or small loss in the tailings, so that in some cases here the ore was separately shaken with oil eight to ten times. Special attention must be paid to using a sufficient quantity of oil each time, as there can be no useless excess, while very little is accomplished if only a small amount is taken. As a minimum, there must be mixed with the ore each time at least one-half the weight of the pulp, and if there is an excess of sulphurets present this weight must be doubled and perhaps trebled.

At first sight, it appeared that the sulphurets were ouly attached to the sides and under surface of the oil, but a closer examination showed that not only the sulphurets, but that some of the gangue, were scattered uniformly through the oil. When the ore was high in sulphurets the oil would at once become so heavily charged with mineral, that not only big globules (called "sinkers"), but sometimes a lower layer of the entire oil surface would settle through the water to the bottom; but this would be recovered with succeeding applications. When the oil was heated in boiling water to 90° or 100° F., its selective action was greatly increased and less of the pyrites and gangue were absorbed, owing to its greater fluidity. As the oil and concentrates were always heated before feeding into the centrifugal separator, over 50% of the mineral and all the gangue would settle out of the oil before the feeding began. On the other hand, when the oil was chilled to 60° F., or less, it became so viscous that it would not absorb and hardly hold the mineral to its surface by its purely adhesive properties. Therefore, it is advisable to have the temperature between 70° and 75° F., and if a very strong selective action is desired, to heat the oil, for the first application, to as high as 100° F., the subsequent repetitions to be made with the oil at the ordinary temperature of 70° to 75° F. In this way the first product will be a concentrate of nearly pure chalcopyrite which can be kept entirely separate from the second grade, containing the iron pyrites and some of the gangue. On other ores it is authentically stated by actual practice that silver glance can in this way be separated from sphalerite, and the same selective action should take place between the copper sulphides and zincblende, owing either to the difference in their specific gravities or the primitive conditions of the difference in their surfaces, whether tarnished, or bright and polished.

In doctoring the oil or water to add to its efficiency it is a question whether any direct benefit commensurate with the costs is obtained. Water, slightly acidulated, will, of course, prevent or decrease the tarnishing of the surfaces, thereby increasing adhesion to the oil and enabling the employment of the acid water from the mine. The addition of common salt to the water will render it more dense, so that the holding power of the oil will be increased; but in the opinion of the writer this is unnecessary, as its absorbent powers are naturally ample, if sufficient oil is used; and particularly, as no oil is lost except the modicum remaining with the concentrates, hardly exceeding one gallon per ton of material passed through the cylinders, it is not necessary to restrict oneself to a small quantity of oil.

With these explanations the modus operandi was as follows: A definite weight of each grade of ore was taken and crushed dry to pass a wire screen ⅛-inch mesh. On the grades low in percentage of sulphurets an artificial bed of a mixture of Nos. 4 and 5 birdshot was placed on the bed screen in the jig, when the ore was slowly and steadily fed to it, having been previously thoroughly wetted to prevent as much as possible the mechanical loss of floating dry slimed chalcopyrite. The fine sulphurets passed through the bed and the 40-mesh bed screen into the water tank underneath, called the hutch.

The clean and coarse mineral settled by gravity to the artificial bed of lead shot when employed, and otherwise to the screen, and was designated the bed.

Resting on this and going to the overflow, the mixture of coarse gangue containing mineral and with some free sulphurets, was known as middlings and was reground and treated by oil.

The overflow of tailings was first conducted into a settling tank and the water and slimes from this siphoned into a large tub, preventing entirely the loss of the floating scum of chalcopyrite, and saving practically all the tailings as determined by subsequent weighing. The difference ran between 1½% to 2¼%, and consisted of clayey slimes only, showing a faint trace of copper by assay.

These tailings, after drying, were screened through a wire sieve of 100 mesh, and that passing through was treated as slimes, while the residue after regrinding to pass through 30 mesh was treated as sand, and each class was separately concentrated with oil.

In the higher grades the middlings carried so much mineral that they were reground to 30 mesh, rejigged and then the resultant products treated as with the original ore.

Three series of tests were employed: The first, where the products were dried before the next step was taken, in which case approximately 10 kilos of the ore were used, and primarily only passed through a ¼-inch mesh screen.

The second, where the process was continuously carried on, without drying anything but the concentrates and final tailings, and the sand and slimes unseparated, but treated by oil together. Two kilos of the ore were taken and crushed dry to pass a screen of 30 mesh.

The third, direct application of the oil to the ore, previously crushed dry to pass 30 mesh, and ½ kilo or 500 grams taken in each test.

GRADE NO. 1 (THE POOREST QUALITY) — FIRST SERIES.—Taken 11⅝ kilos of ore, crushed dry to pass a No. 10 screen. Speed of jig, 350 revolutions a minute, with throw of eccentric ½-inch, and an artificial bed of lead shot. This parcel assayed 0.927% copper, or 18.557 pounds copper in each ton.

JIGGING.

CLASS.	Assay Copper Per Ton, %.....	Per Cent Weight Saved.....	Pounds Copper Saved Referred to Ore.....	Per Cent Copper Saved Referred to Ore.....
Hutch	2.50	1.034	0.517	2.786
Bed	6.10	3.620	4 416	23.796
Middlings	2.10	5.517	2.317	12.485
Tailings	0.56	68.108	7.628	41.105
Slimes	1 10	19.482	3 679	19.825

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay Copper Per Ton, %.....	Percentage of Weight Saved.	Per Cent of Copper Saved.....	Per Cent of Copper Lost.....
Jig Concentrates:				
Hutch	2.50	1.034	2 786	.....
Bed	6.10	3.620	23.796	.....
Oil Concentrates:				
Middlings	5.67	8.70% of 5.517% = 0.480	3.874	.....
Tailings	4.30	7.38% of 68.108% = 4.958	19.598	.....
Slimes	6.29	5.11% of 19.482% = 0.995	4.884	.....
Final Tailings:				
Middlings	1.20	.....	.....	8.610
Tailings	0.293	.....	.....	21.506
Slimes	0.829	.....	.....	14.940
Totals	.....	11.087	54 938	45.056

In the individual steps of the oil concentration there were saved from each class as follows:

From one ton of middlings.....31.035%
From one ton of tailings.....47.680%
From one ton of slimes.....21.640%

This was the first complete test and the results were poorer than any obtained from any of the subsequent ones. Too small a charge of oil was used; too much mineral was still locked up in the sands owing to the coarse crushing; while from the drying of the tailings to their subsequent wetting a very large quantity of the sulphurets was so tarnished that they did not adhere to the oil. In addition to these causes of excessive loss, as well as the low percentage of copper in the hutch, is the fact that jigging is not adapted to this low-grade ore under any circumstance; but there must be employed either vanners or tables, with which clean concentrates should be made and the tailing loss disregarded.

SECOND SERIES.—In this the parcel of ore weighed 2 kilos and assayed 1.34% of copper. It was crushed to pass a screen of 30 mesh, was then thoroughly moistened and fed to the jig, in which was an artificial bed of lead shot. The middlings were treated without drying, directly with oil, and the sands and slimes of tailings were mixed together and also treated direct by oil; only the clear water, after standing sixtcen hours, being siphoned off.

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay Copper Per Ton.....	Percentage of Weight Saved.	Percentage of Copper Saved.....	Percentage of Copper Lost.....
Hutch	2.90%	14	30.449	.....
Bed	4.20%	4.50	14.174	.....
Oil concentrates from middlings	1.60%	6.11	7.331	.....
Oil concentrates from tailings	2.95%	14.75	32.624	.....
Tailings of middlings	0.24%	.....	.....	3.739
Final tailings	0 40%	.....	.....	11.159
Totals	.....	39.36	84.578	14.898

In this test the lowest possible value of the tailings was aimed at, and, in consequence, the oil concentrates were very low grade and very dirty. The hutch had necessarily a great amount of barren matrix, owing to the small bed of mineral obtained with only an original weight of 2 kilos of ore; but the final losses of 0.24% Cu in the middlings and 0.40% Cu in the tailings was conclusively proved to be mineral still locked up in the sand, and to require a crushing to a fineness of 60 mesh to free it, and that there was no tarnishing of the sulphurets.

THIRD SERIES.—In this, the parcel of ore taken weighed ½ kilo, or 500 grams, and assayed 1.29% of copper. It was crushed to pass a screen of 30 mesh and was then treated direct with oil.

CLASS.	Assay Copper Per Ton.....	Percentage of Weight Saved	Percentage of Copper Saved	Percentage of Copper Lost.
Concentrates	3 7%	27	77 38	.....
Tailings	0.4%	...	.....	22.62

Here again it is a matter of fact that the loss is principally locked up in the coarse tailings; but, outside of that, the objections to direct oil application on the original ore are the needless large size of the plant, and the impossibility of getting two grades in the resulting products, namely, the water concentrates, high in iron and low in copper, and the oil concentrates rich in chalcopyrite.

(TO BE CONTINUED.)

Dredging Operations in Oregon.

The scene of greatest activity in dredging operations in the State of Oregon has been upon Snake river, the bars of which, for practically the entire length of the stream, carry values in gold. The metal occurs in thin scales, several hundred colors sometimes being required for 1 cent in value. The problem of saving such gold is a vexing one, and numerous devices have been proposed having this purpose in view. Some success has been achieved by the use of burlap in the sluices, in conjuncion with copper plates for amalgamation.

Inquiries into the status of the industry upon Snake river for the year past brought reports from but a single dredger, though others are known to exist, and may have been in operation. The dredger in question has been working near Ontario. It is the property of the Moraine Mining Co., and has a capacity of 2000 yards of gravel per twenty-four hours. The gravels handled are said to carry 17 to 35 cents a yard.

The Pomeroy Dredging Co. of Portland had a plant at work a few years ago in the bed of Burnt river, below Weatherby, Baker county. Difficulties in operation, presumably, brought about a cessation of operations.

A dredger seems to be a possibility in the near future for the Crane Flat placers, near the Cougar mine, Granite district.

On the John Day river, 4 miles below the town of John Day, the Empire Dredging Co. of Portland is operating a large plant with notable success, according to all accounts. The dredger is of the bucket type, each bucket having a capacity of 7 cubic yards. A 250 H. P. steam plant is used to drive the machinery. The gravels are said to contain 30 cents a yard.

In southern Oregon a dredger is nearing completion upon Foots creek, a tributary of the Rogue between Grants Pass and Gold Hill, the Champion Dredging Co. of Chicago being the owners. About 1200 acres of dredging ground has been made available in the Foots creek basin by the building of a dam near its confluence with Rogue river. The hull of the dredger is 112 feet long, 37 feet wide and 8 feet deep. When loaded with its 175,000 pounds of machinery it will draw 4 feet of water. In its construction 225,000 feet of lumber was used. The elevated material first passes into a revolving screen, by which the heavier wash is carried over the side, the finer being raised to sluices above, which are so arranged that they can be directed to any point from a right angle on either side to dead astern. The length of these sluices is 100 feet, giving a large area of dump. The dredging elevator is 81 feet long and has forty-two buckets of 8 cubic feet capacity each. A steam plant develops 150 H. P. The daily capacity is stated to be from 2500 to 3000 cubic yards. Cost of the plant

is $60,000. It is expected that the dredger will begin operations within a short time.

Dredging operations are contemplated for the Sixes river, Coos county, where values in gold, platinum and osmiridium are to be saved; for Evans creek, northern Josephine county, and for Bolan creek, tributary to the Illinois.

The dredging industry in Oregon is doubtless in its infancy, as many locations are yet available which can be made to yield profitable returns by this method of mining.

Method of Working Mines of Santa Eulalia, Chihuahua, Mexico.*

Written by EDWARD G. CAHILL.

The Santa Eulalia silver-lead mines are 16 miles southeast of Chihuahua, Mexico. The ore bodies occur in a hard Cretaceous limestone, lying nearly flat. This formation is capped by rhyolitic tuff that varies from a fine-grained rock to a coarse breccia. Between the deposition of the limestone and of the tuff a long period in geological activity intervened, which is indicated by a marked unconformity between the two formations. The thickness of the limestone is unknown, but is certainly more than half a mile.

The deposition of the ore bodies occurred after the period of volcanic activity which produced the tuff capping, for the fissures, which in the lime widen into ore lenses, extend through the 300 or 400 feet of rhyolite to the surface, and can be easily traced across the country.

Mines of Santa Eulalia, Chihuahua, Mexico.

The ores are lead carbonates and oxides carrying silver chloride with occasional bodies of galena and silver. They appear to have been deposited by ascending thermal waters bearing the metallic sulphides in solution. The process was clearly one of metasomatic replacement between the easily soluble carbonate rock and the sulphide solutions.

The ore bodies occur in three shapes—flat blankets, vertical ledge-like "abras" and vertical pipes. The occasional streaks of galena are very hard, but most of it is friable sand carbonates and is mined by pick and shovel without the use of powder.

One hundred and fifty years ago the Spaniards worked the Santa Eulalia mines by gouging, and packed the ore to the surface on the backs of peons. In this manner all the ore within 400 feet of the surface has been extracted. At that depth mining on the Spanish plan ceased to be profitable, and the mines stood idle until the advent of American enterprise and machinery.

The problem before the modern engineers was to go down 400 feet through hard rock and immense caves before striking any pay ore. It has been successfully solved and Santa Eulalia is now a deep mining camp, most of the working shafts being below the 1500-foot level. Some of the caves through which shafts have been sunk are 100 feet wide. The miners met this difficulty in two ways. In some places hollow pillars of concrete with the shaft passing through the center have been built. In other cases a vertical line of square sets has been built from the bottom of the cave to the roof where the shaft enters. The sides of the sets are then lagged securely and all the waste that is broken in the mine in both development work and ore stoping is brought to the cave and dumped around the shaft. Thus gradually the cave is filled and the shaft secured. In one case—Mina Vieja—of the American S. and R. Co. the problem of getting to the deep ore was met by Superintendent T. H. Mitchell in a manner which did away with all necessity for a surface hoisting plant. The mountain side was entered at the bottom of the arroyo, and a spiral and zigzag roadway 10 feet wide was carried through the solid lime down to the faces of the stopes 400 feet below. Electric lights were then put into the tunnel and burro trains run day and night from the stopes below to the surface chutes. This burro road branches to all parts of the mine, and in several places bridges great caves, sometimes with fills and occasionally with trusses.

In general the ores are low grade, and therefore to work the mines profitably a large tonnage is necessary. Most of the tonnage is now coming from below the 1000-foot level. To hoist a large tonnage from such a depth large engines are necessary, and probably the best surface plants in Mexico are to be found here. The Potosi shaft which taps an ore body in which 3,000,000 tons have been blocked out has the best equipment. A steel gallows frame surmounts the shaft, and the cages are run by a direct-action, conical-drum Corliss engine of 500 H. P. All the other working shafts have heavy steam plants.

Shafts sunk in ore bodies are not safe. The ore is too soft and friable, and no timber is strong enough to secure the ground. Several deep shafts in ore have been lost by caving. Therefore the engineers endeavor to place their shafts in solid limestone and crosscut to the ore bodies. It is impossible to predict where the ore will go, and for this reason the placing of a shaft is largely a matter of guesswork. Of all the working shafts in this camp there is but one which has not tapped ore at some level. The new shaft of the Buena Terra mine is in ore at the 250-foot level. The engineers realize that to go through the ore with heavy timbering will not do. They have decided to take out every pound of the ore that is there before going a foot deeper. If it leaves a cave in front of them they are prepared to go through it by the method of sets and filling described above. If other ore bodies are met, the same mode of procedure will be adopted. In this way only can they hope to keep their shaft safe. If they go through the ore and then attempt to back out they will come to grief. An ideal shaft can be cut through the solid lime. The rock is so hard that no supporting timbers are necessary and nothing is put in except what is needed to hold the guides in place. None of the shafts in the district have pump lines. The bottom of the Santo Domingo mine is 1350 feet below the surface. It is so dry and dusty that water for the drill holes and drinking purposes must be carried down by the miners.

There are two systems of hoisting in use in the district. The majority of the mines use the double cage and car system. The others use the skip and level-chutes plan with automatic dump in the gallows frame. As practiced in Santa Eulalia the latter is by far the cheaper and more efficient method.

There are in use three general ways of working the ore bodies. The first tried was the square set and filling system on the vertical bodies. A shaft is sunk, if possible in the limestone, and crosscuts run to the ore bodies at intervals of 75 to 100 feet. On each of these levels, sill sets are put down and the entire width of the body, which may vary from 50 to 150 feet, is worked out one set high. Then heavy lagging floors are put down underfoot and all the sets that are not necessary for car tracks are filled solidly with waste. The ore above is then attacked and mined by overhand stoping, and another row of sets is thus gradually built over the full width of the body. When this layer of sets is worked out it is filled solidly with waste, and this process is repeated over and over. Chutes are carried up through the sets in convenient places and ore thrown down to the cars in the track level below. Finally the timber from one level connects with the sills of the level above. The heavy floor lagging originally put in prevents the waste from falling down. As the last layer of ore is removed from the level below, waste is packed in tightly and the upper floor supported. The idea is to square set out the ore and fill with waste. That the filling must closely follow the face is the vital condition for success under this method and is fully recognized by all the engineers using it. If the stope gets two or three sets ahead of the filling in these loose friable bodies a cave is almost inevitable. The square set in use is a modification of the Comstock system, the tenons being cut differently. This method of mining is expensive because timber must be brought either from the United States or Southern Mexico at an expense of 6 cents Mexican a board foot. This amounts to thousands of dollars in a month. Another disadvantage is that a great deal of time is needed to lower such a large quantity of timber through the shaft. This is especially bad where a large tonnage is required, as it decreases the hoisting time, and, therefore, the capacity of the plant. A great advantage of the system is that it disposes of all waste from development work, and thus renders prospecting cheap. The best distance between levels is about 70 feet. A 7-foot high set is used, which makes ten sets between levels. That is about as high as it is advantageous to pack up waste filling.

(TO BE CONTINUED.)

*Abstract Cal. Jour. Technology.

The Force of a Drill Blow.

TO THE EDITOR:—I never really became thoroughly interested in the problem of finding the force of a blow struck by a power drill until we got into the electric drill business, and prospective customers asked the question on an average of half a dozen times a day. I had discussed the question several times with engineers, but the discussion soon ended, as we readily agreed that the time element necessary to solve the problem was unknown, and could not be measured without prolonged experiment with very elaborate and expensive apparatus.

But, when customer after customer asked the question and I was obliged to say that we did not know, and the customer would proudly state that the Blank drill struck a blow of 700 pounds, and the Blankety Blank struck 500 pounds (the agent told him so—and agents never lie), I thought it was time we knew the correct answer.

Curious to know what other drill manufacturers estimated the blow of their drills to be, I asked a few, and the amounts they stated varied from 450 to 900 pounds.

After studying the problem for some time I found a very simple method of calculation and prepared the following dissertation on the subject, which will appear in our new bulletin on the box electric rock drill:

"The force of a blow may be defined as the average pressure which would accomplish the same result as the blow. In general, a blow is the result of a small weight moving at a high velocity.

"The high pressure developed by the blow is the result of the sudden stoppage of the rapidly moving weight. To calculate this pressure it is first necessary to find the amount of energy in foot-pounds stored in the moving weight, and the energy can be found if we can measure the velocity of the weight the instant it strikes.

"To measure the velocity is by no means a simple matter, especially in the case of a power drill.

"On the other hand, if we did know the foot-pounds of energy in the moving weight, we cannot obtain the average pressure on the drill without knowing the time during which the steel is moving forward into the rock under the impelling action of the blow. This space of time is so short as to be imperceptible and cannot be measured except by very elaborate and expensive apparatus.

"Therefore, the measurement of the force of the blow in a power drill is not likely to be accomplished outside of a very richly endowed laboratory.

"However, the advent of the electric drill in which the power and efficiency are so readily measured, enables us to use a very simple method for calculating the force of the blow, as follows:

"The electrical energy delivered to the box electric drill is 1½ H. P., or say 50,000 foot-pounds, and assuming that only half of this is actually delivered

to the cutting end of the drill steel, we have practically 25,000 foot-pounds of work done per minute.

"In hard granite the box drill will penetrate at the rate of 3 inches, or 0.25 foot per minute.

"The work done on the drill side of the cutting edge of the steel must equal the work done on the rock side of this edge; we, therefore, have the equation: 25,000 foot-pounds = 0.25 X P, in which P is the average pressure throughout the distance of 0.25 foot. Solving the equation for P gives the value of P as 100,000 pounds. Therefore, the force of the blow struck by the hammer of the box electric drill is fifty tons." LEWIS SEARING.

Denver, Colo., April 30.

Concrete in Mining and Metallurgical Engineering.*

NUMBER IV.

Written by H. W. EDWARDS.

COST.—It is difficult to give any very definite figures in regard to this very important subject because the prices of suitable rock and the facilities for crushing it, as well as the cost of sand or tailings and cement, will vary widely in different localities. I submit, however, a figure which may be useful as a guide. In modifying this figure to suit conditions in any giveu locality, it is important to bear in mind that the magnitude of the work has cousiderable effect on the ultimate cost. For example, a piece of work like the experimental dome described consumes a relatively small quantity of concrete material, while the cost of the wooden form must have been relatively large. Compare this with a heavy retaiuing wall where a crib has to be built to form one face only. It is best, therefore, to limit this discussion to the question of the cost of labor only; the remaining figures of the cost of the material and the crib can then be adjusted to suit the local conditions.

Presuming that the materials are delivered in railroad cars convenient to the work, I find that an average cost—covering many jobs at different periods and locations—of unloading cars, mixing, arranging platforms, gangways, placing and beating concrete in place, is approximately equivalent to a cubic yard of structure per man per day. This figure is sufficiently liberal to cover incidentals, such as wear and tear on tools, lights at night, etc. Beyond this there yet remains the cost of cribs, excavations, scaffolding, lumber, etc.

About the cheapest work recorded in my note book is a retaining wall 16 feet high, 92 feet long, 3 feet thick at the base, tapering to 20 inches at the top. The ingredients of the concrete were jig tailings and picking-belt rock available ou the spot, and cement at $2.15 per barrel. The lumber cost was $14 per 1000 feet and wages were 15 cents per hour. The total cost of the wall was 22 cents per cubic foot. This cost included the straightening up of the work after it bad been roughly finished, and the supervision during the entire construction. About two-thirds of the lumber was credited as fit for other rough work.

Anotber entry in my note book is the following: A large engine foundation of hand broken slag, granulated slag and cement was constructed at a total cost, inclubing crib, of $7.75 per cubic yard iu place. In this instance, I have spccified, not per cubic yard of material, but per cubic yard of finished work. It is necessary to bear tbis distinction in mind because, as before explained, a cubic yard of tamped and finished work requires more than a cubic yard of material.

I find that there is but little difference in the cost of hand mixed concrete and machine mixed concrete. Tbis statement, of course, is restricted to the comparatively small structures built in the ordinary run of mining and smelting operations. For the construction of heavy railroad bridges or other massive structures involving thousands of cubic yards, I believe there is now but little hand mixed concrete used. In this conuection, however, the machine mixed concrete gives the better results.

SEASONING.—The seasoning of concrete is worthy of important consideration. The question is: "How long a period should elapse after laying the concrete before it should be loaded?" The auswer depends on two conditious: First, the season of the year, and, second, the use to which the work is to be put. In summer time, or in a dry, winterless climate, concrete rapidly reaches its full strength, and it is best to retard its too rapid hardening by coveriug it with a layer of sand or dirt, which is frequently moistened. Under these conditions the concrete may receive its load in a week or ten days, or even sooner, if it is entirely below ground, where the mass has no opportunity to spread. In more northerly localities, where the winters are cold, concrete, if built late in the autumu or in the winter, will not be really solid until warm weather has set in. The influence of temperature on tbe hardening and seasoning of concrete is very distinct and must be taken into account.

The second condition which has to be considered before applying the load is the purpose of the structure. If the load be applied gradually, as, for example, in the case of a retaining wall to be gradually filled up from behind, loading may commence after a week or two of warm weather. It would be unwise, however, to set an engine to work on a green concrete foundation, although there would be but little harm in mounting it in its place after a week or two have elapsed.

Thin work, such as floors and flues, naturally solidify much more rapidly than heavy masses. I have used a floor on the third day after its completion, merely taking the precaution to place a few old boards where there would be the most traffic. Unless in winter, the cribs can be removed on the third day.

In heavy masses, hardening and seasoning will go on for many months. Beyond delaying the setting until warmer weather, frost, even if the wet concrete itself be frozen, does not appear to be in the least injurious.

REINFORCING CONCRETE WITH IRON.—The embedding of iron in concrete is almost as old as concrete construction itself. F. Von Emberger, in Trausactions of the American Society of Civil Engineers, cites a case where iron rods were found embedded in concrete below water level for 400 years. For the protection of iron, concrete is better than paiut.

In 1897 there was some discussion on the effect of limestone in concrete, and a general impression is left by the correspondence that limestone was injurious to iron embedded in concrete.

For reinforcing retaining walls nothing can surpass old rails set vertically and horizontally, so that, if the wall goes at all, it has to go bodily—an effect uot to be apprehended. For light work, such as roofs or walls of dust flues aud chambers, discarded coarse mesh woven wire trommel screens are very suitable.

For foundations in bad ground the area of the concrete may be largely extended without fear of deflection by placing on the bottom of the mass a double series of steel beams, placed horizontally at right augles. I once had occasion to erect on very unsatisfactory ground a brick stack estimated to weigh 100 tons. The foundations, therefore, were extended and laid in the manner described above, by two layers of 8-inch steel I-beams 16 feet long. In all, thirty-six I-beams were used, giving a foundation area of 16x16 feet, upon which was rammed about 3 feet of first-class concrete. Including the weight of this bed of concrete, the total stress on the under surface of the foundatiou was about 1000 pounds per square foot—a most moderate pressure. This construction gave as firm a footiug as could be desired.

FOUNDATIONS UNDER WATER.—Concrete may be deposited in still water and will harden there almost as soon as in the air. Evidently, however, it will not do merely to dump the concrete into a deep pool. I have had good satisfaction in the use of a home-made iron funnel with a stem long enough to reach to the bottom, and which for convenience was cut shorter from time to time as the work progressed. The method of operating is to rest the outlet of the funnel on the bottom and to fill the stem and hopper with concrete; then, by lifting it a little and moving it about with some judgment, the concrete can be spread evenly and with slight opportunity for the cement to get washed out from the sand and crushed rock.

In running water quite a different method must bc followed. The cheapest is to make a more or less water-tight box, or coffer dam, consisting of a bottom and sides. The height of the sides must be sligbtly greater than the depth of the water. A double layer of boards, having a layer of tarred roofing paper between them, makes a very suitable construction. The ground upon which the foundation is to rest is roughly leveled and the coffer dam sunk into position by loading it with concrete. I witnessed the construction of foundations for a large stack—a very heavy spring of water having been struck in the excavation—made in this manner, and, so far as known, there have been no subsequent difficulties. The construction must have been much cheaper than pumping out the water while the concrete was laid in the usual manner, and cheaper than sheet piling.

SHRINKAGE.—In places where concrete is intended to finish accurately to a definite level, the shrinkage must be taken into account. The shrinkage varies with the coarseuess or fineness of the ingredients, the quantity of water used in the mixing and with the rapidity of setting. Fine material used very wet and setting rapidly is the combination which gives the greatest amount of shrinkage.

An allowancc of one-eighth or three-sixteenths of an inch per foot in height for vertical sbrinkage is a fair average; but great caution sbould be used not to exceed the desired level, as it is much easier to "shim" up the work to be placed on the concrete than it is to shave off a fraction of an inch. After the first piece of work has set, the operator has a standard of shrinkage which can be used for all of the constructiou, provided the materials remain unchanged, or as long as the season of the year permits an approximately similar period for the concrete to set.

(TO BE CONTINUED.)

*Abstract Trans. Am. Inst. Min. Engs.

A Nevada Ore Deposit.

Written for the MINING AND SCIENTIFIC PRESS by SAMUEL C. WIEL.

In a recent issue of this paper "Concentrates" said that the occurrence of alabandite as an ore was rare, and mentioned deposits in Tombstone, Arizona, associated with silver as the most notable example. It may be of interest to note a recently opened deposit of similar nature in Nevada.

This manganese deposit is located in the Shelbourne range, in White Pine county, Nevada, in the eastern part of the State, about 15 miles north of Aurum. The Shelbourne range is one of the Paleozoic ridges common to Nevada, running north and south, formed by great outflows of eruptive rock and by tilted Paleozoic strata. It reaches a height of about 9000 feet.

The structure of the ridge at the place where the deposits now in question lie consists of a series about 1000 feet thick, at the base quartzite, above that limestone—in which the ore is found—and at the top shale. The strike of this series is about northwest and southeast, dipping about 50° southwest.

Tbe limestone is much crushed. It was at one time without doubt in stratified beds, as is usual. The breaking resulting from mountain building was largely felt by this limestone, being much softer than the quartzite or shale. There is much evidence of faulting and slipping throughout the limestone, especially slickensided surfaces (seen in the tunnels), the planes running in various directions, without uniformity. The writer had just previously visited the Eureka Consolidated mine at Eureka, Nevada, making the visit to the present locality in company with H. C. McTerney, for many years superintendent of the Consolidated, and noted a strong resemblance betweeu the limestoue in question and the crushed limestone at Ruby Hill.

The outcrops were originally found by tracing heavy, black float rock up the mountain. The ore in place is a heavy, black mineral, usually soft and moist when taken out, but soon hardening. Frequently it is concretionary, looking like small balls of closely packed needles, at the same time often showing small cavities, like gas bubbles, which give it an appearance very much like a wall of slag. It is, in fact, a common explanation given by the miners that the deposit was formed by solidification from a molten state.

An analysis of specimens of tbe ore showed it to be in the main alabandite, the sulphide of manganese, to which its hardness and blackness are due. Silver is carried by the ore to the extent of perhaps 150 ounces to the ton, making it a high-grade ore. The analysis indicated that the silver was carried by the alabandite, mixed with it either as sulphide or as minutely divided particles of the metal. There is present also in considerable quantity rhodochrosite, the carbonate of manganese, and in lesser quantities as incidental constituents there are hydrous iron sulphate, pyrite, free sulphur, argentiferous galena and antimonial silver.

To review the relative importance of these constituents: The fact that the body of the ore consists of alabandite, and the intimate mixture of the rhodochrosite with the alabandite, of the carbonate with the sulphide, is probably conclusive against an igneous origin for the deposit. A carbonate is a demonstrated impossibility as an original constituent of an igneous rock. Iu this connection the writer once heard Alexander Agassiz discussing the origin of certain islands in the South Pacific, attributed by others to volcanic action, but by him to the work of corals. Having found limestone to be one of the important rocks of the place, he asked whether his opponents would call it a volcanic limestone, this evokiug a laugh from an audience composed largely of many learned men of science.

As to the other constituents, the free sulphur, antimonial silver, and some free mercury that is reported in small particles as occasionally met with, would be taken, especially in connection with the concretionary and slag-like appearance of the ore, to represent some degree of fumerolic action, and the presence of gases, but their relatively small quantities would preclude this to any great extent. The absence of oxides of manganese would argue against any great influence on the score of surface enrichment.

Perhaps the following is a fair explanation of the origin of the deposit: During the process of crushing and faulting, approaching brecciation of the limestone, which, like most geological processes, must have gone on imperceptibly over a long period of time, lines of weakness and even open cavities were formed that afforded channels for the deep-seated circulatiou. One open space, especially, in the form of a long, flat, inclined cave, has been opened, entirely similar to the well-known caves at Eureka, the ore being rich in the vicinity of this cave in much the same way. Heated solutions making their way tbrough this crushed limestone while still buried in depth deposited the sulphide, and at the same time replaced with manganese the calcium in the limestone, forming rhodocrosite, by the process known as metasomatic replacement. The earlier formed deposits were themselves crushed in the slow movement

that continued to go on, the general result being that the ore occurs in chambers or pockets of varying sizes and forms, scattered throughout the limestone. The chambers or pockets show a preference at present for the hanging wall contact, which may be attributed to the greater crushing of the limestone at its contact with the harder rocks. But no general continuity throughout the deposit appears at the contact any more than elsewhere.

Probably it would be called a single lode within Justice Field's definition in the Eureka case, which includes all deposits of mineral matter found through a mineralized zone or belt coming from the same source, impressed with the same forms and appearing to have been created by the same processes, but it is certainly not a single vein within the miner's and geologist's definition.

Remembering the close relation in properties between manganese and iron, and changing the manganese of this Shelbourne deposit for the iron of the Ruby Hill deposits, the deposits seem alike. In both cases, moreover, the chief value was in the silver associated with the ore, and in both cases the ore was readily smelted because of the value of the base as a flux. The many discussions relative to Eureka would indicate that the deposits here, as there, are due chiefly to replacement.

Ore Deposits of Rossland, B. C.*

Written by EDMUND B. KIRBY, E. M.

The Rossland mining district began active production in 1894. Its total yield up to Jan. 1, 1904, is 1,620,540 tons of smelting ore, containing about $26,000,000 gross value, or $16 per ton in gold, silver and copper.

This tonnage was derived from the following mines:

	Approximate Tonnage.
Le Roi	974,785
War Eagle	240,455
Center Star	229,648
Le Roi No. 2 (Josie and No. 1 mines)	115,007
Iron Mask	17,655
Rossland Great Western Nickel Plate	12,331
Columbia-Kootenay	7,790
Velvet	5,416
Jumbo	4,305
Giant	4,344
I. X. L.	2,900
Miscellaneous	2,447
Evening Star	1,500
Spitzee	900
Monte Cristo	409
White Bear	302
Homestake	140
Virginia	100
Portland	25
Total	1,620,540
Estimated value	$25,816,342
Average value	$16

The ore is transported to the Columbia river over two competing lines of railway, and supplies extensive smelting works at the town of Trail and at the town of Northport. These towns, together with a population of about 6000 in Rossland, are supported by the mines.

GEOLOGICAL POSITION.—The geological position of these ore deposits is shown on a map by the Geological Survey of Canada. An elongated oval area of gabbro is surrounded by a border of varying width of augite and uralite porphyrites and fine-grained green diabases. The transition from the gabbro to the porphyrites is not well defined, and they are both from the same magma. Beyond the above border come alternating series of porphyrites, tuffs and slates, and beyond these are agglomerates.

The basic coarse crystalline and plutonic gabbro thus surrouuded by borders which become more acidic and finely crystalline, and fiually pass into volcanic breccia and tuffs, indicates an ancient volcano center. The gabbro area is the main plug or neck of lava crystallized at great depths and exposed by deep erosion. Its great age is indicated by this erosion and by the numerous alterations in the rock structure and in the rock minerals.

The active mining has been carried on, not within the gabbro area, but outside of it, and in the porphyrites surrounding its western end. The principal mines are all included in the small group of claims shown near the edge of the gabbro and located on the flank of Red mountaiu, above the town of Rossland. A horizontal section through this group of claims at the approximate elevation of 3530 feet above sea level shows the structure details exposed by the workings of the Le Roi, Center Star, War Eagle, Josie, Number One and Iron Mask mines. These mines aggregate 20 miles of total workings, and the priucipal depths attained are those of the War Eagle, 1615 feet, measured on the vein, Le Roi 1361 feet and Center Star 1289 feet.

Ou the west of these claims there is a belt of fine-grained eruptives, probably porphyrites, which are in a schistose condition, frequently resembling shale.

COUNTRY ROCK OF MINES.—Within the area of the claims the prevailing rock is evidently all from the same magma, but shows innumerable variations in rate of cooling and degree of metamorphism. It is mainly composed of plagioclase feldspars and pyroxene, generally in about equal proportions, but towards the gabbro area bodies of pure pyroxenite are occasionally encountered. There is usually a small proportion of orthoclase feldspar and sometimes hornblende, and some observers have noted the fact that these appear more frequently towards the west. The rock appears to be holocrystalline and more or less porphyritic. The crystals may be either microscopic or as large as, say, five mm., while one or two mm. is a common limit. The feldspars are more or less altered to a turbid or porcelain-like appearance, while the pyroxenes are partially transformed to fibrous minerals of the uralite group. In strongly altered plaees, and especially within the veins, the rock is frequently colored brown from microscopic crystals of secondary biotite.

DIKES.—This country rock is cut by innumerable dikes which require detailed comparison and determination by the microscope. Generally speaking, they appear to be either miea traps (perhaps kersantites) or altered basalts (perhaps melaphyre). The latter are often greatly decomposed.

The general direetion of the parallel fractures has been north 10° W. with dips, which are either vertical or very steep, to the east. They have mauy fluctuations in strike and dip, and they branch, unite and re-branch. They probably beloug to at least two periods—one before and the other after the ore deposition. Occasional belts of special crystallizatiou in the country rock indicate dikes of an earlier date, which have since become cemented with the country rock and jointed to correspond with it.

THE VEINS.—These are shear zoue fissures consisting of a series of parallel platings of the rock produced by shearing under high compression. In the Center Star–Le Roi vein, in which the shear zone is most typically developed, this series of platings is 20 to 40 feet wide and dips about 70° to the northwest. The Josie vein is parallel; but the Center Star north vein, the War Eagle and Iron Mask veins are brauches from the Center Star–Le Roi vein. Their positions and dips are shown upon the maps.

The ore consists of country rock more or less replaced or impregnated by pyrrhotite, accompanied in places by small proportions of chalcopyrite, pyrite, arsenopyrite and quartz. The pyrrhotite when it occurs by itself, even in solid masses, carries but little gold, say, from 50 cents to $3 per ton. The chalcopyrite is the principal carrier of gold, and ore of commercial value occurs ouly in those localities where chalcopyrite, pyrite and arsenopyrite have been deposited with the pyrrhotite. The manner in which these minerals occur within the interstices of the pyrrhotite, and the fact that continuous masses of pyrrhotite ore are impregnated in some places and barren in others, proves the later deposition of these valuable minerals. They have been introduced after most of the pyrrhotite was in place, although occasional occurrences of chalcopyrite aud pyrrhotite in quartz point to the possibility of some contemporaneous deposition. The change from one deposition to another was probably gradual. A small proportion of the gold in the ore is native in the form of small grains and scales. The fact that oxidation extends only a few feet below the surface, while the proportion of metallics seems to average much the same, even in ore shipments from the lower levels, suggests original deposition in this form. No data have been collected, however, to indicate whether it was contemporaneous with the pyrrhotite formation.

The average proportions of gold, silver, copper and total sulphides in a grade of, say, $15 full assay value, are as follows:

	Average Center Star ore.	Average War Eagle ore, Representing also ore of Number One, Josie–Le Roi.
Gold, ounces	0.59	0.505
Silver, ounces	0.43	1.0
Copper, per cent	1.12	1 78
Sulphide minerals, per cent	25.0	22.5

In various places the pyrrhotite seems to be accompanied by a little nickel and cobalt. Specimen analyses ranging from 0.13% to 0.65% nickel, and from a trace to 0.59% cobalt.

FAULTS.—These have an average direction which corresponds to the dike system, with dips ranging from vertical to 50° easterly. Out of the great number of fractures studied and surveyed only the principal faults have been plotted, i. e., those fractures which appear to have affected the veins by well defined displacements or by acting as barriers to min eral solutions.

The faults are frequently not plainly marked, having no clay filling, and at most only a small thickness of comminuted material. They frequently consist of a zone or series of close fractures, some of which are better marked than the others, and these fracture planes often interweave in such a manner that local measurements of their strike and dip are deceptive, and these can be determined only by comparison with other workings. As a general rule, the faults appear to have been too tightly compressed to give access to mineral solutions, and those existing during the deposition period have therefore tended to act as barriers to the flow of tbese solutions.

Since individual faults often cross dikes at sharp angles in strike and in dip, a fault frequently breaks along a dike for considerable distances. Hence, in many cases of vein displacement it is impossible to say how much of the total amount has been due to the dike fracture and how much to the subsequent fault fractures accompanying it. In most cases where dikes are not accompanied by plainly marked fracture planes the displacement is so small as to indicate that the fault system, and not the dike, has probably been responsible for most of the shifting.

The sharp angles at which the faults cut the War Eagle vein have tended to produce overlaps of the vein, which is most clearly disclosed in the case of a fault on upper levels.

(TO BE CONTINUED.)

*Abstract Trans. Canadian Mining Institute.

The Opportunities for Gold Dredging in the Yukon.

Written for the MINING AND SCIENTIFIC PRESS by E. B. BOLGER, C. E.

In the month of August, 1896, the first discovery of gold was made by a miner called Henderson ou Gold Bottom creek, 35 miles from what is now the town of Dawson. Almost simultaneously with this discovery gold was discovered on Bonanza and Hunker creeks by Carmac and Hunker, respectively, and ever since the news of these discoveries became general, there has been one continual stream of humanity pouring into that land of golden opportunities.

In the early days the only meaus of transporting outfits was to pack them on your back over the Chilcoot pass, later by pack train via the White aud Chilcoot passes from the seaports of Dyea and Skagway, Alaska. Now, however, the trip from the sea to the inland waters of the mighty Yukon can be made with as little inconvenience as is incurred by traveling from San Fraucisco to Los Angeles.

The old time miner, or "Sour Dough," as he is familiarly called, had formerly many difficulties to contend with: Firstly, the extreme cold weather during the winter months, when for weeks at a time he would be obliged to discontinue excavating the pay until the weather moderated. However, he was somewhat compensated for this inclement weather by the five months of fine weather duriug the summer, three months of which were continual daylight; secondly, the scarcity of provisions and cost of transportation; thirdly, the difficulty of working the ground, which was frozen to an unknown depth iu some places, having been in that condition for ages.

During the first years of mining the hardy "Sour Dough" resorted to the primitive method of lighting fires on the ground to be worked, thus loosening a foot or two of the auriferous gravel at a time, which could theu be handled with the pick and shovel—altogether a very tedious process indeed, and one which required the richest kind of ground to pay for immense expenditure of time and labor. From 1896 to 1898 no ground could be handled which contained less than from 50 cents to $1 per pan, i.e. from $135 to $270 per cubic yard, a pan containing on an average 0.10 of a cubic foot, while in many iustances as high as $10 to $15 per pan were found, though this of course was only occasional, still it all goes to show the immense wealth hidden in the gold fields of the North.

To facilitate the thawing of the gravel, some miners then conceived the idea of using a steam boiler fitted with rubber tubes having steel nozzles attached; the steam is sent through these tubes and the nozzles driven into the ground to be worked, so that a cousiderable amount of the pay streak could be thawed by one shift and excavated by the next.

Until 1900 the steam boiler with attachments was considered the acme of modern appliauces for working the mines in the Yukon, but in that year a Detroit firm decided to place a modern dredger of 700 cubic yards capacity per twenty hours ou claim No. 42, below Discovery, Bonauza creek.

This idea was looked upon with a great deal of incredulity by the majority of the miners who thought that it would be impossible to use a dredger on frozen ground with any success; uevertheless, this dredger with a crew of ten men, five on each shift, handled more grouud than 400 men with a boiler could.

The following is a fairly accurate description of the dredger above referred to: The dredger is provided with two endless chains of buckets, twenty-nine buckets for each chain, occupying, respectively, the frout and rear of the structure. The chain of buckets situated at the front performs the functiou of excavator and hoist, the other that of tailings stacker. The lips of the buckets of the former are armed with strong prongs of nickel steel, those of the latter are plain. A 75 H. P. boiler furuishes the power, 65 H. P. being required to operate the plant.

The excavating buckets elevate and empty the gravel into a rotating perforated trommel, the axis of which is inclined about 10°. The gravel is treated in the usual way, the oversize falling iuto buckets of the tailings elevator and the fine gravel, carrying the gold, passing along with the wash water over tables situated on either side of the trommel. The gold which is not caught on these tables falls with the tailings into sluice boxes situated below.

The "cleau up" is made every morning. The mats are shaken over a pan placed in a large box and panned in the usual way. The fine gold which cannot thus be reclaimed is transferred to amalgamators and run over amalgamated plates. The sluice boxes are cleaned in the usual way. It is es-

sential, in order to make the working of the dredger a success, that you should have the following information: First, an accurate knowledge of the nature of the ground to be worked, the distance to bedrock, the size of the gravel, etc. Second, a thorough test of the auriferous gravel. (This is easily obtained, as there are hundreds of prospect holes in every claim of any value so that there is little difficulty in making a thorough test with a minimum expenditure.) Third, the proximity of good roads to facilitate the transportation of the dredger, the hauling of fuel, provisions, etc. Fourth, a sufficiency of water to float the dredger (4 feet is ample). So I have no hesitation in saying that with the immense area of auriferous land to choose from there would be no difficulty for an engineer conversant with the requirements of a dredger in the Yukon, to obtain, perhaps, one of the best dredging propositions in America today.

The only rival the dredger has in the North to-day, and it can hardly be considered a rival, is the steam shovel. Some miners recently have used the steam shovel as an excavator, but there are inconveniences connected with its use.

With the present existing facilities for gold dredging in the Yukon, and which will improve year by year, it is safe to predict that the near future will see numerous dredgers in operation there and that the yearly output of $10,000,000 worth of gold dust may be trebled or quadrupled.

The Balance Rope at Hylton Colliery.*

Written by T. E. PARRINGTON.

It is desirable, where winding bas to be done from great depths, that some means should be employed to counteract the effect on the engine of the weight of the winding ropes. To produce a large output, a high speed of winding is essential; and, to attain this with safety, the load on the engine must

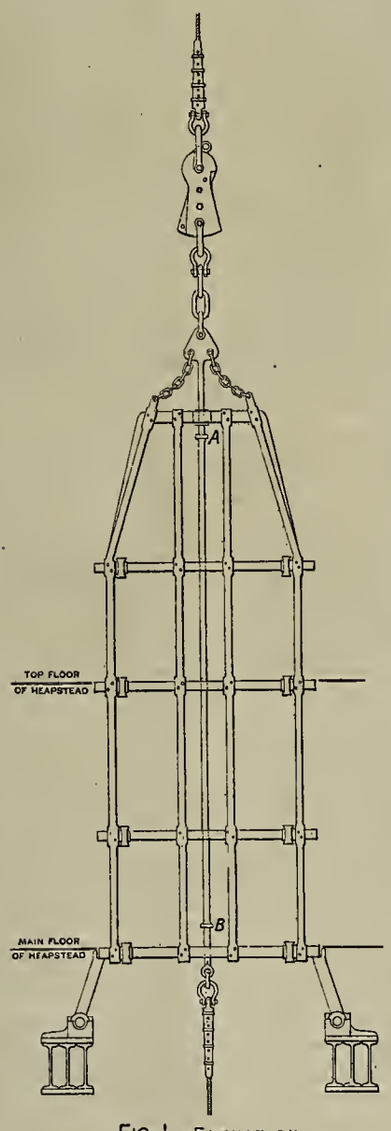


FIG. 1.—ELEVATION.

be as nearly constant as possible, throughout the run.

The method of applying a tail or balance rope, hung beneath the cages, though in theory the most perfect, never appears to have come into great favor, especially in this district, owing no doubt to several admitted objections to its use; notably the increased strain on the sockets of the winding ropes, on the cages, and upon the keps, when the cage is landed; and, in addition, the loop at the pit bottom has frequently been a source of much trouble, probably owing to the want of some suitable means of guiding it.

The east pit, at Hylton colliery, is 20 feet in diameter, and is drawing coals from the Hutton seam at a depth of 1560 feet. Some months ago, a balance rope was introduced into this pit, and it has since

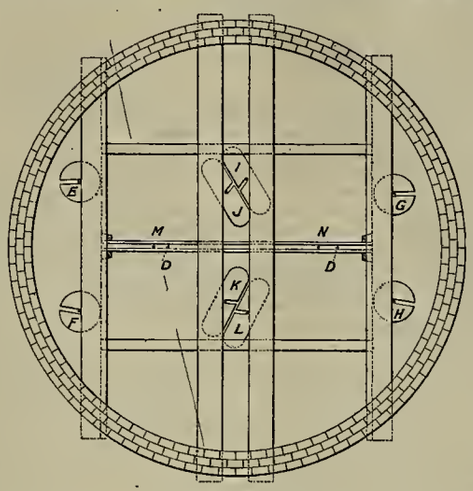


FIG. 2.—PLAN

been running, most successfully, beneath the cages, especially designed and built for its adoption. Each cage carries eight tubs, that is, four tubs on each deck: the intervening space, in which the men ride, adapts the cage to the double beapstead and obviates "decking." A draw bar of forged iron, 2½ inches in diameter, runs through the cage from top

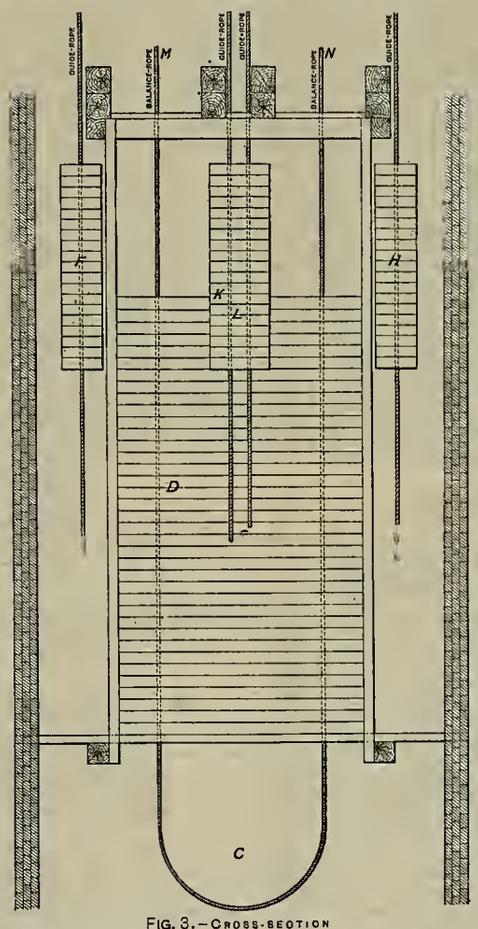


FIG. 3.—CROSS-SECTION

to bottom. The cage is built in halves, and the draw bar is inserted before the two sections are bolted together.

Fig. 1 represents the cage standing on the keps. At the lift, the draw bar moves up until the collar, A, comes against the head of the cage, and the cage is taken off the keps and carried ou the collar during the run, the draw bar dropping again so soon as the cage is landed. By this means, the extra strain occasioned by the weight of the balance rope is never applied to the cage, while the keps are never required to carry more than the weight of the cage and its load, the balance rope being always directly connected to the winding rope by the draw bar. In the event of the draw bar falling until the collar, B, rests upon the cage bottom, the principle would of course fail; but, unless the cage dropped very heavily upon the keps, this could never happen, the movement of the draw bar being, at the extreme, about 2 inches in ordinary coal drawing. The winding ropes and balauce ropes are capped in the ordinary way, the sockets being riveted and hooped (Fig. 1). The winding ropes, of Langs lay, built up of six strands of nineteen wires each, are 5¼ inches in circumference and weigh 13.7 pounds per yard. In order to make the balance rope as flexible as possible, special thin wire is used in making it, the full rope comprising six strauds of thirty-seven wires each, and it weighs twelve pounds per yard.

Figs. 2 and 3 are a plan and a cross sectiou respectively of the pit bottom below the dabbing baulks; and they show how the loop, C, or return of the balance rope is dealt with. The rope is made to run in a deep perpendicular groove, D, whose vertical sides guide the rope parallel to the bend, but in all other respects the course of the rope is entirely free. This method, the writer thinks, has not before been adopted in this district, altbough it has becn in use for some years at collieries in South Wales, where he believes it was first introduced.

At Hyltou colliery, the groove, D, is 22 feet deep and 2½ inches wide, and the sides are formed of redwood deals, 1½ inches thick. It will be noticed (Fig. 3) that the extreme bend, C, of the rope is allowed to project below the groove, the arrangement being found advisable iu order to prevent the possibility of the rope becoming jammed. Owing to the twisting action of the balance rope, the top deals of the groove, at first, wore through very rapidly, but by substituting teak instead of redwood, at the top, the trouble has been overcome. This remedy is preferable to liniug the top with sheet-iron, as is sometimes done, the noise iu that case being very objectionable. In every other respect the arrangement has been found most satisfactory, and the ex treme simplicity is a great recommendation.

Mill Construction, Milling and Amalgamation.*

NUMBER III.

Written by I. ROSKELLEY.

This excess of feed need not, I admit, be present, but it often is because it is hidden away behind the chuckblock and the millman cannot see it. The advocates of high discharge say that banking against the screen of material too coarse to pass through will occur if a low chuckblock is used. A 2-inch discharge has been used in the Robinson Deep mill ever since the mill has been running, and by always keeping the feed low we have not been troubled witb "banking" or excessive breaking of screens.

FEED.—This should be kept even and low. Uneven feeding causes banking at the ends of the box, and both this and high feeding impedes crushing.

WATER SUPPLY.—The mill should have a coustant head of water, and its supply should not be tapped by any other department. If the pipes of the mill are supplied from a large tank outside, as is done on some mines, this is assured. The water pipes of a mill should always be somewhat larger than theory demands, to allow for space taken up by adhesive matter in the water; as, after being in use for some time, unless provision is made for this, tbe supply will be inadequate. In every mill some arrangement should be made so that each shiftman uses the same amount of water. Where each battery is supplied with a single pipe this can be easily done, but whatever system of piping is adopted in the construction of the mill, if cocks are used instead of valves and the cocks marked, the water supply can be always kept near the actual amount required. The water supply must be varied according to the coarseness of the rock coming to the mill, as the rate of crushing varies as it is coarse or fine.

I do not see that it can make much differeuce to the rate of crushing wbether the water is introduced at the top or the bottom of the box, as the action of the stamps prevents it striking directly on the ore. Several different arrangements are in vogue for the distribution of the water throughout the box. A supply near each eud is good, aud so is small jets the wbole length of the box.

Increasing the quantity of water does not greatly affect the rate of crushing, but if the supply is irregular crushing is undoubtedly retarded. The water supply is regulated not by conditions in the mortar box, but by the flow over the plates. If the supply is inadequate, sand will bank on the plate, and if in excess botb black sands and fine gold will be carried away, the latter not getting a chance to amalgamate. If a fine screen is used the amount of water per ton of rock crushed must be increased. If the screen is very fine the particles passing over the plate are fine, and slimes and fine material tend to stick to the plate much more than rougher particles, hence the increased supply of water necessary to keep the plate clear.

Before making any remarks on amalgamating I have a little to say on the use of cyanide in the mill.

* Trans. North England Inst. Min. and Mec. Engrs.

* Abstract Trans. Jour. Chem. Met. and Min. Soc., S. A.

I have never yet met a millman who did not advocate the use of cyanide, nor a cyanide man who did not say that it ought to be discontinued. These widely different attitudes are but natural; the millman finds it assists him in his work, and, consequently, he stands up for it; the cyanide man says it dissolves gold on its way from the mill to the cyanide works, and speaks against it. This antagonism, though I have always found it a friendly one, has done harm, and has prevented the question from being discussed openly, and the result has been that millmen preserve as a dead secret the amounts which they use for different purposes. The harm which cyanide does when used in a mill is patent to every chemist, and the result is that in a few cases millmen have discontinued using it.

Stated briefly, the objections to using cyanide in the mill are: (1) It dissolves gold on the plates; and (2) it interferes with the pulp after leaving the mill.

The advantages accompanying the use of cyanide are perhaps better known to millmen, who have the practical handling of the amalgamating tables, than to any one else. They are:

(1) It greatly assists in the setting and dressing of plates by causing the mercury to spread and mix with the amalgam. Two men who can set a copper plate well in an hour, using cyanide, will require twice that time without it, and even then the result is not as good.

(2) It keeps the plates in good condition. When cyanide is used, plates are seldom seen discolored with streaks of yellow, oily-looking scum as often occurs with certain ore when it is not used. It has been affirmed that this discoloration can be done away with by feeding a little lime into the mortar boxes, but I have not found lime very effective. The use of lime ought to be avoided when cyaniding follows amalgamation, since it interferes with the amount required in settling the slimes, and for this reason, since it is of small use in the mill, I have discontinued it.

Cyanide, when used in dressing plates, removes this yellow scum which forms on the lower part of the plate, and since the dressing is done every four hours it prevents it from appearing in any quantity. The amount of gold caught on the lower part of the plate is small, and the loss in gold, therefore, owing to the presence of this scum, is slight, but the escape of mercury to the cyanide works, which it causes, is another matter. When plates are in good condition the mercury which is applied in dressing oozes through the amalgam down to the plate and never appears on the surface. Immediately the oozing quicksilver reaches one of those discolored patches it rises to the surface and drains down the plate in "tears."

(3) It thoroughly cleans copper plates of grease and foreign matter, which would interfere with "setting."

Some time ago I started taking samples in the mill, to see how far the evils advanced against the use of cyanide were real ones. I may state here that for dressing plates I use one-half ounce of cyanide dissolved in four gallons of water, and that this is sufficient for ten tables. In setting plates I sometimes used a slightly stronger solution, but since this occurs seldom I leave it out of consideration. Cyanide is never used in the Robinson Deep mill, except for dressing and setting plates, but seeing I was face to face with the fact that either I must discontinue the use of cyanide and let the amalgamation suffer, or else I must go on seeing a certain amount of gold dissolved and partly lost, so giving trouble to the cyanide works. Both of these I was unwilling to do, and at last it struck me that both my troubles might disappear if I washed off the dressing solution before letting the stamps fall and collect it at the bottom of the table. I now collect regularly the first wash of the plates after dressing with a trough which is rectangular, about 4 inches deep and 2½ inches wide, and goes the whole length of the table. I store the washings in tanks.

From what I have said it will be seen that I consider the indiscriminate use of cyanide in a mill distinctly harmful, but that if used in small quantities and special precautions taken against its escape to the cyanide works, it is beneficial. Using large quantities and not collecting the washings may contaminate the water supply of the mill on those mines that return the water after only a short interval.

The time lost in collecting the first wash of the plate is infinitesimal, something like five seconds, I should say.

Amalgamation.—Inside amalgamation, pure and simple, is not often seen nowadays, but it is still the custom in many mills to feed mercury into the mortar boxes. The advocates of this method say that the mercury from the box which passes through the screens helps to keep the plates in good condition, and that a small percentage of gold is caught in the boxes. If plates are dressed properly every four hours this continued application is unnecessary, and there are several objections to the practice. These are:

(1) Excessive loss of mercury. Much of the mercury in the box is "floured" by the beating of the stamps and passes through the screen in this finely divided condition. Floured mercury floats readily on water, so that little assistance is given to the plates, but much mercury is carried down the plates and escapes through the mercury traps to the cyanide works and is lost. I find that the loss of mercury with outside amalgamation is .3 ounce per ounce of gold recovered. On more than one occasion in this society, when the loss of mercury in mills has been under discussion, it has been stated as so much per ton of rock crushed. Now, this seems to me to be a most misleading method of making the statement. The loss depends on the amount used, and this is dependent on the number of ounces of gold recovered. Where the grade of rock is low the loss of mercury must be low, since the amount of gold recovered is low, and the reverse is the case where the grade is high. If the loss is stated per ton of rock crushed, then the dwts. of gold recovered in the mill per ton of crushed rock should also be stated.

If the loss is stated as so much per ounce of gold recovered, or as a percentage of the total amount of mercury used, we have figures which can be compared with those of any other mill.

(2) Accurate screen samples cannot be obtained. This is true for two reasons:

(a) Some of the gold is amalgamated in the box, and

(b) Beads of mercury and amalgam passing through the screens get into the sample tin, making the sample go higher than it should.

(3) Loss of amalgam. Small beads of amalgam collect on the blanketing of the screens and on their frames, and when screens are changed these fall on the plates. Often these are not collected in the clean-up pan, but are allowed to remain until the water is turned on, when they are carried away.

Setting Plates.—Before attempting to set a plate the operator should see that it is perfectly clean. If the plate is scoured with fine sand, brushed down with a cyanide solution and then washed, it will be ready for setting.

Sixteen ounces of mercury is sufficient for setting a 16-foot plate. The mercury, which is sprayed on the plate through canvas, is rubbed into it with a soft brush. If the brush is dipped into a cyanide solution from time to time it will be found that the mercury will spread much better than if this is not done. Of course, the top of the plate is the proper place at which to begin.

After the plate has been silvered, if possible, about six ounces of gold amalgam should be rubbed into it. If this is not done for the first twenty-four hours after amalgamating is commenced the plate will not amalgamate more than two-thirds of what it should do. In setting a plate care should be taken not to get it "wet" with mercury. When in the best condition for catching both gold and black sands a plate has a pasty surface.

Dressing Plates.—Plates are dressed every four hours—twice each shift. Ten minutes is allowed for the first dressing and five minutes for the second, hence the total loss is forty-five minutes per day. In some mills the stamps are hung up, and when the water has washed the plate clean dressing is commenced. In others, again, the water is shut off immediately the stamps are hung up and the plates are left covered with black sands and concentrates.

This sand is brushed off and put aside to be amalgamated in a grinding barrel. The latter is the method which I adopt, and this, I believe, accounts for the varying amounts of gold in the first washing after dressing. I usually get about one-half pound of fine sand washed down into the trough in which I collect the washing, but this, of course, varies according as the brushing up has been thorough or otherwise.

In dressing plates mercury is sprayed over the upper part—the 3 feet that is scraped daily—and this mercury oozing downwards supplies the lower part. Then a .08% cyanide solution is sprinkled over the plate and the mercury is rubbed in with a hard brush. Afterwards the amalgam is brushed smooth with a soft brush, and after being washed down is ready for amalgamating.

The upper part of the plate is the part that needs most mercury, for it is here most amalgamating is done; 95% of the gold caught by amalgamation is got within 3 feet of the top of the table. With a low-grade ore it is difficult to keep the lower part of a 16-foot plate from scouring, and consequently I do not see that anything would be gained by putting another plate outside the mill, as has been suggested. Neither mercury nor amalgam should be allowed to leave the mill. After a series of tests running over three weeks nothing more than a trace of mercury was discovered on the Robinson Deep.

(To be continued.)

Cost of Mineral Surveys, Etc.

The U. S. Surveyor General for Montana states:

"Only four plats of mineral survey shall be made; only a single posting is required in proceedings for patent for a mining claim, the survey of which comprises a number of contiguous locations.

"But one plat of a mineral claim will be furnished for posting, except in the case of a lode claim and millsite embraced in the same survey, when one plat will be furnished for posting on the consolidated lode claim and one on the millsite.

"The following schedule of prices for office work on mineral surveys is in effect:

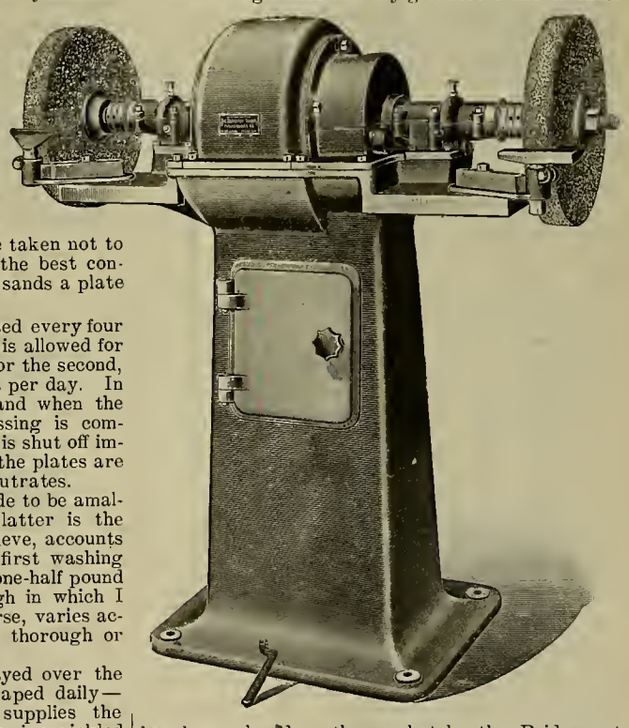
For lode claim, $30.
For placer claim, $35.
For millsite, $30.
For millsite included in one survey with a lode claim, $20.
For each lode claim within and included in one survey of a placer claim, $20.
For several lode locations included in one survey, the first location named, $30.
All other locations included, each, $25.
For several placer locations included in one survey, the first location named, $35.
All other locations included, each, $30.
Supplemental order for survey additional, $5."

The U. S. Surveyor-General's office for California furnishes the following schedule of official charges:

"One lode claim, $35.
One placer claim, $40.
Contiguous lode claims, consolidated, each, $25.
Contiguous placer claims, consolidated, each, $30.
One placer claim, with lode included, $55.
One placer claim, including lodes, $30, and $25 for each lode embraced therein.
One placer claim and lode claim, consolidated, $55.
One millsite, $35.
One lode claim and millsite, $45.
Segregation surveys, $15.
Cancellation of instructions for the survey of a mining claim and re-issuing same, $5.
Official reports, as to expenditures, on either lode or placer claims, $5."

Motor Driven Buffing Lathes and Dry Grinders.

To supply the demand for effective electric motor driven buffing lathes and dry grinders a line of these



has been placed on the market by the Bridgeport Safety Emery Wheel Co. and the Crocker-Wheeler Co. Instead of extending an ordinary motor spindle and making a base to fit the motor, the emery wheel builder supplies shafts upon which the Crocker-Wheeler Co. mount their armatures.

Machines of this class must, of course, be fully inclosed, and the problem of cooling by air is a serious one. This has been solved by having the lower half of the motor open directly into the base casting. The air contained in the inside of the base is thus added to the quantity that circulates around the inside of the motor, and enables it to run much cooler than an ordinary fully inclosed motor of the same size and capacity.

The armature and brush mechanism is covered with an end shield, split horizontally. The lower half contains the brush holders and wire connections; the upper half is attached to the motor frame by cap screws. This upper half of the frame can thus be readily taken off, giving easy access to the armature and brushes.

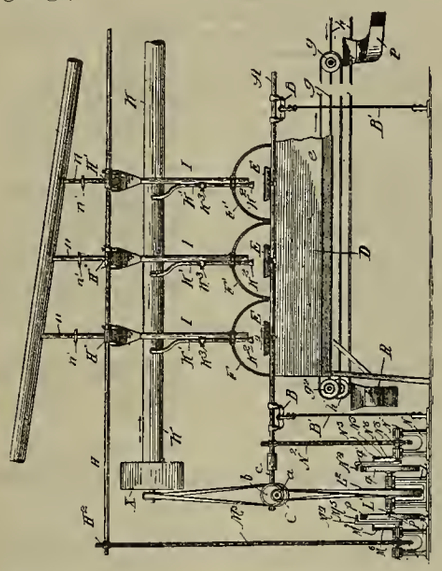
The machines are equipped with ring oiling bearings. On the outer end of each box is a dust-proof collar, held in place by a key with two ring nuts, to compensate for all end wear and thrust of the spindle. The machines are strong, rigid, compact and self-contained. All wires and connections being inside, a short circuit through outside terminals is impossible.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 3, 1904.

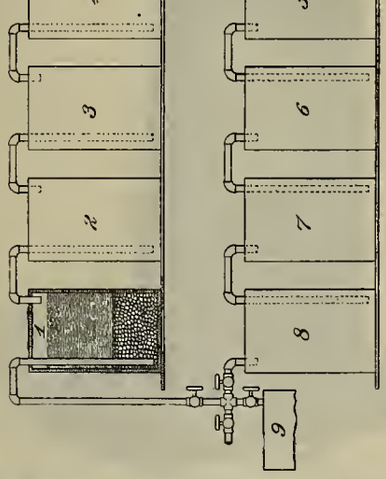
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

DRY ORE SEPARATOR.—No. 758,097; W. H. Noakes, Lagrange, Ill.



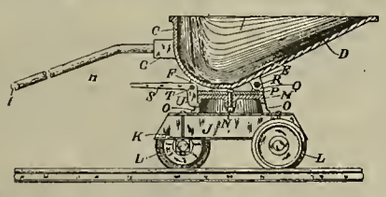
In dry ore separator, combination of pan for holding ore, agitating mechanism for pan, stationary hood extending over pan and means extending through hood for directing overhead air blast into pan.

PROCESS OF TREATING COPPER ORES.—No. 759,191; C. H. Rider, St. Louis, Mo.



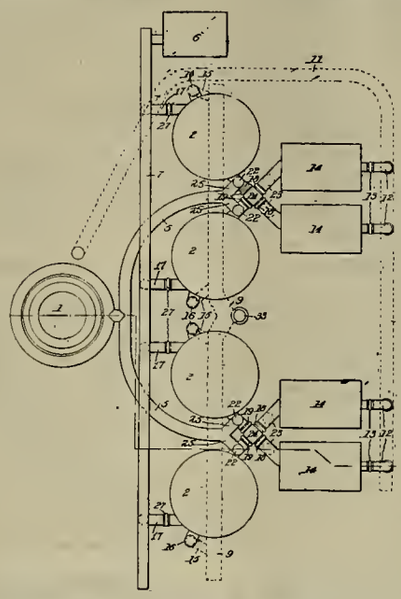
Process of extracting copper from ores by crushing ore, charging a series of connected receptacles therewith, adding solvent comprising sodium chloride, nitric acid and water, closing receptacles and permitting gases generated to circulate through the several receptacles and through a second series of receptacles, connected thereto, containing water, removing water from second series and charging same with metal-impregnated fluid from first series of receptacles and precipitating copper therein.

SLAG CAR.—No. 758,812; B. H. Bennetts and L. W. J. Jones, Tacoma, Wash.



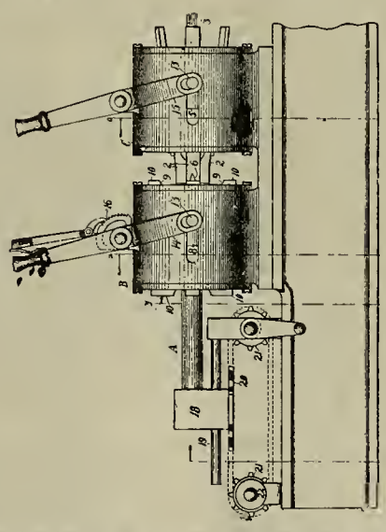
In slag car, combination with truck, of slag pot mounted on truck aud adapted to dump slag in solid mass in any direction from truck, hook pivoted to slag pot and adapted to engage truck whereby pot is prevented from turning on truck and from tripping thereon, and handle engaging rear end of slag pot and bent so that when pot is down car may be pushed by handle, and when it is tipped handle may be within reach, whereby the dumping of slag may be controlled.

HOT BLAST APPARATUS FOR METALLURGICAL FURNACES.—No. 759,171; A. P. Gaines, Bessemer, Ala.



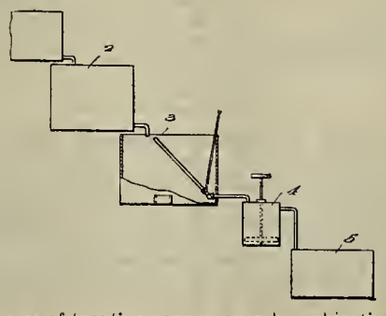
In hot blast apparatus for metallurgical furnaces, combination with furnace, regenerative stove or chamber, means of supplying blast of air thereto, and closable connection between stove and furnace through which hot blast passes to furnace, of plurality of combustion chambers separate from stove, closable connection between each combustion chamber and stove through which hot gases and products of combustion pass from chamber to stove, and means for supplying gases for combustion in combustion chambers.

DRILL SHARPENER.—No. 758,926; D. G. Morgan, Chinese, Cal.



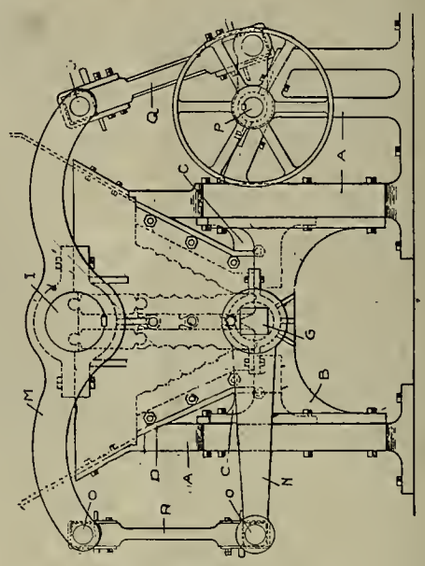
Combination in machine for sharpening hollow drills, of expansible reciprocable dies, jaws for adjustably holding hollow drill with bits in opposition to dies, whereby all bits may be sharpened simultaneously, mandrel in axial alignment with drill, and jaw series and means for actuating dies.

METHOD OF TREATING COPPER BEARING ORES WITH CYANIDE SOLUTIONS.—No. 759,220; L. E. Porter, Los Angeles, Cal.



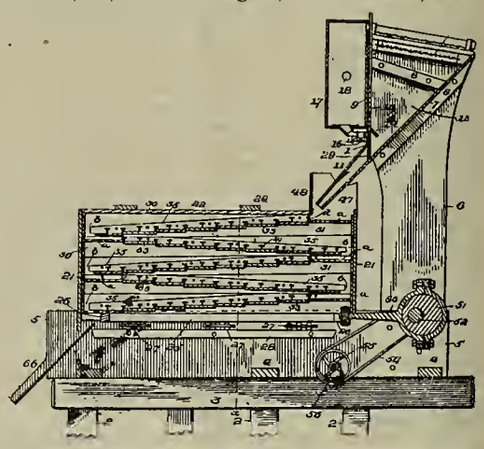
Process of treating copper ores by subjecting ore to action of alkaline cyanide solution, thereby dissolving metals soluble in solution; treating solution with acid and producing copper cyanide precipitate and hydrocyanic acid solution; separating solution containing hydrocyanic acid from copper precipitate; neutralizing hydrocyanic acid solution with alkaline oxide, reproducing alkaline cyanide solution for repetition of before described process; producing metallic copper from copper cyanide precipitate by placing copper precipitate in suitable receptacle together with alkaline solution and treating mixture by electrolysis and producing metallic copper and alkaline cyanide solution.

CRUSHER.—No. 758,735; J. W. Boileau, Detroit, Mich.



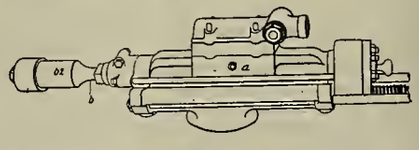
Ore crusher comprising pair of rock shafts connected for synchronous movement, crushing plate, strut, one end of plate and strut pivotally abutting, and opposite ends pivotally engaging bearings upon rock shafts whereby plate may be reciprocated, cooperating stationary plate arranged at angle to movable plate to form wedge-shaped chamber therebetween, and cam in rear and intermediate pivotal bearings of reciprocating plate adapted to cause lateral deflection thereof during longitudinal movement.

CONCENTRATING AND AMALGAMATING MACHINE.—No. 759,153; F. J. Bonnington, San Francisco, Cal.



Tray for concentrators and amalgamators, comprising series of level horizontal steps arranged one after the other in progressively lower planes, combs having depending teeth arranged over the steps and having teeth extending below plane of steps and bent to overlap same.

CLUTCH HEAD FOR ROCK DRILLS.—No. 758,761; J. E. Littleton, North Tarrytown, N. Y.



Drill shaft for drilling machines provided with cylindrical head having central longitudinal recess therein, inuer end of which is conical in form, sleeve inserted in outer end of recess and inner surface of which is conical internally at its inner end, clutch member circular in cross-section and tapered at both ends and composed of plurality of longitudinal parts and held in head by sleeve, and cap adapted to be screwed on head and to force sleeve thereinto.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

J. H. Fox, formerly of the Funtor Bay Co., says he is organizing a company to work the Portago group at Funter bay, near Juneau.

Juneau reports say the Eagle River M. Co. has its 10-stamp mill in full operation. Tho first week there was only sufficient water to run five of the stamps, but Superintendent Thane cleared up off the plates each day $160.

Operations are resuming in the Alaska-Juneau mine, near Juneau. Tho snowfall in tho upper hasin was light last winter and the shoveling out crew is having little difficulty in opening up the surface workings. J. Porella, foreman at the Alaska-Juneau mine, has men laying pipos.

Manager W. Hile says the Jualpa M. Co., near Juneau, will oporate this season. Among the early contracts let will be a flumo 3000 feet long, 1000 foet of wingdam and 325 feet of crib dam.

The Treadwell mines at Douglas are running full blast and 1100 mon are on the payroll. The number will he incroasod to about 1300 men bofore June 1.

J. H. Hutchinson of Boise, Idaho, and Pittsburg, Pa., men have organized the Pittsburg-Alaska Tin Co., to open up tin mines on Seward peninsula, which Hutchinson holds under a bond. Tho National Load Co. is part owner. Hutchinson will sail from Seattle, Wash., about June 7, with sixty men, including a tin expert from Singapore, and will go direct to Port Clarence.

ARIZONA.

Cochise County.

At Duluth, Minn., the Lake Superior & Pittsburg M. Co., has been incorporated as the result of consolidation of the Lake Superior and the Pittsburg Development companies, operating near Bishee. T. F. Colo and C. F. Congdon of Duluth, Minn., and G. R. Campbell, Calumet, Mich., constitute the first board of directors.—— The Yavapai Dev. Co., organized for general mining business, both in Minuesota and Arizona, has been incorporated in Duluth, Minn. Its directors are T. A. and L. H. Merritt and A. E. McManus of Duluth. It is understood that its object will be to develop the Pickaway group of claims.

Graham County.

The new section of the Shannon concentrating plant near Clifton is in operation, there being in all thirty-nine tables, which aro handling 400 tons of ore per day. The entire plant is treating from 625 to 650 tons of ore per day and making 20 tons of copper per day. It is expected that the output will be increased to 700 tons of copper per month.

The directors of the Standard C. Co., with mines near Clifton, report the following figures and statements, which embrace a period of fifteen months, from Jan. 1, 1903, to March 31, 1904. At that time the company was on the edge of some rich ore bodies which required but little development to bring to the surface. This was done, and for soveral months the mines made rapid shipments of high grade ore. For the period of fifteen months mentioned, there was shipped to the Clifton smelters a total of 5030 tons of ore. Favored thus with ore of high-grade and with the double advantage of small production cost and good prices for electrolytic copper, on which settlement for ore deliveries was made, three dividends were paid, aggregating 12½%; since there has been a decline in revenue through a gradual fall in the price of copper, as well as a smaller output of rich ore. As the ore grew leaner and more difficult to extract, the cost of mining advanced, and the directors are at present considering the best and cheapest method of increasing the value of the ore hy reducing its cost. At the same time the erection of an aerial tramway and two sets of ore bins began, which have since been completed at a cost of $16,311. They have also had to contend with a lawsuit over a disputed territory, which, although decided in the company's favor, involved it in a loss of $10,000. These expenses are now finished with. They also bought some smaller mining property. With the exception of the Chavez crosscut of 406 feet, the majority of the period's development work paid for itself, as the bulk of it was driven on ore. The crosscut of 406 feet will have to be driven at least 300 feet more to get at the point where it was originally intended to drive it. With the development that has been laid out, it is intended to keep the reserves continually in advance of output. Within the past few months they have made a satisfactory contract with the Shannon C. Co. for the treatment of all the Standard's ores, whereby they are enabled to ship much of the ore at a profit that formerly had to go on the dump. The balance sheet shows the following figures: Tho ore shipments for the fifteen months amounted to 5030 tons, which gave a net profit of $83,792, out of which dividends were paid to the amount of $52,500; cost of litigation, purchase of new property, patenting claims and other improvements made amounted to $15,000.

Tho Poland-Nelson Mountain group of seventeen claims near Clifton have been sold to the Polaris M. Co. These claims adjoin those of the company and several of them are on the Black Prince lode. They are higher up the mountain than the other claims of the company, and will be developed by the Phonolite tunnel now being driven. The holdings of the company, with these claims, include forty claims in one group.

Santa Cruz County.

Full operations are under way at the Mowry mine, at Mowry Camp, near Nogales, hy the American Industrial & Dev. Co., of which J. N. Curtis is manager. The Mowry is a contact vein, between granite and limestone. The ledge proper is 100 feet in width. The main shaft is 360 feet in depth, developing the ore shoot below tho old workings. Another shaft southwest of the main shaft, along the ledge, has reached vertical depth of 70 feet, from bottom of which a drift and winze are developing the ore shoot. Northeast, another shaft is going down on another ore shoot, and is at a depth of 80 feet, from the bottom of which a drift is running to connect with the old Mowry workings. There are fifty mcn at work and the numher will be increased.

Yavapai County.

(Special Correspondence).—The Bradshaw railroad is finished from Prescott to Crown King, and trains are regularly running.

Crown King, May 7.

Yuma County.

The Bonanza mine (the Harqua Hala) at Harqua Hala, 65 miles rom Aztec, has been sold, says Superintendont A. G. Hubbard, for $40,000 to an Eastern company. The owners of the Oro Cobra, adjoining the Agard properties in the Hacuvars, have let a contract for 250 feet of work.

CALIFORNIA.

A table has been compiled by the United States Geological Survey, showing the production of petroleum of California hy years. The total production previous to 1876 was 175,000 barrels. From 1876–81 (inclusive) the production was under 100,000 barrels per month; in 1882 it was 128,636 barrels, and in 1886 reached 377,145 barrels. The following year it nearly doubled, heing 678,572 barrels, and in 1888 was 690,333 barrels, dropping in 1889 back 303,220 barrels; raising to 705,969 barrels in 1894, and then by years as follows:

Years.	Barrels.
1895	1,208,781
1896	1,252,777
1897	1,903,411
1898	2,257,207
1899	2,642,058
1900	4,324,484
1901	8,786,330
1902	13,984,268
1903	24,337,828

The total production to Jan. 1, 1904, has amounted to 66,172,301 barrels.

Calaveras County.

The Royal mine of Hodson has about completed a 12-inch pipe line from the Salt Spring reservoir to tho mine, a distance of 10 miles, for supplying the 120-stamp mill with water. The line will also furnish the chlorination plant of the company with water. This plant will be built to handle all the sulphurets of the 120-stamp mill, as well as the forty stamps of the old mill. Everything is put through the mill, commencing at the surface and going down, the rock on the top showing $1.50 per ton free gold, says the Angels Record. An incline shaft 1100 feet with crosscuts and drifts has been sunk and in the course of work the entire property will be quarried out. J. C. Kemp Van Ee is superintendent.

The Maltman mine, near Angels, is closed down pending a settlement of claims against it.

The 5-stamp mill formerly at the Empire mine, below Hodson, is being placed on the Benson mine, 1 mile from Angels, near the Gold Hill mine.

Inyo County.

Olancha reports say a new district is being opened up at Cactus Flat, 15 miles southeast of Olancha. On the Boland and Lockett prospect the shaft is down 60 feet. At this point the ledge is 4 feet wide, and assays show gold values. The ore is being sacked for shipment as it is taken from the shaft. On the mine owned hy E. Walker et al. a shaft has been sunk 36 feet on the vein. They have an 18-inch streak in the bottom, which carries high grade free-milling gold.

Nevada County.

I. Haas and G. W. Root of Grass Valley, interested in the Auriferous mine, report machinery in place and working, and the compressor was started up this week. It is believed by July 1 they will reach the gravel channel. They have 350 feet more to run.

On Badger hill, a mile from Cherokee, quartz mining is progressing. Last week at the Siberian mine, A. S. Bigelow, of North Columbia, reports striking a ledge in the lower tunnel showing the pay shoot that existed in the upper levels. The ore carries free gold. The tunnel was run in a distance of 700 feet and tapped the vein 340 feet below the surface. The work of drifting north and south has begun, and as soon as the drifts are run ahead some distance, stoping will be started. The formation is 6 feet wide and there are 20 inches of quartz. The company will build a 5 or 10-stamp mill on the mine as soon as the roads are in a condition to haul the lumber and machinery.

Manager G. W. Root, of the Kenosha M. Co. (Seven-Thirty mine), near Grass Valley, expects to have the machinery in place and ready to start up next week. The duplex air compressor, together with the hoist and pump, have been hauled out to the mine. The electric company has strung the wires. The 90-foot shaft will be continued to depth of 400 feet before drifting is done.

Next week operations will begin on Randolph Flat, near Grass Valley, where C. Hay has a group of claims. Work was suspended with the heginning of winter.

Placer County.

The Buckeye mine, on the Forest Hill divide, has heen sold to J. A. Johnson et al. for $40,000. The Buckeye adjoins the Mayflower mine, near Forest Hill.

Santa Clara County.

R. B. Harper, manager of the Santa Teresa and San Juan quicksilver mines, being operated south of San Jose, is preparing to build a 25-ton furnace for coarse ore, and will also increase the condenser capacity.

Shasta County.

A tramway to haul fluxing ores to the smelter of the Mountain C. Co. at Keswick will he built by M. Muriansky & Co., operating the Quartz Hill mines, 3 miles east of Keswick station. They have asked the supervisors for a franchise to construct a steam tramway along the county highway from Quartz Hill to Keswick station. The tramway will be of 30-inch gauge and will follow the general course of the road now in use, with the exception that the tramway will follow the new road ¾ mile in length from Quartz Hill to the Redding, Keswick and Old Diggings road.

The Gipson place on Cloar Creek, near Shasta, has been bonded to J. White & Co., and will be prospected for gold. The ground lies helow the Heintz dredger 2 miles.

Manager Cohen of the Bully Hill C. Co. at De Lamar says they are preparing to put in a heavier hoist for the main mine, and preparing for construction of a tramway from the Anchor lode to the smelter.

The annual report of the Mountain C. Co., operating mines at Iron mountain and smelter at Keswick, for 1903 shows 118,973 tons of ore mined, 124,678 tons smelted, yielding 6616 tons of copper bullion, or an average of nearly 5% copper. This bullion yielded at the refinery 6226 tons of fine copper. The fire in the mine has been put out, though parts of the mine continue hot. The effects of the strike have been overcome and the works are in full operation. —— Exploratory work has not shown any new deposits of copper ore. The principal ore bodies are those of the Iron mountain deposit and the Hornet deposit. —— Preparations are heing made to utilize the sulphur in the ores for manufacture of sulphuric acid and artificial manure.

Siskiyou County.

J. Johnston, manager of the Headwaters quartz mine on upper Humbug creek, near Yreka, reports opening up a 4½-foot ledge and will start crushing next week at the mill, now ready for operation, a 10 H. P. engine and boiler having been set up. Johnston says he has the money raised to put up a smelter in Yreka as soon as the railroad to Scott Valley is built. It will be a 300-ton smelter, to he used in smelting ore from this mine, and other mines on Humbug, hut needs the output of mines from Scott valley, Cherry creek, Cottonwood creek and other sections to keep it in steady operation.

Tehama County.

(Special Correspondence).—The Basler M. Co. of Sacramento is operating a group of claims on the north side of Elder creek, 9 miles from Lowrey. The main tunnel has heen driven in 800 feet. The formation is granite, near a slate and greenstone contact. At 200 feet beyond the present face of the tunnel it is expected to cut a large vein, which on the surface shows an iron capping. This vein carries copper, gold and silver values. The plant is equipped with a compressor, and machine drills are worked in the tunnel. C. M. Basler of Lowrey is superintendent.

Lowrey, May 12.

Trinity County.

At Dedrick H. Ramdohr, superintendent of the Globe mino, has men at work opening up for the season.——The water supply for the gravel mines is botter and will last for a longer season than usual.

G. W. Payuo of LeLoy, Ill., superintendent of the dredger on the Boyce ranch at Trinity Center, says the dredger will be started up next week, as soon as repairs are made. The company owns 600 acres of dredging ground, said to average from 15 to 17 feet in depth.

Work will be resumed at the Globe mine at Dedrick about June 1. The snow is 14 feet deep at the Globe, which is over the mountain divide beyond the Chloride-Bailey. Each works forty to fifty men during the summer. At the Globe the superintendent has a few men at work shoveling out trails and trying to gain admission to the hoisting works and office buildings.

Tuolumne County.

At the Mt. Jefferson mine at Groveland the mill is running steadily and crushing four and a half tons per stamp. With the reservoir ahovo the mill, sufficient water for hattery and boilor purposes is at hand without uecessity of pumping hack that which has onco been through the mill. Work is heing done on the cyanido plant. The gasoline engine, roller mill and all the tanks are in position. The tramway from the concentrating room to the roller mill will be huilt and the plant put in operation by June 1. In the mine drifting at the 600-foot west levol is going ahead. At the 500 east stoping is going on. Gains in the wood supply are being made with the four teams at work. There are twonty men on the payroll.

Near Groveland operations will he resumed on the Golden Harvest M. Co.'s mine, 6 miles southeast of town on the Tuolumne-Mariposa line. This is a Los Angeles company, and the group consists of nine claims. There are 300 feot of shaft and drifts. N. Bundy and G. A. McElfresh of Los Angeles are part owners. J. C. Hendersou is superiutendent.

W. S. O'Brien is preparing to develop his mining claims on the main Tuolumne river, near Groveland. Work has been started on the Victor mine, one of the group, and as soon as prospects warrant a mill will he huilt. W. H. Scott is foreman and W. S. O'Brien superintendent.

Underground work will be resumed at Confidence next month in the Confidence mine. The mill will start about June 1. The cyanide plant has already been started. About twenty-five men are employed in and around the mine.

COLORADO.

(Special Correspondence). — It is reported tho strike in the southern coal fields has been settled by agreement between operators and miners. In the northern fields a strike is imminent on account of the operators having declared a reduction in wagos, which the miners claim they will not accept.

"Colorado Manufacturers," is the title of a booklet published hy the Colorado promotion and publicity committee of Denver to be distributed throughout the East and at the World's Fair at St. Louis, Mo. The book gives statistics concerning manufacturing plants of Colorado.

Government engineers are at present in the State to pass upon the proposed Gunnison tunnel in Montrose and Delta counties. This tunnel, if carried through, is estimated will cost $2,500,000 and will take four years to build. By its construction, 180,000 acres of land in the Uncompaghre valley will be reclaimed.

Denver, May 9.

Boulder County.

The Victoria mine, in Gold Hill district, was bought last week at sheriff's sale by L. W. Fowle of Boston, Mass., for $48,600.

The Revenge Dev. Co., owning a group on Bryan mountain, near Eldora, expects to resume operation. F. Armstrong of Eldora is consulting engineer.

A strike was made in the tunnel of the Wellington mine, in Gold Hill district, near Boulder, last week, says Superintendent Kirkbride, at 200 feet from the surface. The ore runs in nickel, gold and copper, assaying 30% of copper. Manager Degge says the width of the vein is 25 feet. The company is preparing to build a matte smelter at the property.

The Gold Coin mine, near Eldora, has been sold to W. M. Williams, who will resume operations this week.

Chaffee County.

Manager T. Goodwin of the Ohio & Colorado S. & R. Co., operating the smelter at Salida, says plans are being

made for the establishment of an independent refinery plant hy the company either at Salida or Puehlo.

R. G. Hinkson, manager of the Mary Murphy mine at Romley and the Buena Vista S. & R. Co. smelter at Buena Vista, has returned to Romley. He has started the company's mill. This mill is treating daily seventy-five tons of low-grade ore, the product* heing lead concentrates, which are shipped to the Denver smelters. They are working forty men in the mine, who are doing development work largely. It is expected work will he resumed on the tunnel, which was shut down last fall. This tunnel, in Chalk Creek district, will cut the Murphy vein at a depth of 3000 feet. The length of the tunnel when completed will he 4200 feet, and it has heen driven 2250 feet. The smelter has heen rehuilt and is ready to he hlown in. Hinkson states no date has as yet heen settled on when they will resume.

Clear Creek County.

Arrangements have heen made hy the Waldorf M. Co., near Georgetown, for construction of a mill. F. Oliver, general superintendent of the holdings of the Waldorf Co., says the mill will have a capacity of at least 200 tons per day, and will he hoth a concentrator and stamp mill. A large amount of the ore carries a percentage of copper. In the Tohin tunnel there is said to he 4 feet of mineral which will return a net value of $40 per ton. The mill will be huilt at the mouth of the Wilcox tunnel, hut for the present it will he kept supplied with ore hauled from the Tohin. The distance is 1 mile, and there is a down grade to that place. Work is being crowded on the Wilcox tunnel, and it is the intention of Superintendent Oliver to drive it rapidly to cut under the Independence, Kittie Ousley and other former producers. It is expected that the mill will he completed hy July 15th, and that hy September 15th the Wilcox hore will have reached the ohjective point. Then ores from hoth the Wilcox and Tohin will he treated.——Owing to insufficient supply of water, the Stevens mill, near Georgetown, has been closed down temporarily the past two weeks, hut it is expected next week a sufficient flow of water will he availahle to warrant a steady run for several months. This mill has a capacity of 100 tons daily.

Operations on the Terrihle mine, near Silver Plume, are in full hlast and more men have heen put to work. The company mill, which was closed down last month on account of frozen pipe line, is again turning out concentrates, and freighters are husy hauling the output to the Georgetown sampler. This mill has a capacity of fifty tous per twenty-four hours. The Whiting M. Co., owners of the Terrihle group, are increasing development. Five machine drills are operated in the levels and it is intended to put in two additional drills for stoping ore. Fifty men are on the payroll, hut hy May 1st it is expected 100 men will he employed in mine and mill.

It is expected that work will be started on the Ramsdale group of claims, on Lincoln mountain, near Georgetown, this week. A tunnel site has heen located and will he known as the Market tunnel.

The Standard says the Central Colorado mine, near Silver Plume, is again heing put in condition for production. It is owned hy a Denver company, and is under the management of W. Blanton. Several lodes have been cut hy the tunnel.

The Boneita mill, near Idaho Springs, will have improvements made. The entire plant will he raised one story and more machinery put in, such as sliming tahles, Hartz jigs and a sizer, also apparatus which takes the water out of the pulp and returns the mineral, putting it on a tahle in such a condition as to make it susceptihle to treatment with a minimum loss. The new mill will have capacity of fifty tons per day.

The Pacific group of claims on Repuhlican mountain, near Georgetown, is now owned hy the Pay Rock Extension M., M. & D. Co., and hy June 1 men will he put to work, in addition to a numher of contracts to he awarded. It is also thought a numher of leases will he issued. A tunnel has heen driven on the Pacific lode for 425 feet and 3 inches of lead ore are exposed. The tunnel is heing driven southwesterly, and it is thought the vein is an extension of the Pay Rock. The company owns nine claims, three of which are patented. A storage tank was erected which will hold 12,000 gallons of water. It is near Bridal Veil stream. A pipe line 8 inches in diameter has heen put in and a Pelton water wheel set up. An exhaust pipe line has heen placed in the tunnel and it is estimated that there will he sufficient water to run eight power drills for at least nine months during the year. J. H. Roheson is general manager and D.W. Hartshorn superintendent.

The completion of preparations for treatment of ore at the Clear Creek mill, near Empire, hy addition of an eight-ton crusher and other machinery to enlarge the daily capacity to the thirty-ton mark, will he followed hy concentration of an accumulation of mill stuff from the Gold Dirt and Gold Fissure mines. As shipments of this class of ore from the former alone will more than utilize the capacity at the Clear Creek plant, the idle Knickerhocker mill will prohahly he again used with its equipment of crusher, rolls, jigs, tahles, etc.

Custer County.

Cahles 2500 feet in length will he put in at the Bassick mine, near Silver Cliff. The shaft is 1600 feet deep, and as soon as the new cahle arrives, says President Radel of Denver, the shaft will he sunk deeper.——A lead of telluride hearing quartz that runs $70 a ton is reported uncovered at a depth of 140 feet in the Dakota Bill mine.

A forty-acre plot of ground adjoining the Silver Bar mine has heen sold to the O. W. Murphy M. Co. The ground adjoins the Silver Bar mine, near Rosita, on the south. The company owns the Silver Bar, which is a low-grade milling proposition.

The Big Bonanza M. Co. has heen organized for developing mining interests in Custer county, its properties heing 4 miles east of Silver Cliff. E. P. Ricker, C. W. Haskell and J. R. Smith are incorporators.

Gilpin County.

W. Kelly, owner of the Claudia J. group on Tip Top mountain, near Rollinsville, is preparing to take out ore. He has a large hody of ore in the Millie B., hut for the present he will devote his attention to taking out ore of a smelting grade.

The shaft huilding and plant of machinery on the Kirk mine on Quartz hill, near Central City, is nearly completed and developments will he started next week, as soon as the shaft has heen put in repair. Pitchhlende or uranium ore has heen taken out of this mine. The lessees are California and Colorado men. L. C. Nesmith is superintendent.

The shaft huilding on the East Missouri mine on the "Patch" in Nevada district, near Central City, is up and a 25 H. P. steam plant placed. A local pool is interested and they have heen taking out milling ore, some of it running four ounces gold to the cord and the smelting ore going $80 per ton. The property is owned hy McFarlane & Co., and is heing operated under a lease.

J. R. Anderson of Denver, who has heen operating the Gold Dirt mine at Perigo, under lease and hond, has taken up the hond. The price is reported at $125,000. Pittsburg men are associated with Anderson. During the past year the company has heen increasing development work and it is claimed smelting and milling ores are hlocked out ready for stoping, and that hy June 1st, at which date the Moffat Railroad announces they will he ready to receive freight to and from Rollinsville, the company will he prepared to make regular shipments to the Denver smelters. As yet no stoping for production has heen done, hut hetween 400 and 500 tons of ore are in the hins, saved from development work. It is the intention of the company to huild a 50-ton reduction mill, which later will he increased to 100 tons.

Hinsdale County.

Machinery for the Megunticook M. Co. mill, near Lake City, is on the ground. The shipment was made up of two Huntington mills and a numher of hydraulic sizers, says Manager Kazar.

Lake County.

Leadville reports say Leadville mines shipped 70,000 tons of ore during the month of April. Of this ore the American S. & R. Co. handled 50,000 tons. This tonnage going to the American Co. is exclusive of the zinc ores and includes the sulphide and carhonate silver ores and the lead and gold production. The Ohio & Colorado smelter at Salida, the Empire & U. S. Zinc Co.'s and the Colorado Fuel & Iron Co.'s plant at Puehlo received the greater part of the ore not taken hy the American. During the month a contract was let for erection of an electric plant at the Yak tunnel to supply power and light to the tunnel and mines tapped hy it and to operate an electric railway through the tunnel. Considerahle new work and prospecting and developing in hoth old and new properties was carried on during the month.

Ouray County.

It is reported negotiations are under way for extending the railroad track from Red Mountain to the Barstow mine. The Barstow Co. will huild the grade, and the railroad company the rest.——Work has heen resumed on the Snow Flake in Red Mountain district. The property is owned hy Van Horn & Anderson, and was closed down last fall for lack of water.

Manager J. Warner of the Silver Ledge, near Red Mountain, is preparing to put in an electric process of zinc extraction. He says the railroad has made him rates on zinc ores and he will hegin shipping as soon as the mill is ready to treat it. Bodies of ore are hlocked out. With the exception of one hody of zinc ore, the ore runs 40% lead and forty ounces in silver.——As soon as the water supply is increased hy the melting snow, Manager Rumery will resume operations on the Congress mine at Red Mountain.

The Atlas M. & M. Co., near Ouray, is continuing development on a group of claims on the same vein on which the Governor mine is located, says the Times. The company owns seven claims in the group. The group is headed hy the Atlas and is in Sidney hasin. The main tunnel has heen driven 1200 feet, attaining a depth of 500 feet from the surface. The ore hody is 3 feet in width and averages $20 per ton in gold, hesides values in silver, copper and lead. Preparations for huilding a 10-stamp mill to treat the ore are under way and the mill will be huilt as soon as the snow is gone.

Summit County.

The gold placer mining dredger of the American Gold Dredging Co. is working in the gold-hearing alluvium of the Swan River valley, 5 miles northeast from Breckenridge. The dredge can work gravel to a depth of hetween 38 and 40 feet helow the surface of the artificial pond on which the hoat floats. It is secured to the hank with steel cahles. The average depth to the hedrock is less than 30 feet, and as there are few large howlders in the deposit, says Manager W. W. Dyar, the gold-hearing sands and gravel are readily scraped up and dumped on hoard the hoat into revolving screens, where jets of water wash the adhering mud and fine gold from the stones or gravel. The gold, sand and mud then pass through riffled sluices which have their hottoms covered with cocoa matting. Mercury is also used in saving the gold. The dredger is credited with an output of $2000 gold per week. At the mouth of Galena gulch, in Swan valley, this company excavated a pit to the bedrock with hydraulic elevators; hut, owing to circumstances, the "elevator" method of operation was postponed.

Teller County.

By June 1 the Elkton management at Cripple Creek expects to he ahle to get into the lower levels and hegin mining there. There is only ahout 10 feet of water in the mine at present, the El Paso tunnel having unwatered it to this depth. The water is receding at the rate of 2 feet per week. The Elkton is making weekly shipments of fair grade of ore, hut as soon as the miners can get into the lower workings the output will he increased and the values will also increase. —— The Mary McKinney has men in its lower workings and ore is heing hoisted and shipped from the hottom of the mine. The Mary McKinney, while greatly assisted hy the El Paso tunnel, hurried the unwatering of the property hy pumping.——Many mines in the north end have already heen unwatered, and nearly all that were affected at a depth of 600 feet have heen unwatered hy the tunuel.

The Mary Cashen mine, at Cripple Creek, heing worked hy Inkeep & Co. on lease, is producing regularly and shipping out eighty tons of ore per month. The output is coming from a point 50 feet south of the shaft at a depth of 400 feet. The ore hody varies from 18 inches to 2 feet in width, and the last two shipments gave returns of $32 and $42 per ton, respectively. The lessees expect to increase the output.

The American Eagles mine of Stratton's Co. at Cripple Creek has resumed. Superintendent Robhins says 100 men will he employed and a production of a carload of ore per day he made. The work of developing the ore hody at a depth of 1500 feet will he increased.——It is expected the Lillie mine, on Bull hill, will he put in operation next week. F. Gilpin is reported to have a lease.

The Foley shaft on the Keystone claim of the Mint Con. M. Co. on Gold Hill, Cripple Creek, will he lowered to depth of 1000 feet. The shaft is 742 feet deep and from a few of the levels mineral is heing daily hroken hy lessees.

IDAHO.

Boise County.

Work is temporarily suspended in the Mary Jane mine on Willow creek, near Idaho City. A flow of water was struck that the pump was unahle to handle, says Superintendent Ring of Brooklyn, N. Y. If work is resumed a larger pump will he put in. A ledge was struck in the hottom of the shaft, reported to assay $4 a ton. This ledge has not heen drifted on.

A. C. Gallupe, superintendent of the Mineral Hill mine in Placerville, reports work progressing in the district. He says the placer miners are all at work and securing good results. Hs is putting up a sawmill at the mine, and expects to have it in operation next week. The two Chilian mills, with a capacity of eighty tons, and other machinery are on the ground, and he expects to have them in operation in July. The track for the tram cars in the tunnel has heen relaid with heavier iron.

Custer County.

C. E. Gahle of Pittshurg, Pa., manager of the Golden Sunheam mine, 60 miles from Custer City, says the property has been equipped with a 60-ton mill, the crushing heing done with two roller mills, each of daily capacity of thirty tons. The plant will he ready to start June 1. The ore of the mine occurs in porphyry dykes. The values run principally in free gold.

Idaho County.

W. Q. Brown has started work on the Mother Lode No. 2 mine at Hump. There are 24 feet of ledge matter. Values were ohtained in silver and gold.——Work on the Ajax continues north and south in the drifts.——The 100-foot level has heen reached in the Atlas shaft. Drifting will he started north and south.——Flint & Hawley of the Crackerjack Co. are in camp. A cyanide test will he made of the concentrates and tailings from the mill, which was started May 1.

A. A. Cass of Cartersville, Mo., who has a hond on the Glasgow mine in Big Creek district, is preparing to increase work this summer. He has let a contract for driving a tunnel. This is in 436 feet. In running it eight veins were crossed, the assays all showing values.

(Special Correspondence). — Superintendeut Ahhott of the Sunnyside company says when survey of the wagon road is completed work of huilding the road would he pushed to completion.

The Burr Oak crosscut tunnel on the Sunnyside is in over 1200 feet. Foreman Wagner says the ore hody will he reached in ahout 200 feet. This crosscut is 480 feet vertically helow the upper tunnel. In a crosscut in the west tunnel a hody of ore found assays $33.94 per ton. A contract for 3000 cords of wood has heen let.

M. Curran of Boise has men running a tunnel on the Mysterious Slide group, adjoining the Dewey grounds. The hreast is in 400 feet and ahout 150 feet helow the surface. Assays taken as the work progressed show values from $2.75 to $6 per ton in gold. Davis & Shaw are managing the work.

Work is progressing on the H. Y. group under the charge of Foreman Bushy. A tunnel on the Dakota claim is now in 300 feet. The ore is different from most of the ores of the district, in having more iron sulphides. They carry from $1 to $1.50 per ton in silver. Boulders of diorite are met in the last 50 feet, usually surrounded hy high-grade ore. For the last 100 feet values averaged $6 per ton.

Men are clearing out the cave in the Mollie tunnel preparatory to continuing the hore. The mill plant for the group will he placed on the Cornish creek side of the divide.

On the upper end of the Climax group a double-compartment shaft is down 60 feet. A steam hoist will he installed as soon as transportation will permit. At the lower end of the group a tunnel is in 200 feet and has cut a succession of phonolite strata having the same pitch as the hill. The including ground is ore having values running from $5 to $20 per ton.

Roosevelt, May 1.

The Eureka Fraction mine, in Buffalo Hump camp, was sold last week to W. Parks of Lewiston. The Eureka Fraction is an extension of the Wise Boy and free gold ore is shown in places. Development work has shown a hody of ore. Parks says a small developing mill will he put on.

Record Bros. of Everett, Wash., have hegun work on their property at Grimes Pass. They will develop the group this season hy driving a tunnel.

Kootenai County.

The Panhandle S. & R. Co., Ltd., is going ahead with the plans for its refining plant and other improvements at Sandpoint. The smelter will be on the shore of Lake Pend d'Oreille at Penderay, ¼ mile east of Sandpoint, on the north side of the lake. H. M. Williams of Spokane, Wash., and W. E. Nelson of St. Paul, Minn., are interested. They have water power on Sand creek, 2 miles from the smelter and 3 miles from Sandpoint. From the dam huilt across Sand creek, the point of divergence of the water to the smelting plant gives a fall of 400 feet. This water power is sufficient to furnish water and light for Penderay and Sandpoint and also to furnish the new plant water, light and power. The company owns the townsite of Penderay. The company hought the hoats of the Pend d'Oreille Navigation Co., consisting of two steamers, three harges, a pile driver and some floating docks. The company has hought a group

of mines at the south end of the lake, known as the Venezuela group, said to contain fluxes needed in the Northwest. The mines are the extension of the Keep Cool group, on which extensive development work has been done. The Venezuela shows 400 feet of ore. It is in lime formation and it is stated to carry $15 in gold and silver. A contract has been let for a dock 2200 feet long to extend from the smelter to the deep water of the lake. This dock will have a tramway extending to the smelter. The smelter will be run by electric motor. The sampler will have a 30 H. P. motor, the crusher a 30 H. P. motor and the tramway a 20 H. P. motor. Bids will be called for this month for the erection of the plant.

Shoshone County.

According to the sworn statements of the mine owners made to County Assessor Hooper, the net profits of the silver-lead mines in Shoshone county for 1903 reached the sum of $2,165,416, an increase over the preceding year of $660,000. Of this amount the four companies of the Federal M. Co. netted $998,726. The record of the Hercules shows 10,043 tons of ore extracted from the mine, giving a net profit of $438,746, after expending $100,000 in repairs and construction. For 1902 its net profits amounted to $169,000. The net profit for the Morning was $346,420, a gain over 1902 of $200,000, while the Bunker Hill returns a profit of $287,497, as against a profit of $67,000 for 1902. The net profits of the Standard and Mammoth were $595,038, while in 1902 they reached $618,912. The Last Chance, at Wardner, increased to $382,652 from $279,697, while the gain of the Hecla was approximately $40,000. The producing mines to report a loss were the Cœur d'Alene Dev. Co., the Gold Hunter, the Frisco and the California Con. The Cœur d'Alene Co., operating the Silver King mine, reported deficit of $38,838. For 1902 the company reported a net profit of $143,000. The gross yield of the mines was $10,064,218. The total cost of extraction was $5,811,388; reduction and transportation cost, $3,814,343; repairs and construction cost, $376,394.

The Oreano M. Co. has an air pipe line under construction from the compressor of the Anchor M. Co. to the tunnel which is being driven on the Oreano mine, near Burke. The line will be built of 2-inch pipe and will be 6000 feet long. The drilling so far has been done by hand. The tunnel has been driven 400 feet, and it will be necessary to go 1000 feet farther before the first ledge is cut. There are three parallel ledges on the surface. All of them will be cut by the tunnel. C. Amonson is manager.

During April the Bunker Hill & Sullivan M. & Conc. Co. shipped between 4500 and 5000 tons of concentrates and ore. The Standard and the Mammoth consigned, approximately, 3900 tons of concentrates to the smelters last month, while the shipments from the Tiger-Poorman were 1000 tons. The ore body opened in the Kellogg tunnel is said to show in the breast of the tunnel 6 feet of shipping ore, between 2600 and 3000 feet deep on the dip of the vein. The tunnel cut the ore body at 12,000 feet. No. 8 tunnel, which was 250 feet above on the dip of the vein, uncovered a body of ore 105 feet wide and 450 feet long, all of which will be mined and milled.

Under management of J. Murphy, operations have been resumed on the placer properties of the Cœur d'Alene G. M. Co. near Murray. He has twelve men at work. This number will be increased as the season opens up. About 100 claims are owned by the company. They extend along Prichard creek and its tributaries. The first work is being done on Prichard creek, 1 mile below Murray.

After a forced idleness, development work is again under way on the Sixteen to One mine, near Wallace. The present work will be done in the lower workings.

The Hercules M. Co. proposes building a tramway from the mine near Burke to the railroad track. It is said negotiations are pending between the company and the railroad companies for an extension of their tracks through the upper part of Burke to the proposed site of the terminal of the tramway. It will be necessary to extend the railroad track about 1000 feet. The proposed tramway will be 7000 feet in length. The ore from the mine is now transported to the railway by wagons.

KANSAS.

Cherokee County.

At Galena the Black Jack mill, operated by J. Keys, is running steadily and a weekly turn-in is made of 10 tons of jack and 4000 pounds of lead.

MISSOURI.

Benton County.

C. H. Dahlgren, manager of the Southwest Lead & Zinc Co., at Raymond, says the company is working in ore carrying zincite at a depth of 185 feet. The company is building a mill to crush and clean the ore and it is expected shipments will begin next week.

Jasper County.

G. Hubbard, superintendent of the Forrestal & O'Donald lease on the Connor land, near Webb City, is preparing to put up a head frame and tramway to the mill from the shaft the company has finished. ——The Golden Rod mine on Underwriter's land last week made production of 190 tons of jack and 120,000 pounds of lead, in value approximately $10,000.

Manager Beckwith, of the Premier Lead & Zinc Co., on the Guinn land, north of Webb City, in the sheet ore belt, says he is getting good dirt from a drift being driven west from the shaft. The face of ore is 14 feet in height and carries both lead and jack in paying quantities. Two other drifts will be started. Beckwith is planning for a concentrating plant. The water is easily handled with the pumps.

Work on the mill of T. Coyne, near Webb City, is progressing. The wiring of the mill for the motors and electric hoisters is being done.

J. W. Aylor and R. A. Bowen, who hold the lease on the Williams land 2 miles west of Carthago, are still in mineral. Their company is the Monitor M. Co. The shaft is down 64 feet and a drift has been run 8 feet south. Hand jigs were started last week on the ore already taken out and piled about the shaft. A drill sunk in the bottom of the shaft showed good cuttings. A 20-foot face of ore has been uncovered to present depth of the hole.

H. J. Vancil, who has a 40-acre lease near Prosperity, is prospecting it with a drill. In the first hole a body of ore was penetrated from 160 to 180 feet and the drill is on a second hole.——The Sancho Panza M. Co. of Joplin has been incorporated by G. C. Spencer, A. E. Spencer and R. C. McConnell.——The Prior Creek Oil & M. Co. of Joplin has been incorporated by A. H. Freeman, F. G. Writer, I. Simon, J. Malang and J. M. Entwistle.

The Mutual M. Co. is making eight tons of zinc ore per week, says W. J. H. Kapp, manager. The mill is temporarily closed down, pending addition of three more jigs and also changes in the building so that the company can handle more dirt. They have three working drifts with faces of ore. The sub-lessees are repairing one of the old shafts on the lease.

MONTANA.

Broadwater County.

The Stevenson M. & Dev. Co., which owns thirteen claims near Winston, 1½ mile from the railway, is preparing to increase prospecting and development work on the group, says Manager Stevenson. They include the Free Coinage group and several other claims adjoining the H. & H. In the Free Coinage no work has been done below the water level. The tunnel on the Free Coinage will be continued and sinking will be done on the veins that have been cut. The values are principally in silver with a showing of gold. The 300-foot tunnel on the Manitoba will be continued. Machinery will be put on the older properties for working, and a spur will be run from the railway 1½ mile. There are water and timber at hand. The company is composed of Eastern men, with headquarters at Sharon, Pa.

NEVADA.

Lincoln County.

G. F. Colton of Los Angeles, Cal., of the Duplex M. Co. at Searchlight, says he will resume operations. G. F. Mitchell, superintendent, is fixing up the storage tanks preparatory to unwatering the mine. During the shut down all the lower workings, including the 600-foot crosscut to the New Year's Gift, filled and there are 85 feet of water in the shaft.

Superintendent C. Rives of the Pioche-Nevada Con. mine at Pioche, says he has opened a body of ore in "contact" vein and will begin sacking ore for shipment. He is sacking ore for shipment from the Talisman claim and getting ore that will go 500 ounces in silver per ton.

O. A. Tibbetts of Salt Sake City, Utah, has an option on the Delmue group of claims near Pioche.

Esmeralda County.

A company is being organized to put in a custom cyanide mill at Goldfield, says Manager J. Jones of Goldfield, south of Tonopah. Jones, with L. L. Patrick and Z. Keudall, has a lease on the January mine. They have been shipping $150 ore from the January. There are 4000 sacks of ore on the dump, but can get no teams. The teams are all working on the railroad. They have a 60-mile wagon haul and it costs $40 a ton to ship and treat the ore. They have sixty men working on the January.

J. R. Sears of Yerington has men at work on the Lottie mine in Garfield district.

J. C. Ralston of Spokane, Wash., has a bond for $80,000 on the Sandstorm group at Goldfield, which consists of sixteen claims, on Columbia mountain.

Storey County.

The suit of the Occidental M. Co. vs. the Comstock Tunnel Co. has been settled and a satisfaction of judgment filed in the U. S. Court at Carson. No money is to be paid in settlement of the judgment for $50,000, but the Tunnel Co. will extend the Brunswick south drift to the Occidental mine and that company will work its property through the tunnel.

Lyon County.

The Douglass mill in Dayton, which was built in 1864, will be torn down.

Washoe County.

It is reported a strike has been made at Olinghouse canyon, near Wadsworth, in the Oro mine owned by D. M. Harvey et al. The Oro group of three claims adjoins the mines of the Springfield, Nev., G. M. Co. Harvey reports they have an open cut across the vein 4 feet of ore, 15 inches of which has a value of $100 per ton. The remainder goes $15 per ton. They have started a crosscut to tap the ore shoot at a depth of 150 feet. The length of shoot on surface so far exposed is 300 feet.

NEW MEXICO.

Grant County.

Work on the removal of the Burro Mountain smelter to Silver City started last week. By June 10 it is expected the plant will be in operation at Silver City. The site for the smelter adjoins the Silver City reduction works site on the north and covers ten acres.

OREGON.

Baker County.

Operations at the Adelene group will be resumed as soon as snow will permit surface work in the Rock Creek basin, near Sumpter, says Superintendent C. S. McLaren. He will start work in the tunnel above the buildings, where a crosscut was being driven to open the lode. Other men may be put in the deep tunnel started near the creek level.

L. G. Lilley, manager of the Baby McKee Con. properties, suspended work temporarily at the Last Chance mine, near Sumpter, owing to the deep snow preventing surface work in securing necessary timbers and materials for sinking. He was sinking the main shaft from the 100 to the 200 foot levels.

The Golconda mine, in the Cracker Creek district, near Sumpter, is shut down pending repairs, and forty men are out of work. The pumps will be kept going and a day shift employed.

L. R. Bellman, manager of the California mine, near Sumpter, expects to start operations at the California before June 1st.

The Emma mine, in Virtue district, near Sumpter, has installed electricity as motive power at the hoist. Later it will be used both at the mill and the hoist. The Cyclone, in the same section, has been using this power for some time and reports it cheaper and more reliable than either coal or wood.

Douglas County.

The Oregon Pacific M. Co. has been incorporated by J. E. Hardman, B. T. Underwood, E. F. Gray, G. G. Graham, G. and J. W. Cox, J. F. Miller and W. M. George, with principal place of business Cottage Grove. The company owns several claims in Bohemia district, which will be developed.

Josephine County.

F. L. Morris, H. C. Berry, H. C. Pickett et al. of Oroville, Cal., who have two dredgers in operation there, are preparing to test a body of dredging ground in the Althouse district, near junction of Althouse and Sucker creeks. The seventon prospecting and boring machine formerly used by the Champion Dredger Co. has been bought. They propose to take up 3000 acres of ground, nearly all of which will be available for dredging.

The mill of the Granite Hill mines, near Grants Pass, has begun operations. It is a 10-stamp battery. The mortars have been placed on cement foundations, made by the filling of deep pits, filled and packed with gravel and granite. Superintendent L. Y. Wickersham of the Granite Hill properties has fifty men at work.

SOUTH DAKOTA.

Lawrence County.

Superintendent Rock, of the Golden Empire M. Co., at Tinton, says work is progressing on the company's mines. Besides work which the Golden Empire company is doing on its gold mines, it is also developing tin prospects, one of these being the Homeward Bound. On this a double-compartment shaft has been sunk for 60 feet on a ledge of high-grade tin ore, and will be sunk several hundred feet deeper. The company is building a hoist on the shaft, putting in a compressor plant and making other arrangements for deep working. The company's placer ground on Beaver creek is also being worked.

The Tinton Tin M. Co. mill is saving from 1500 to 2000 pounds of concentrates daily, which assay 75% metallic tin. These concentrates are saved from about sixty tons of ore crushed, the mill not being able to work to its full capacity owing to the present bad condition of the roads, most of the ore having to be hauled in wagons. With good weather and better roads it is expected that the mill will handle 100 tons daily. It is said that the capacity of the plant will be enlarged this summer and a system of transportation from the mines to the mill will be put in. M. H. Lyon is superintendent.

The Golden Empire M. Co. is repairing the Inter Ocean stamp mill at Welcome, in Garden City district, and is preparing to start it this month. The mill has twenty stamps.

The Safe Investment G. M. Co. of Deadwood is building a sawmill on its mine in southern Lawrence county, and will cut lumber to be used in surface improvements. An air compressor and drills will be put in.

Pennington County.

The Black Eagle G. M. Co. is preparing to put in a Huntington mill on its mine near Rochford. This company was formed by H. E. Fisher and others for operation of the Black Eagle group of claims along Castle creek.

UTAH.

The ore and bullion settlements reached $2,000,000 for the month of April and the copper product reached 4,300,524 pounds, bringing the total in value for that time to about $3,000,000. The total copper output of the independent smelters for the month was 3,210,524 pounds. To this should be added to obtain the output of the State, the product from the American S. & R. Co., estimated at 850,000 pounds, but the money value of this copper is included in the regular ore and bullion settlements. To these totals should also be added the output from the Utah & Eastern smelter, near St. George, which is 240,000 pounds, and the value of which is not included in the ore and bullion settlement returns, says the Salt Lake Tribune. A number of mines of the State, the ores from which are sold to independent buyers, are not included in the totals given, so that the ore and bullion sales, including the copper from the American smelter, will aggregate close to $2,000,000, while the copper from the independent concerns, aggregating 3,450,524 pounds, will bring with its gold and silver contents from $750,000 to $1,000,000, making the total output of the State for the month about $3,000,000.

Davis County.

The second rig is in operation in the Farmington oil section, near Salt Lake City. The Union Gas & Pipe Line Co. began drilling last week at a point west of the Oregon Short Line depot at Centerville, in Davis county. The derrick measures 72 feet in height. Superintendent Wallace says it is equipped with machinery that will drill a hole to a depth of 3000 feet. J. H. Bigger & Co. of Salt Lake City are interested.

Iron County.

The Creole G. M. & M. Co. of Stateline has been incorporated by W. J. McBurney, C. W. Cheney and G. H. Tryon.

Juab County.

J. Knight of Salt Lake City says it is his intention to consolidate La Reine and the Bullion-Beck Tunnel Companies, near Eureka, as soon as the present La Reine assessment is paid in and the company's indebtedness discharged. He expects the ledge in which the cave occurs in the tunnel will be productive of ore below, and that it is the same ledge on which La Reine was preparing to sink when he bought the mine.

The hoist for the Tetro mine, near Eureka, has been set at the top of the shaft in the tunnel. The shaft will be sunk and the ore body proven up at depth. Six cars were shipped during April, from which the company realized $5000.

The shipments from the mines of Tintic district for the month of April are reported as follows: Ajax, 14; Centennial Eureka, 242; Tetro, 12; Salvator, 8, Dragon Iron mine, 43; Laclede, 1; Joe Bowers, 1; South Swansea, 4; Star Con., 1; Lower Mammoth, 8; Grand Central, 82; Mammoth, 48; Gemini, 99; Bullion-Beck, 46; Uncle Sam, 8; Yankee Con., 15; May Day, 1; L. E. Riter & Co., 1; Carisa, 22; Martha Washington, 1; Cornucopia, 1; R. A. Brown, 1; Showers Con., 1; Utah Lease, 1; Eureka Hill, 29; Victor Con., 3. Total, 693 cars.——Three cars of concentrates were shipped from the Uncle Sam mill and one from the May Day mill.

The Godiva mine of Tintic, near

Eureka, after an extended shut down is again in operation. The extraction of ore will begin as soon as some of the old workings are cleaned out.

Salt Lake County.

The Maxfield M. Co., in Big Cottonwood canyon, near Alta, says Manager Thomas will start driving a new tunnel by which the ledge may be tapped at a point 700 feet below the present workings and at the same time unwater it and do away with pumps. To accomplish this it will be necessary to drive 1 mile.

Summit County.

A strike is reported made last week in the California mine at Park City. The find was on the intermediate level and has a width of 12 feet, says Manager Snyder. Assays showed 35% lead and twenty-two ounces of silver to the ton. The ore also carries zinc to an extent that will require it to be subjected to concentration, and to meet this need preparations are being made to start up the company's mill June 1st.

Assistant Manager E. Bamberger of the Daly-West mine, at Park City, says additional ore bodies are being opened up in the Quincy ground of the Daly-West Co. The find was made on the 300-foot level, on south side of porphyry dike and consists of 3 feet of bigh-grade ore.

The Brown-Eagle M. Co. has been incorporated to develop ground in the Elkhorn district, near Park City, by F. D. Aubery, O. F. Johnson, G. Wilson, J. H. McDonald and F. J. Hansen. J. H. McDonald is manager.

The Sunrise claim, near the Woodside mine at Park City. has been leased to J. Allen et al. for three years.

Last week the pump at the 800-foot level of the Wabash mine at Park City was started up and work resumed with full complement of men.

Tooele County.

Operations will he resumed at the Overland mine, near Mercur, before June 1st, says the Reporter. The Overland is a low-grade gold mine.

The management of the Honerine M. Co. at Stockton has arranged for the construction of a sampling mill. The plant will have a capacity for handling 1000 tons per twenty-four hours.

The Ophir Hill mine and mill at Ophir have been closed down, throwing 100 men out of work and cutting off a source of considerable ore and concentrates from the valley smelters, says the Reporter. No reason for the action has been given out. It is thought, however, the suspension will be only temporary. W. A. Clark, of Butte, Mont., is owner.

WASHINGTON.

Cowlitz County.

At St. Holens, for $5000 cash, the Royal Flush group, consisting of four unpatented claims, has been sold to C. M. McCurdy et al., of Ionia, Mich. The ledge has been exposed by an open cut and a small shaft which shows 5 feet of smelting ore. McCurdy proposes to incorporate the property and carry on development work all season. It is estimated this summer there will be 500 men employed in the mines of St. Helens, and at least two plants will be built. Manager Coe is completing arrangements for a smelter on the Mount St. Helens Con. E. A. Sessions, of Sessions & Simpson, interested in the Cascadia, expects to begin building a plant on that property. The mines of the district are owned and controlled mainly by Portland, Or., men.

Stevens County.

Last week furnaces Nos. 4, 5 and 6 at the Northport smelter of Le Roi C. Co. were blown in. Ore shipments are going from Le Roi mine at Rossland, B. C., daily.

Manager G. A. Tuttle of the Copper Mountain M. & M. Co. of Copper City, Or., says they have bought four claims in the Skookum group, west of Valley, next to the King G. & C. M. Co. property. The claims carry gold and copper. The price was $46,000 in cash and stock. He expects to put men to work next week.

Development work is progressing on the Defender group, near Bossburg, under Superintendent J. T. Dolan. The group consists of eight claims, embracing 160 acres. It is on Tanlow mountain, 1 mile from Orient, in the western part of the Pierre Lake district. There are four parallel veins traversing the group. There is said to be a dike of porpbyry, interspersed with quartz veins, whicb have been exposed hy erosion. The development consists of three sbafts, two tunnels and several open cuts in tbe ledges. The ore carries values in gold principally. The Defender group is owned by the Defender M. Co. of Waukegan, Ill. J. A. Walford is president. Tbey have planned to sink the shaft in the Defender 300 feet, and crosscut at 100-foot levels; also to sink the Gold Crown shaft 300 feet and crosscut. Superintendent Dolan is putting up an experimental cyanide plant on Bear creek, which affords an abundance of water. Later the company will build a larger plant and treat all the ore on the property.

Okanogan County.

W. R. Clark, of Spokane, part owner of tbe Ben Franklin mine at Chesaw, says the Ben Harrison has made a strike of carbonate ore running in silver, copper and lead.——The Opal Co. has increased its number of men and intends to push development work. The Crystal Butte Co. is working a double shift of men. The Grant property on Buckeye mountain is progressing. The Rainbow Co. is working its mine, which has copper ore.——At the Ben Franklin group, near Strawberry lake, a 10-foot ledge has heen uncovered, with values uniform. Assays show average of $20 a ton in gold, silver and copper.

Preparations are being made to put in an electric plant and a 100-stamp mill on the Palmer Mountain Tunnel property near Loomis, says D. M. Drumheller of Spokane, part owner. The tunnel is in 4000 feet. For the last year they have been drifting on the ledges. The company has water rights on Coulee creek and will put in an electric plant costing $100,000 to operate the mine. The ore is free milling.

FOREIGN.

AFRICA.

Abyssinia.

Included in a report on Ahyssinia hy U. S. Commissioner Skinner at Marseilles, France, he says that little serious prospecting has been done in mining. A French engineer, M. Comhoul, hy direction of the Emperor, made a number of interesting discoveries, which would douhtless have been put to profit before this, had he lived. The principal gold mining venture resulted from his initiative. From samples gathered here and there, the presence of gold, silver, iron, coal, tin, zinc, porphyry, feldspar, kaolin, mica and bitumen is supposed to have been traced in quantities. At Dire Douah, M. A. Levertois, the owner of a concession, has specimens indicating the probable presence of diamonds, rubies and emeralds. The desert is covered with a large quantity of stones, brought down by the torrential rains from the mountains above, including quartz, agate and marble. Mining enterprises, seriously planned and hacked hy reasonahle capital, would be supported by the Government. The Ahyssinian plateau being the result of volcanic action, deposits of basalt and trachyte are numerous, particularly the former. Granite, quartz, feldspar and porphyry are found in ahundance. Mica is frequently obtained, from which sheets of good dimensions can be taken.——The existence of gold has been recognized in Abyssinia for centuries. The inhabitants of the west and southwest provinces engage in placer mining. The value of the gold-bearing sand is low. The Gallas, who appear to monopolize this industry, devote themselves to it only during the leisure remaining to them after tending their flocks and fields. After the exhaustion of a given point where placer mining has been carried on, it is abandoned until another rainy season is passed, when work is renewed. Recently researches have led to the discovery of veins of gold-bearing quartz which give promise of values. At the present time, with the exception of the Wallaga mines, helonging to a Milanese company, the gold production is nearly all in the hands of the Emperor. However, even under existing circumstances, native merchants sell about 926 pounds of gold per annum. The price per 2.2 pounds varies from $579 to $585. The gold dust as mined is placed in quills, and after its first change of hands is worked into malleable rings of pure metal and in this form reaches the market.——Numerous deposits of lignite have heen found in Abyssinia, the more important heing at Debre Levanos, fifteen hours from Addis-Ahaha. Traces of coal have also heen found at Ankober. Recently samples have been obtained from Tagoulet, near Debre Levanos. Iron ore seems to exist in all parts of tbe Empire. The samples are generally pure and bave usually been obtained near the surface under considerations favorable to economical mining. Owing to the absence of fuel other than wood and the present impossihility of transporting ore to tbe coast, the industry gives no present promise.

Rhodesia.

The Rhodesian Chamber of Mines at Bulawayo reports tbe gold output for month of March amounted to 17,756 ounces (Mataheleland, 14,628 ounces, Mashonaland, 3,128 ounces). The monthly returns have been as follows:

	Gold		Silver.
	1904.	1903.	1904.
	Ounces.	Ounces.	Ounces.
January	19,359	16,245	3,521
February	18,673	17,090	3,461
March	17,756	19,626	5,453

AUSTRALIA.

Queensland.

The annual report of the Under Secretary for Mines shows that gold, copper, tin and coal made substantial increases during 1903, and the value of the year's output reached £3,686,096 ($17,868,566), an increase of £375,496 ($1,821,056). A season favorable to miner and mill owner alike conduced to these results, permitting ore to be transported and crushed throughout the greater part of the year and allowing alluvial mining to be carried on steadily. "The varied ore of the Etheridge, the copper of Cloncurry and the silver and lead of Lawn Hills continue to be subjects of speculative interest rather than sources of material prosperity." —— The year's gold yield was £2,839,813, exceeding that of 1902 hy £119,174. The dividends paid by the gold mining companies amounted to £983,679. —— The general tendency to restore the diamond drill to its position as an aid to prospecting is noted. The success of the Goldfields Diamond Drilling Co. of Western Australia and at Mount Morgan seems to have convinced mine owners that tho improved modern drill is the most effective appliance for cheap and expeditious exploration, and arrangements have been made for a series of bores in tbe principal section of the Charters Towers field. —— At Charters Towers considerahle progress and development, as well as output, was made in all of the principal mines.——The value of the gold yield from Croydon field was £135,136, an increase over 1902 of £14,585, the improvement heing attrihuted to the fact that the principal mills had command of a water supply which enahled them to carry on crushing operations throughout the greater part of the year. The Golden Gate mine was the largest producer and the Golden Gate Consuls paid the largest dividends. —— The principal producers at Gympie were No. 2 South Great Eastern, Scottish Gympie, South Glanmire and Monkland. —— At Mount Morgan the report says: "For some years past the gradual decline in the value of the ore of the Mount Morgan mine has heen met hy a steady decrease in the working costs. The most striking innovations last year were: The installation of the steam shovel for the purpose of removing waste rock lying about good ore that is known to exist, hut has hitherto been inaccessible; and the initiation of a system of prospecting the lower levels of the mine by means of diamond drills. The steam shovel, started in the first week of September, had, by November 30, excavated 48,000 tons, and Manager G. A. Richard in his report of November 30 says that 'expenditure in procuring the sbovel has been amply justified hy results, and the cost per ton and capacity has more than confirmed the estimate.'" —— The principal silver-lead producer has been the district around Chillagoe. —— Tin shows an increase for 1903, the largest producer being the Vulcan mine at Irvinebank, which yielded ore of value of £24,560. Tho main shaft of the Vulcan is down 900 feet. The Stannary Hills M. & T. Co., Ltd., at Herberton, produced tin ore of £15,848 value; the Lancelot, £15,102. —— The increase of £100,000 in value of the copper output for 1903 over 1902 was due to Herberton and Mount Perry districts. —— The abundant rains allowed opal mining to be carried on under conditions more favorable than obtained for several years. The opal industry in 1903 employed a total of 170 men. The principal need of the opal fields of Queensland is a water supply. Sapphire mining at Anahie is progressing and has become an established industry.—— "The increase in the year's production of coal is to some extent discounted hy the decline in price, which has fallen to 6s 6d per ton, the lowest figure yet recorded." The following is a synopsis of the production of minerals other than gold:

Mineral. Total Quantity Won.	Tons.	Value.
Tin	3,708½	£243,149
Silver	*642,125	65,538
Lead	3,795	43,639
Coal	507,801	164,798
Copper	4,916	285,122
Opal	.....	7,300
Wolfram	197	7,870
Manganese	1,320	5,332
Bismuth	11	2,523
Bismuth, wolfram and molybdenite	24	2,100
Lime	13,612	8,060
Gems	.....	7,000
Iron	9,808	3,852
Totals	515,192½	£846,283

*Ounces

Western Australia.

Bewick, Moreing & Co. are now general managers for the Great Boulder Perseverance G. M. Co. Ltd., and R. Nichols remains resident mining manager at Kalgoorlie, Western Australia.

BRITISH COLUMBIA.

Boundary District.

H. Pemberton of Montreal, manager of the Montreal & Boston Con. C. Co., is arranging to start the company's smelter at Boundary Falls. A payment on the Dominion C. Co.'s property has been made. The combination will take over the Montreal & Boston Co.'s smelter, the Sunset mine, the Dominion C. Co.'s group —the Brooklyn, the Rawhide and the Stemwinder—the Morrison, probably the Athelstan - Jackpot, and Mackenzie & Mann's interest in the Emma.

Work will be started this month on the Last Chance mine at Skylark camp, acquired by the Spokane Boundary M. Co. of Spokane, Wash., men.

Toronto reports tell of a consolidatiou of mining interests at Camp McKinney. An agreement has heen arrived at whereby the Kamloops, Minnehaha and Sailor M. Cos. come under one management, and resume operations in all of the properties mentioned.

Plans are being drawn for an electric drill plant, ore crusher and picking helt for the Paragon mine near Boundary Falls. The mine is owned hy Spokane, Wash., men, with F. S. Ernest as manager.

East Kootenay District.

The mines at Morrissey, as also at the other collieries, Coal Creek and Michel, are practically closed down at present, says the Rossland Miner. The reason why the Great Northern is not taking any more coal is not made public.

The numher of men working at the St. Eugene mine at Moyie, near Fort Steele, has heen increased to 180 men. About sixty of these are at the upper workings of the mine. The concentrator is grinding steadily, running day shift only, hut a douhle shift will be put to work as soon as the required number of experienced mill men can he secured. The mill is heing fed hy ore from the Lake Shore workings.

Lillooet District.

Manager Burnett of the Highland Valley group of copper mines, near Ashcroft, says work progresses and ore is being opened up. Development will be increased. Next month it is expected forty men will be at work.

Nelson District.

W. J. Hughes of Ymir, manager of the Pilot (Ymir) G. M. Co., says he is arranging to put up a stamp mill on the company's property, which consists of two claims a mile east of the Foghorn mine, near Ymir.

Slocan District.

Work started last week on the Mahon group at Ten Mile.——The Payne at Sandon is adding another magnetic separator to its zinc plant.

The Slocan Star at Sandon resumed operations last week, all danger of slides baving passed. The Slocan Star has received more machinery for the concentrator. When the mill is completed the Star expects to ship forty carloads a month of zinc, lead and silver ore.——The Ivanhoe mill is turning out silver-lead concentrates at the rate of ten tons to a shift.

At the Payne mine at Sandon a shaft has heen started in No. 8 tunnel. It is down 40 feet and in ore all the way. It is expected to extend down and connect the workings of Nos. 9, 10 and 11.

Vancouver Island.

Manager S. Matson of Victoria says a company of London, England, men has taken over the Lenora mine at Mount Sicker, the Breen & Bellinger smelter at Crofton, the Mount Sicker Railway, connecting them, and Lloyd's sawmill, which supplies lumher for the mill. All will he operated in conjunction. It is expected the smelter may require an increased capacity.

Yale District.

Machinery for a 75-ton silver-lead concentrator is heing arranged for by the Alice Broughton mine, near Creston. A tramway will he put in.

CANADA.

Alberta.

The Alherta Coal & Coke Co. last week sold outright all of its coal lands at Cowley to E. Restor of London, England, and J. H. Thorburn of Edinburgh, Scotland, for $100,000 and full payment of all sums due by the company to the Dominion government o account of the lands in question. The lands sold consist of 6400 acres at Cowley, on the line of the Canadian Pacific Railroad, east of Frank. They were acquired from the Dominion government, with the right of purchase, two years ago, and lie to the north of the railway line. Breckenridge and Lund's coal lands are on the other side of the track.

By July 1st the International Coal & Coke Co. of Coleman expects to be shipping 2000 tons of coal and coke a day. The company is preparing to put in additional machinery, including 300 coke ovens. Some of tbe machinery is on the ground. It has been shipping 100 tons of coal a day for the past six months, but beginning with July 1st the output will he 2000 tons a day. Of this about 500 tons

will he made into coke. The company has a contract with the Canadian Pacific Railway Co. and the entiro output will be delivered to it. The coal company's head office is in Montreal. S. H. C. Miner is president.

MEXICO.

The Treasury Department has issued a report, including the following reports during the first seven months of the fiscal year 1903-04 to Feb. 1, 1904, as declared in the custom houses in Mexican currency:

Mineral products—	
Mexican gold coins	$11,422 00
Foreign gold coins	1,237 06
Gold in bars	11,500,758 13
Gold in other forms	537,838 12
Total gold exported	$12,051 255 25
Mexican silver dollars	$15,324,181 00
Foreign silver coin	45,704 00
Silver in bars	28,141,792 95
Silver in other forms	8,878,276 61
Total silver exported	$52,390,254 66
Copper	$12,546,748 11
Lead	2,946,398 45
Other mineral products	891,106 36
Total sundry minerals	$16,384,252 92

Guanajuato.

S. Morado, of Siloa, and J. M. Wiley will dovelop a cinnabar mine which thoy have hought on the Encinal ranch, near La Duz.

J. Lopez will develop tin properties which he owns near San Felipe.——F. R. Rocha, of San Nicholas, will develop his gold and silver bearing claims.

Jalisco.

Etzatlan reports say the properties of La Guadalupe and Camicho, the former operated by H. H. Sawyer and the lattor by C. Romero, I. Garcia et al., are hoth showing progress. They have not yet reached the poiut of shipping. —— The Amparo M. Co. has ore and is shipping regularly. Owing to the railroad company not being able to supply them with enough cars, shipmeuts are curtailed, says Superintendent E. J. Callahan.

H. M. Moran et al. have "solicited title" covering 20 mining pertenencias on a tin bearing vein adjoining the Esperanza mine in the Paso de Sotos municipality, near Teocaltiche, says the Jalisco Times of Guadalajara.

P. Brusky et al. are preparing to put in a 3-stamp mill at their mine near Ameca.——M. Valle is preparing to develop a silver and copper mine near Etzatlan.

Lower California.

George P. Brown, superintendent of the Esperanza mines, Cedros island, has bought the plant of the National Smelting & Refining Co., National City, Cal., and will move it to the Esperanza property.

T. Fermin and T. Agruel, of Ensenada, have a concession from the Mexican government to develop oil prospects near Mulege.

Nuevo Leon.

The Torreon Smelter Co., of Torreon, E. Madero president, has leased the Cabrillos mine near Monterey for four years with the privilege of renewing the lease for another four years. According to terms of lease, the Torreon Co. guarantees the Cabrillos M. Co., F. Zamhrano president, the royalties from the ores of the property will amount to not less than $250,000, of which amount they agree to pay $120,000 the first year. The Cabrillos mine is a silver-lead proporty said to carry enough iron ore to make it a valuable flux. The lessees propose to put in machinery and begin increased development.

Sonora.

The Cananea Con. C. Co. at Cananea has been granted hy the Mexican Government four concessions to build railways that will connect the Sonora railway with the Mexican Central railway over routes in northern Sonora and Chihuahua. The first is for a line of railway from San Jose station, on the Cananea, Yaqui & Pacific railway, to the Chihuahua State line, at a point about 20 or 30 kilometers south from the international boundary; the second is for a line from that point to some point on the Rio Grande, Mexican & Pacific, at or near Casas Grandes; the third, for a line from the last indicated point to the Mexican Central road; and the fourth for a line from the Cananea, Yaqui & Pacific railway to the Sonora railway. When completed, a railway built under those concessions will supply rail connection between the capital and gulf coast all in Mexican territory.

SALVADOR.

The mineralized zone of southern Salvador, extending from the mines of Encuentros on the west to Salamanca on the oast, or about 20 miles, contains many outcroppings and a few mines. It may be said to consist of three districts, none larger than 1 mile of proven value along the strike of tho vein. Some of the following mines have mills in operation and all of them have been exploited to a greater or less oxtent in the past, generally to the water level: The West group or district contains the Encuentros mine, silver-lead sulphide with free gold, carries also zinc and copper. It is 15 miles east of San Miguel.——Loma Laga mines, farther east, comprises many claims. The ore is principally silver-lead sulphide and sphalerito (zinc sulphide). Oxidized ores are being treated hy cyanide. The Devis-erdero mines, still farther east, carries values in gold principally.——The Central group, 15 miles east, contains tho San Sobastian mine. This mine has been operated with varying success for many years. Tho ganguo is quartz with iron sulphides, carrying high-grado gold values.——The East group, 5 miles east, contains the Salamanca mines, and other veins of small value as far as opened up. The general striko of all the veins is northwesterly. The veins' walls are usually well marked, and near the surface or above water level, much broken, requiring close timbering in mining.——The Saiamanca mines, owned and operated by the Salvador M. & M. Co. of New York, is 2½ miles north of Santa Rosa, in the department of La Union, and some 30 miles north from the port of La Union on Fonseca hay, to which all supplies and machinery are shipped. The vein has a strike of north 65° west and dips from 45° to 70° north. The width varies up to 5 feet, with an average of 1½ feet for the shoot. The quartz is often shattered; sometimes hard and massive, and again of cellular structure. Manganese, prohably as manganite (MnO) (OH), occurs, deposited from water and associated with iron oxide. It is also found coating the vugs of the cellular quartz. In the San Sebastian mine tellurides and nickel salts are found and the green nickel sulphate is prominent in the richest parts of the mine. In the Salamanca vein rich ore is indicated by the dentritos (a form of manganese oxide) found in a thick palm-leaf like form. The value is principally in free gold and the ore yields by straight milling and amalgamating about 65% of its gold value. The percentage of sulphide from the result of the mill's runs is about one-sixth of 1%, or 3 pounds of sulphides to 1 ton of ore.——There are no taxes of any kind on lands or mining and milling properties. Bullion, concentrates and ore may be exported free of duty and taxes, and the Government is assisting the mining industry as much as possible. All necessary machinery and supplies for mining and milling purposes are admitted free of duty, except for a port of Government stores tax of one-half cent silver per kilogram (2.2 pounds avoirdupois) gross woight.

Obituary.

WM. COLE, a pioneer mining man of Boise Co., Idaho, died at Ola, Idaho. Deceased was a native of Virginia, 77 years of age.

A. P. JOHNSON, a pioneer mining man of Mono Co., Cal., and later interested in Tuolumne county, died at Sonora, Cal., April 28. He was part owner in the Bonanza mine at Sonora.

J. H. MATTHEWS, president of the Copper Chief M. Co., which owns the Copper Chief mine on Equator hill, in the Jerome district, Ariz., died in East Orange, N. J., April 13, from the effects of an accident.

G. W. KRAMER, vice-president of the Colorado Midland Railway Co., and vice-president of the Utah Fuel Co., operating coal mines in Carbon Co., Utah, died in Denver, Colo., on the 4th inst. Deceased was born in Sandusky, Obio, in 1851.

G. GOODWIN, a pioneer mining man of California, died at San Francisco, Cal., on tbe 7th inst., at the age of 75 years. Deceased was a native of Ronsperg, Bohemia, and went to the placer diggings of California in 1854. He later engaged in the manufacture of artificial stone.

Trade Treatises.

"Hydro-Carhon Paints," from the Hydro-Carbon Manufacturing Co., New York and Denver, describes and illustrates their application.

A commendable little treatise from the Jos. Dixon Crucihle Co., Jersey City, N. J., discusses the value of their handy graphite rope dressing for wire ropes.

The engine and boiler catalogue from James Leffel & Co., Springfield, Ohio, is of interest to steam power users. There are numerous full page and many smaller illustrations. There is much detailed information nbout engines and hoilers. The book will be sent to any one nddressing tho company.

Personal.

L. H. MITCHELL, M. E., is now located in Los Angeles, Cal.

R. G. BROWN of San Francisco, Cal., hns gone to Honduras, C. A.

J. G. SAWYER is now superintendent Seigel Con. mines, Aurum, Nev.

J. A. VEATCH of Napa, Cal., is in San Francisco, Cal., on mining business.

J. J. BROUGHALL of Salt Lake City, Utah, hns returned from Denver, Colo.

F. U. BOWERS of Sonora, Cal., is in San Francisco, Cal., on mining business.

J. PERELLA is foreman for the Alaska-Juneau group of mines, near Juneau, Alaska.

B. LINDENBERGER of Black Diamond, Cal., is in San Francisco, Cal., on mining husinoss.

FRANK KEITH is the new superintendent of the Tonopah Co.'s mines, Tonopah, Nev.

E. W. GIDDINGS, a mining man of Colorado Springs, Colo., is in San Francisco, Cal.

L. L. LANE of San Francisco, Cal., is at Juneau, Alaska, examining mining properties.

E. B. CONELY has assumed charge of the Butie and Gold Center mines, Olinghouse, Nev.

SUPERINTENDENT H. T. TRIPP of the Sumdum mine is at Juneau, Alaska, for the summer.

W. L. COLE succeeds Lewis T. Wright as general manager Mountain Copper Co., Keswick, Cal.

S. W. CLAWSON is mine superintendent Copper Queen Co., with headquarters at Douglas, Ariz.

W. D. WASHBURN of Chicago, Ill., interested in mines in Arizona, is in San Francisco, Cal.

D. M. HARVEY is superintendent of the Ora group of claims at Olinghouse, near Wadsworth, Nev.

A. R. WILFLEY of Denver, Colo., is spending some time in Missouri, taking a much needed rest.

J. MURPHY is manager of the placer properties of the Cœur d'Alene G. M. Co. near Murray, Idaho.

L. L. PATRICK, who has mining interests at Tonopah, Nev., is in San Francisco, Cal., on business.

W. O. EMERY has been appointed head of the chemistry department of the New Mexico School of Mines.

F. C. ALLSDORF of the Cuprite C. Co. of Morenci, Ariz., is in the East in the interests of that company.

A. B. EMERY, who has mining interests at Rossland, B. C., is in San Francisco, Cal., on mining business.

S. F. PARRISH, manager of the Le Roi C. Co., returned to Rossland, B. C., last week after an extended absence.

L. R. BELLMAN, manager of California mine, near Sumpter, Or., is in Minneapolis, Minn., on company business.

F. L. SIZER of Helena, Mont., is manager of the Whitlach-Union group of mines at Unionville, near Helena.

G. F. OBER, engineer and mineral surveyor of Denver, Colo., is doing professional work at Atlantic City, Wyo.

J. S. ACKER returned to Prescott, Ariz., last week from a six months' visit to Cincinnati, O., on mining business.

THOMAS DERBY, superintendent of the New Almaden quicksilver mines in Santa Clara county, is in San Francisco, Cal.

J. H. ROBESON is manager of the Pay Rock Extension M., M. & D. Co., owning the Pacific group, near Georgetown, Colo

G. W. SPARKS, president Fairhanks-Morse Co., who has been traversing the Pacific coast, has returned to Beloit, Wis.

G. W. CROWE, consulting engineer for the Ruby G. & C. Co., near Oriz, Sonora, Mexico, is in New York on company business.

J. W. O'DONOGHUE of the Con. Virginia mine at Virginia City, Nev., has gone for a month's visit to points in the East.

J. HOLLINGER of Ursine, Nev., interested in Pike's Diggings, near Stateline, has returned there from Salt Lake City, Utah.

THOS. J. BARBOUR, consulting engineer of the Risdon Iron Works of San Francisco, Cal., has returned from London, England.

D. W. HARTSHORN is superintendent of the Pacific group of the Pay Rock Extension M., M. & D. Co., near Georgetown, Colo.

F. D. SMITH, manager of the Snow Creek, Or., mine, returned to Sumpter, Or., last week from an extended mining trip to Mexico.

W. C. RUTTER of Seattle, Wash., manager of the Big Four M. Co. at Granite, Or., is superintending operations at the company's mines.

H. PEMBERTON of Montreal, Quebec, has gone to Boundary Falls, B. C., as manager of the Montreal & Boston Con. C. Co. mines and smelter.

C. M. FUELLER, mining engineer and metallurgist of Denver, Colo., has heen examining mining property near South Pass, Wyo., the past week.

J. B. MONTGOMERY of San Francisco, Cal., has gone to the Yakutat section of the Copper rivor country, abovo Valdez, Alaska, on mining business.

COMPTE DE GABRIAC of Paris, France, secretary of tho La Grange Hydraulic Co., is on a visit to the company's property, near Weaverville, Cal.

G. A. OVERSTROM takes the chair of mine, plant and mill designing in the State School of Mines, University of Utah, Salt Lake City, Utah.

L. G. LILLEY, manager of the Baby McKee Con. M. Co., operating tho Last Chance mine, near Sumpter, Or., is in the East on company business.

A. J. MCMILLAN, managing director of Le Roi mine at Rossland, B. C., has returned there from London, Eng., where he has been for the past six months.

H. W. CROWTHER of Salt Lake City, Utah, managing director of the Continental M. & S. Co., is in Mexico examining mines for his company and New York men.

W. J. ADAMS, E. M., has returned to San Francisco, Cal., from Mokelumne Hill, Calaveras county, Cal., where he made a study of the geology of that district.

A. H. ELFTMAN, M. E., of Minneapolis, Minn., is touring the west half of America in inspection of mines he is developing, and is this week in Park City, Utah.

RICHARD EAMES, JR., of the Associated Security Co., 10 Wall street, New York, has gone to Mexico to secure suitable representatives of his company in tbat country.

H. A. SHIPMAN, formerly manager of Stratton's Independence, Ltd., at Cripple Creek, Colo., has been appointed manager of the Golden Horseshoe mine of Kalgoorlie, Western Australia.

M. TORPHY, superintendent of the Newell-Caffe quarry at Carthage, Mo., has been transforred hy the company to the superintendency of the Pennsylvania Zinc & Lead Co.'s mines at Neck City, Mo.

PRESIDENT C. R. MCCORNICK of the Chase Creek C. Co., near Clifton, Ariz., is in Paris, France, to attend the annual meeting of the Gold Roads M. Co. of Mohave county, of which he is a shareholder.

J. P. BOYLE, until recently superintendent of the Ivers properties in Lincoln county, Nev., has gone to Roosevelt, in Thunder Mountain section, Idaho, to assume superintendency of the Lost Packer mine.

CHARLES F. WALLACE has resigned the general managership of the Illinois Central Railroad to assume the position of chief engineer in the construction work of the Panama canal, for the Panama Canal Commission, at an annual salary of $25,000.

PROFESSOR ALBERT W. SMITH has resigned as head of the Department of Mechanical and Electrical Engineering at Stanford University, California, to assume charge of the Sibley School of Engineering, Cornell University, Ithaca, N. Y., where he succeeds the late Professor R. C. Thurston.

H. V. CROLL, who has heen in charge of the Salt Lake City, Utah, office of the Allis-Chalmers Co. for several years, and who was before that the representative of the E. P. Allis Co. at Spokane, Wash., has been appointed to the charge of the Allis-Chalmers office in San Francisco, as the successor of George E. Ames, who has resigned. Mr. Croll's San Francisco office is 623 Hayward building.

Commercial Paragraphs.

R. D. TOMLINSON has assumed charge of the condenser department of the Allis-Chalmers Co.

A. V. DICKERSON, 1505 Monadnock Blk., Chicago, is agent in that territory for Arthur Koppel of New York, manufacturer and builder of complete railways for mines, etc.

THE Pittsburg office of the Sullivan Machinery Co. of Chicago—Geo. W. Favor, Pittsburg, manager—is removed from 339 Fifth avenue to rooms 1112-13 Farmers' Bank Building.

J. FITZ BRIND, president of the Insoloid Fuse Co., Denver, Colo., was in San Francisco last week arranging to ship fuse from Europe direct, San Francisco to be a distrihuting point for coast trade.

I. A. TAYLOR, who has for many years heen connected with the electrical industry, hoth on the manufacturing side and as consulting engineer, associated with A. B. Herrick, has joined the staff of the Engineering Co. of America.

SAYEN & SCHULTZ of Thirteenth and Commerce streets, Philadelphia, manufacturers of packing, mechanical ruhher goods and hose, are now represented on the Pacific coast hy John T. Roberts, whose offices are in the Crossley Building, San Francisco, Cal.

U. S. CONSUL G. BIE RAVNDAL, Beirut, Syria, writes that there is a market there for an oil engine of simple construction. The following named firms might be addressed: Michel J. Nasser, Beirut, Syria; American Exchange Co., Haifa, Syria; Meshaka & Nachman, Damascus, Syria.

A. LESCHEN & SONS ROPE CO. have the large offices, 163-165 Washington street, New York City, for carrying a larger stock than in the past. Their new manufacturing plant, with their main offices, are at 920-922 North First street, St. Louis, Mo.; their other branch offices are located in Chicago, Denver and San Francisco.

THE Canadian husiness of the Allis-Chalmers Co., which recently acquired the Bullock Electric Mfg. Co. of Cincinnati, O., will hereafter be conducted hy a new organization hearing the name Allis-Chalmers-Bullock, Ltd. The works and principal offices of this important, new Canadian company are in Montreal, Canada.

B. C. RIBLET has a contract from the Metropolitan G. & S. M. Co., which owns the Triune mine near Ferguson, B. C., for the erection of a douhle-rope aerial tramway, at a cost of $20,000. The tramway will carry the ore from the mine to the wagon road, and do away with rawhiding down the mountain side. It must he finished by August 4, 1904. The mine is to be equipped with air compressor and drills.

THE demand for Crane patent pop safety valves has made it necessary for Crane Co., Chicago, to increase the capacity of their manufacturing departments on these goods. They have also brought out a number of new forms of pop valves for stationary, marine, locomotive and portable boilers and a variety of cylinder reliefs, water reliefs, high pressure and hydraulic relief valves for general purposes and pressures.

ALL of the material used hy the contractors on the new Moffat Railroad has been purchased hy the S. H. Supply Co., of 22nd and Larimer streets, Denver, Colo. This is one of the largest purchases of its kind ever made, there heing sixty-five carloads of material. This comprises all of the tunnel plants of air compressing and drilling machinery used hy hoth Geo. S. Good & Co. and Orman & Crook, nine air compressors, with hoilers, drills, steel, etc., two electric drilling plants, and thousands of feet of pipe and rail.

THE Taylor Iron & Steel Co., of High Bridge, New Jersey, manufacturers of manganese steel castings of every description for heavy mining machinery, as well as the larger types of armor-piercing projectiles, will have two interesting exhihits at the St. Louis Exposition. Both of these are located in the Mines Building. On aisle "H" in hlock 73 the firm has a space 27 by 42 feet, where will he shown manganese steel castings in great variety. Deserving of special mention is a revolving soreen of 60-inch inside diameter with 21-foot screening surface. The perforated plates and all wearing parts of this screen are of manganese steel. Among the other large castings in the exhihit are parts of large "Gates" crushers, coal rolls and jaw crusher parts. Mine car wheels, sprocket wheels, gears, detachahle link helting, teeth and lips for steam shovels, lips and bushings for dredge huckets are also shown, as also a variety of the regular steel (not manganese) castings in gears, dredge parts, etc. The manganese steel castings now furnished to many of the larger gold dredging plants throughout the West hy the Taylor Co. are giving such excellent satisfaction to dredge operators that this department of the plant at High Bridge is running full on bucket hases, connecting links, tumhlers, gears and ladder castings, both for new dredges and renewals. The second Taylor exhihit at St. Louis is also in the Mines Building, and forms a part of the display of the International Nickel Co. It consists of nickel steel castings, including mining and crushing machinery, car wheels, dredger parts and armor-piercing projectiles. The Taylor plant now has a department for the production of nickel steel castings on a large scale.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING MAY 3, 1904.

758,807.—STEAM GENERATOR—G. W. Arper, Oakland, Cal.
758,950.—CUT OFF—B. C. Ball, Portland. Or.
758,954.—CUT OFF—F. P. Bell, Fairfield, Wash.
758,812.—SLAG CAR—Bennette & Jones, Tacoma, Wash.
758,734.—BISCUIT CAN—C. G. Blickle, S. F.
759,153.—CONCENTRATOR—F. J. Bonnington, S. F.
758,817.—APPLYING INSECTICIDE—Brown & Winship, Seattle, Wash.
758,818.—SHOE SOLE—G. C. Calentine, Tacoma, Wash.
758,744.—WIRE MATTRESS—W. E. Fisher, Seattle, Wash.
758,962.—FOLDING MACHINE—R. B. Friend, Oakland, Cal.
758,642.—TENT—F. H. Gotsche, S. F.
758,911.—CAN SOLDERING MACHINE—J. J. Griffin, S. F.
758,913.—LINK CHAIN—C. G. Hampton, Ryde, Cal.
758,914.—MECHANICAL MOVEMENT—W. Hanson, Calistoga, Cal.
759,109.—FEED CUTTER—W. Houghton, Snohomish, Wash.
759,189.—PLOW—T. J. Hubbell, Pomona, Cal.
758,970.—CLOSET CISTERN—F. Jackson, Oakland, Cal.
758,760.—KEYBOARD—J. H. Kohlmoos Jr., S. F.
759,116.—SLIMING GATE—J. L. Lawrence, Cloverdale, Or.
758,770.—FOLDABLE BASIN—J. W. McCann, Republic, Wash.
759,005.—PARING KNIFE—G. W. McLeod, Tacoma, Wash.
758,767.—GAGE GLASS PROTECTOR—T. Mirk, S. F.
759,000.—VEHICLE WHEEL—W. E. Mitchell, Stockton, Cal.
758,926.—DRILL SHARPENER—D. G. Morgan, Chinese, Cal.
758,846.—FARE REGISTER—S. Paduveri, S. F.
759,011.—GAS GENERATOR—F. E. Pfister, Oakland, Cal.
759,126.—BUSHING—Pfluger & Christensen, Portland, Or.
758,685.—TRANSOM LIFT—B. Phelps, Seattle, Wash.
759,220.—TREATING ORES—L. E. Porter, Los Angeles, Cal.
658,691.—FARM GATE—C. U. & J. L. Reams, Suisun, Cal.
758,940.—WEARING APPAREL—A. Siminoff, Los Angeles, Cal.
758,941.—LOCK—N. B. Stone, Outlook, Wash.
758,874.—TREATING PINE NEEDLES—C. M. & O. C. Terrell, Tarts Pass, Or.
758,946.—ELECTROREATER—E. R. Waterman, S. F.
758,879.—BANJO BRIDGE—C. S. Weber, San Jose, Cal.
759,145.—PUMP—P. M. Wing, Boyd, Or.

Notices of Recent Patents.

Among the patents recently ohtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

AUXILIARY FARE INDICATOR FOR STREET CAR REGISTER.—No. 758,846. May 3, 1904. Felix Paduveri, San Francisco, Cal. This invention relates to a device for use on street cars and the like as an adjunct to the ordinary cash fare and transfer registers and adapted to he operated simultaneously with the latter to give an audible signal at that part of the car where the register signals are not generally heard. The object of the invention is to prevent the continuous and material loss to the companies hy dishonest conductors failing to ring always the correct number of fares.

CAN SOLDERING MACHINE.—No. 758,911. May 3, 1904. J. J. Griffin, San Francisco, Cal. One-half assigned to A. W. Livingston of same place. This invention relates to improvements in apparatus for soldering cans, and particularly polygonal cans. The object of the invention is to provide a machine wherein the cans will he advanced and turned to present the several angles of the cans to the successive acid and solder baths, and especially to provide a machine having a continuous movement in contradistinction to those of intermittent movement commonly in use, whereby the output of a machine may be greatly increased.

DRILL SHARPENER.—No. 758 926. May 3, 1904. D. G. Morgan, Chinese, Cal. This invention relates to a machine for sharpening rock drills, and particularly drills of the type having a hollow shank and radially disposed cutting bits. By this machine all the hits of a drill are fulled or spread and sharpened simultaneously. The numher and character of the dies may he varied according to the number and character of the bits of the drills sharpened. By removing the pin or mandrel and changing the dies the machine is adapted to sharpen ordinary solid drills.

DETACHABLE LINK CHAIN.—No. 758,913. May 3, 1904. C. G. Hampton, Ryde, Cal. This invention consists in the construction of the sides of the links with elongated slots punched through them, said slots at one end having an enlargement and the slots at the other end being adapted to receive the ends of tubular sleeves, which are also formed and hent separately so as to be removable from the side links. The pin connecting the adjacent links passes through the tuhular sleeves and is flattened at the ends to interlock with the narrower portions of the slots of the links with which it is engaged.

Books Received.

During the week three valuahle publications have been received from the United States Geological Survey, viz.: Bulletin 208—The Descriptive Geology of Nevada South of the Fortieth Parallel and Adjacent Portions of California, by J. E. Spurr. This is the result of a geological reconnoissance hy the author and does not purport to be a complete and final dissertation on the subject. It is illustrated hy half-tone engravings and numerous maps and diagrams. Bulletin No. 225, being Contrihutions to Economic Geology in 1903, by S. F. Emmons and C. W. Hayes. It deals with mineral deposits in Alaska, Maine, Vermont, Oklahoma, South Dakota, Utah, California and other States and covers a variety of subjects. Professional Paper No. 12—The Geology of the Globe Copper District of Arizona, by F. L. Ransome. Illustrated with engravings and maps.

Latest Market Reports.

SAN FRANCISCO, May 13, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅞d (standard ounce, 925 fine); New York, har silver, 55¼c, refined (1000 fine); San Francisco, 55¾c; Mexican dollars, 44½c San Francisco, 44¼c New York.

COPPER.—New York: Standard, $13.50; Lake, 1 to 3 casks, $13.50@13.50; Electrolytic, 1 to 3 casks, $13.25; Casting, 1 to 3 casks, $12.87½; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £57 10s spot per ton.

LEAD.—New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, har 5¾c: pig, $4.85. London: £11 17s 6d ℔ long ton.

SPELTER.—New York, $5.25; St. Louis, $5.00; London, £22 5s 0d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.50@27.65; San Francisco, ton lots, 29½c; 500 lbs., 30c; 200 lbs., 30½c; less, 31c; bar tin, ℔ lb., 32½@35c. London, £125 7s 6d spot.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $45.50@46.50, large lots; London, £8 5s 0d; San Francisco, local, $43@44 ℔ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.00c; San Francisco, Plumhers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 50@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.00 @14.35; gray forge, $13.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer hillets, Pittshurg, $23.00@23.00; open hearth hillets, $23.00 @23.00; San Francisco, har, 7c to 12c ℔ lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$16 00@16 50
Foundry Northern 1	14 50@14 75
Northern 2	14 00@14 25
Northern 3	13 50@13 75
Southern 1	14 15@14 40
Southern 2	13 65@13 90
Southern 3	13 15@13 40
Forge	12 40@12 65
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 45@ 1 50
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@28 00
Plates, hoiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 36@ 2 41
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	12 50@13 00
No. 1 cast, net ton	11 00@12 00
Iron rails	16 50@17 00
Car wheels	13 50@14 00
Cast borings	4 50@ 5 00
Turnings	8 50@ 9 00

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the hasic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ℔ bhl. in sacks, 4 sacks to hhl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7¾c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tapo, $3.60 per 1000 feet; douhle tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS.—Cyanide of potassium, 98%-99%, johhing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, hhls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, hhls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, hhl., 49c; cs., 54c; raw, hhl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, hbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in hulk, 14c; Mineral Seal, iron bhls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, hulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in hulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., hhl., 75c; cs., 80c; Neats-foot Oil, pure, hhl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 52@57c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymho, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. hags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 70c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittshurg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

MINING AND SCIENTIFIC PRESS

Whole No. 2287.—VOLUME LXXXVIII. Number 21. SAN FRANCISCO, CAL., SATURDAY, MAY 21, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Chinese in British Columbia.

In British Columbia the owners and operators of the coal mines have again secured a decision of the full bench of the Supreme Court that they may employ Chinese in their mines. A few months ago James Dunsmuir was fined $2000, or $20 for each one of 100 Chinamen employed in his mines, contrary to the provision of the provincial law. This fine was imposed by a magistrate at Nanaimo. The mine owner was allowed to carry a case direct to the court with the above result, the court declaring the legislative act ultra vires (beyond the powers conferred upon the legislators). The Provincial Government will take the matter before the judicial committee of the privy council in London—the last court of appeal. This question was previously taken before the privy council, in another case, and the mine operators won. The legislature at once proceeded to strengthen the coal mines act, making the employment of Chinese a misdemeanor, and now the Supreme Court declares that the legislature has no jurisdiction. Previously, the law applied to all aliens, but now it is directed toward those only who are unable to comply with the simplest regulations as to education, etc., and is directed particularly at the Chinese.

Uniform Nomenclature Needed.

If the nomenclature of mine, mill and smelter were more uniform in the English language, it would be of undoubted advantage to those interested in the business. In different districts in the United States there are found a variety of names for the same object or thing, while in the English colonies and in England, mining terms are so widely different from those used elsewhere as to often leave a doubt in the minds of those who are unfamiliar with these localisms and colloquial expressions, as to what is meant. In some parts of Australia ore is called "stone," in other parts "dirt." In Gilpin county, Colorado, ore is weighed by the cord. In some parts of Utah the output of base ore is stated in pounds, a practice confusing and unwarranted. Hoisting of the United States has become "winding" in South Africa. In measuring water or referring to the amount used, as in concentrating and milling operations, there is great diversity. In one section the number of inches (miner's inches) is given; in another the number of gallons; in still another the cubic feet, and in still other places the quantity is stated in tons per day. Given any of these quantities, one interested can figure out the amount in terms corresponding to those with which he is familiar, and reach a conclusion, when making a comparison of methods, but it seems like a needless waste of time and mental effort. One in time might become familiar with such expressions as "a parcel of stone sent out," when a shipment of ore is meant, and may possibly comprehend the meaning of the statement that "often pieces of the ore weighed two stone," but to those unfamiliar with such expressions they seem odd to say the least. The various mining engineering societies may find in this an opportunity to bring about a change which would make a common nomenclature for all English speaking miners. In these days there is a vast amount of technical literature on mining and ore treatment and the man who wants to keep abreast of the times must read much of it, but he is often hampered by the uncertainty of the names employed and by a lack of uniformity in method of expression.

Old Dominion Smelter, Globe, Ariz.—See Page 344.

THE various representatives of the several gold-dredging companies operating on the Feather river and elsewhere in California have organized what is known as the Dredge Miners' Association, the object of which is to advance and protect the interests of the dredge operators in that State. The dredging industry has grown up from an experiment to one of the foremost branches of mining industry in that State, and those interested in it believe that greater success and possibly greater economy may result from organization.

PRELIMINARY steps have been taken by a number of chemists, assayers and metallurgists of Denver, Colo., to organize the Society of Western Chemists, Assayers and Metallurgists. A temporary organization has been formed at Denver, with F. W. Traphagan, president pro. tem., and H. C. Parmalee, secretary pro. tem. It is proposed, if 100 members enroll, to make the organization permanent.

Old Dominion Mine and Vicinity, Globe, Arizona.—See Page 344.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1164 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MAY 21, 1904.

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Important Legal Decisions.

Judge De France of Colorado has rendered an interesting decision in the case of the Big Five Miniug Co., which sought to condemn a right of way across the Christmas claim, in Spauish Bar mining district, Clear Creek county. The Supreme Court of Colorado has denied all right of tunnel owners to drive through the property of others to reach their veins beyond, but in the iustance above mentioned the Big Five Mining Co. also claims to be a transportation compauy, and, therefore, a common carrier, and consequently in a sense a public utility. In some localities the mine owner has beeu enabled to condemu rights of way from his mine over the surface of the property of others to reach the nearest available means of transportation, by means of what has been legally termed "lateral railroads," but the law recognizing such roads requires that they may be subject to use by others, if required, making them essentially public in character. It has been held that in the case of a mine owuer claiming the privilege to condemu a right of way he cannot do so for the purpose of transporting the product of his own mine only; such use is of a private nature aud not applicable to the law of eminent domain. The law has reference to surface transportation, and it is presumed that iu the decision recently rendered in favor of the plaintiff in the above mentioned case the court considered that the law applied with equal force to tunnels driven for a purpose similar to that contemplated in the law.

Another decision of interest and importance was recently made by the United States Supreme Court in affirming the decision of the circuit court of appeals, in the case of the St. Louis M. & M. Co. of Montana and W. Mayger, appellants, vs. The Montana M. Co. (Limited). In this case the St. Louis Co. owned a patented lode location, adjoiniug a lode claim, also pateuted, owned by the Montana Co. Within the boundaries of the St. Louis claim was a lode other than the discovery vein having its apex within the boundaries of the St. Louis claim, but in its dip passing out of the side line of the St. Louis claim into the Niue Hour claim, owned by the Montana Co. A crosscut was driven 260 feet from the St. Louis vein into the Nine Hour claim to reach the parallel vein referred to. The crosscut run horizontally through barren country rock, and would not intersect any other vein between the two known veins. It was not intended by the St. Louis Co. to extend the crosscut beyond the vein referred to, and only intended to work this vein through the crosscut and workings already made on the discovery vein.

The circuit court enjoined the further prosecution of the crosscut, and the injunction was sustained by the circuit court of appeals of the ninth circuit. The St. Louis Co. appealed to the Supreme Court, which affirmed the decision of the circuit court of appeals. In delivering the opinion of the court, Justice Brewer said, the situation and the question could be easily presented by consideriug the significaut lines as lines of a right-angled triangle; the vein descending on its dip being the hypothenuse, the tunnel the base line, and the boundary between the two claims the side line of the triangle. The St. Louis Co. being the owner of the vein may pursue and appropriate the veiu on its dowuward course, although it extends outside the vertical side lines of its claim and beneath the surface of the adjoining Nine Hour claim, but the court denies the right to work the vein from the veiu lying back of it through the medium of a crosscut. It must be opened by a shaft on the vein from the surface, proving the identity and continuity of the vein throughout, as both identity and continuity of a vein are involved in the exercise of the extralateral right. To just what limitations the owner of a vein must confine himself in crosscutting and working the vein, vein system or zone, can only be determined in each particular case by geological conditions. The law requires that, in following his vein downward, the apex proprietor must keep within it when he has passed beyond the plane of the side line of his property extended downward vertically. He can not crosscut to his vein to reach it. This is the law as interpreted by the Supreme Court of the United States, and the decision above noted iudicates that the court intends to live up to the "spirit and the letter of the law." It seems like a hardship upon the owner of a mine in which there are several veins, as is not uncommon in many places. As a notable instance may be mentioned the Keystone mine in Amador county, Cal., where there are five distinct veins within a short distance of each other, all of which have been extensively worked, mostly through two shafts sunk on one of them, the other veius being reached by cross cuts. If the letter of the law must be observed, it is as reasonable to require that a shaft must be suuk throughout its depth directly in or upon the vein, though in its dip the vein in its downward course may be so sinuous as to make numerous changes of angle in the shaft—a condition at once expensive and undesirable. All miners prefer a straight shaft, and iu the case of an inclined shaft sunk in straight alignmeut aud at a uuiform angle it may have the vein on the hanging wall side part of the way, and part of the way on the foot, and it may be partly in the vein. An iustance may be mentioued where an inclined shaft starts in the hangiug wall country rock 60 feet distant from the vein on the surface. The shaft, being steeper thau the vein, cuts it between 300 and 400 feet. From that point to the 1000-foot level the vein lies in the hauging wall, and at one place the vein is at least 100 feet from the shaft in the hanging and far beyond the boundary of the claim. There are many thiugs in the mining law which seem to require readjustment, but none more so than that of the extralateral right.

A third interesting decision has been hauded down by the Supreme Court of the United States iu the case of the Clipper Mining Co., plaintiff in error, vs. the Eli Mining & Land Co. et al. In this case a placer claim was located in 1877 within what are now the limits of the city of Leadville, Colo. The following year the locators applied for patent. The application was adversed and patent denied, on the grounds that the land was not in fact placer ground. Later a second applicatiou for pateut to a somewhat smaller tract of the same land was made, which was rejected by the Commissioner of the General Land Office, and his decision was affirmed by the Secretary of the Interior. Subsequently—in November, 1890—four lode claims were staked on the alleged placer claims, ou which the owners had regularly performed assessment work. The owners of the four lode locations applied for a patent, when defendants in error—the owners of the placer location—filed an adverse claim. Judgment was rendered for plaintiff by the District Court of Lake county, Colo., which judgment was affirmed by the Supreme Court of Colorado. Thereafter a writ of error was sued out and the case went to the Supreme Court of the United States, which decides that when rejecting the application for patent to the placer claim, as neither the land office, the Commissioner nor the Secretary of the Interior declared the location of the placer claim void, the claim remained in force and was valid—even though the land office may still set aside the claim upon notice aud restore the land to the public domain. But it has not done so, aud, therefore, it is useless to consider what rights other parties might theu have The court says: "Our conclusion, therefore, is that one may not go upon a prior valid placer location to prospect for unknown lodes aud get title to lode claims thereafter discovered and located in this manner, and within the placer boundaries, unless the placer owuer has abandoned his claim, waives the trespass, or by his conduct is estopped to complain of it. * * * Under the authorities, a prospector may not enter upon a prior placer location for the purpose of prospectiug for, or locating, unknown lodes or veins; and to uphold the judgment we must presume that the evidence before the trial court showed that the veins or lodes upon which defendants' grantors based their locations were unknown when they entered upon the Searl placer for the purpose of prospecting."

Another important decision is in relation to failure of co-partners to contribute their proportion of assessment work. The case mentioued was that of W. S. Elder, administrator of the estate of R. Wilsey et al., vs. Horseshoe Mining Co. et al. of South Dakota. Wilsey and one C. H. Havens located a claim in the Bald Mountain district, 7 miles south of Deadwood, S. D., in 1878. Shortly thereafter Wilsey died, but Havens continued to do assessment work for eight years, when he served notice on the heirs of Wilsey demanding their share of the expenses in performing the work—$400. They paid nothing and neglected to take advantage of this opportunity to secure their original half interest in the property, and subsequently, in 1889, Havens advertised them out. Later, methods of successfully treating the telluride ores of that section having been discovered, the claim increased rapidly in value. In December, 1893, the heirs of Wilsey offered to pay their share of annual assessment from the date of location of the claim, which offer was refused. Havens then sold the property, and the heirs of Wilsey sued for au undivided one-half interest in the claim. The District Court decided in favor of plaintiffs, but the decision was reversed by the Supreme Court of South Dakota The case being carried to the Supreme Court of the United States, the judgment of the Supreme Court was sustained. The fact that a teuder was made in settlement after being dispossessed of their iuterest by legal process was giveu no consideration, and the claim of plaintiffs that no names were mentioned in the publication of the notice was declared by the court to have no force, and that the names of the heirs were not necessary. The notice was addressed to "Rufus Wilsey, his heirs, administrators and to whom it may concern." The claim of plaintiff that at the time of publication of the notice there was no administrator of the estate, the former administrator having died and his successor not having been appointed, was equally unavailing.

IT is stated in Wall street that a large portion of the money realized by the Japanese loan recently negotiated is for the purpose of buying silver, presumably for coinage with which to pay the soldiers and to defray such other expenses as may be paid for with silver during the war with Russia. Japan, it is said, has recently bought 2,000,000 Mexican dollars. Should the war continue for some time longer it cannot fail to have a direct effect upon the mining industry of the United States. Under the circumstances both silver and copper, and possibly also lead, may be expected to advance somewhat in price under the continued demand for those metals by both Japan and Russia.

CONCENTRATES.

THE certificate of location is the basis for a mine patent, and the monuments on the ground determine the outline of the claim. Errors in the survey are subject to correction.

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LEAD POISONING from working in dry carbonate mines cannot be cured except by cessation of such work. But as an antidote or preventive it were well to drink water, in each quart of which is two drops of sulphuric acid.

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MEN can work in caissons under an air pressure of upwards of fifty pounds per square inch without feeling any immediate ill effects, but the lives of men who work continuously under such conditions are known to be shortened thereby.

✤✤✤✤

MACHINE DRILLS furnish a certain amount of fresh air to underground mine workings, but it is an expensive method of ventilating a mine. Ordinary rotating ventilating fans give more satisfactory results and are a more economical means of ventilation.

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THE first dredging operations in California, of which there is any record, were in 1850, on Ousley's bar on Yuba river. But successful dredging was not carried on in that State until the '80s, though dredging was employed in New Zealand twelve to fifteen years previous.

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MINE SAMPLES are of little practical value unless the width of ore represented by the sample, in feet or inches, be also taken. A hand specimen affords little information that is reliable, as it represents only that particular piece of rock, and a doubt remains as to how much more of the same kind is in the mine.

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THE theory that petroleum oil only occurs in the crest or dome of anticlinal folds may have a tendency to keep prospectors from testing formations not having this assumed prerequisite condition. Oil is not known to occur in large amount in synclinal folds, but it has been found abundantly where the strata lay horizontal or nearly so.

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THE assay of battery samples in a quartz mill is not as important as the assay of tailings. If all, or nearly all, of the values are saved, as shown by tailings sample assays, then the value of headings is also known. It is necessary, however, to have mine sample assays to avoid sending rock to the mill having too little value to pay for milling.

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THE iron black water-worn rock from Yukon basin, Alaska, is hard hematite, a variety of iron ore. It has evidently been carried by the water some distance from the place where it originated in the rocks. Ore of this character occasionally contains gold. The common name by which it is known by placer miners is "iron rock." It contains no tin.

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IN a case where final payment has been made on a mine patent and receipt issued by the Receiver of the Land Office therefor, this is equivalent to and just as good as a patent unless the Land Office returns the money and for stated cause refuses to issue the patent applied for. Assessment work may cease on a claim when final payment has been made.

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IN Mexico the vara is a yard—3 Spanish feet, or 32⅞ English inches. In Mexico most land measurements are made by the metric system. A pertenencia is the unit of a mine concession. It is 100 meters square on the surface, but is of indefinite depth—to the center of the earth. There are no extralateral rights in Mexico. The boundaries of the claim limit mining operations to their planes extended downward vertically.

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AN ordinary rectangular ore skip may be converted into a baling skip by cutting an aperture in the bottom and providing it with a hinged valve, having a rubber or leather gasket. In an inclined shaft the hinges should be placed on the upper side, or otherwise the valve may be thrown back so far as not to close when the skip is raised. Valves are sometimes fitted with springs or back stops to keep them from overturning when the skip is filling with water.

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IT is the aim of Concentrates to answer questions relative to the economies of mining and metallurgy and cognate sciences: mining law and questions concerning geology and mineralogy. All questions should be as clear as possible, that it may be known what is wanted. Questions cannot always be answered in the issue following their receipt, as it is sometimes necessary to wait some time to secure an answer, and also because other questions previously received take precedence.

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A DRY RETAINING WALL in a mill is all right if properly built, and if the ground back of it is not too loose or likely to produce too great a pressure against the wall. In selecting a site for a mill on a hillside where terraces are to be cut for the several floors of the mill, it is unwise to choose a site where the rock pitches from the hill toward the mill, as the removal of rock to form the terraces weakens the support of the rock strata and during a wet season a landslide may result, which a retaining wall of any kind may be unable to obviate.

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TINSTONE is usually associated with tourmaline in some form. In the South Dakota tin veins the tourmaline (mostly black) occurs in the form of distinct crystals of all sizes, from fine needle-like prisms to large three-sided crystals having curved faces, often a foot or more in diameter. In the southern California deposits near Corona, Riverside county, a mass of fine needles of black tourmaline is usually the matrix of the cassiterite. In the Australian tin mines tourmaline is of frequent occurrence. The appearance of tourmaline is not an index of the presence of tinstone, though so frequently associated with it.

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A SHAFT may be sunk diagonally on the vein for the purpose of following the downward trend of the ore shoot. This is an idea not often attempted, but has been successfully followed out in a number of instances. A notable instance is that at the Idaho-Maryland mine near Grass Valley, Cal., where a shaft was sunk on the vein from the surface at an angle of 65° to the point where the ore shoot is encountered where it turns off at an angle of 40° on the shoot. It may be considered an economical method of prospecting, but is not recommended for extensive mine operations.

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THE so-called Potter sulphide process consists in treating tailings or crushed ores containing sulphides of the base metals with a dilute solution of sulphuric acid, which is heated to the boiling point, when it is claimed that small bubbles form and attach themselves to the small particles of sulphide mineral present, rising with them to the surface, when they are removed. Salt cake (sodium sulphate, $Na_2 SO_4$) is also present in the solution. It is also claimed that by proper manipulation a differentiation of sulphides can be secured, due to the fact that some sulphides are more quickly attacked than others, zinc blende being the first to rise.

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THE magnetic needles which do not work well, being sluggish, have probably become demagnetized. The magnetism may be restored by drawing the north pole of a common magnet (either one of horseshoe shape or a straight one) a dozen or more times along the needle from the center to the end of the south half and the south pole of the magnet along the north half. After each stroke remove the magnet several inches from the needle. Do not bring a magnet near the needle when it is in position on the pivot, as it interferes with its accurate working and may even cause the north pole of the needle to become the south pole, though in time the needle will assume its true position.

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THE relation of air pressure at the compressor and at the drill in the mine is influenced by the distance the machine is from the compressor, the amount of leakage between the two points and the difference in temperature of the air at the compressor and at the drill. A compressor which is discharging air at ninety pounds pressure per square inch should result in a pressure of seventy-five pounds at a machine 2000 feet from the compressor without reheating, if there are no leaks of consequence in the mine. It is not economy to put in a pipe line of too small diameter between the compressor and the drills in the mine. The friction in small pipes—less than 3 inches inside diameter—is too great for economy and results in greatly reducing the efficiency of the air.

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THE oil wells of California have a wide range of altitude. Those at Summerland, in Santa Barbara county, are at sea level, and some actually below it, the wells being started from a pier extending out into the ocean. The highest are in the Timber Mountain and Sulphur Mountain districts, in Ventura county, at an altitude of 2500 feet. The shallowest producing well is 260 feet deep. One well in Santa Barbara county, in Lompoc district, is 2500 feet deep and is reported producing 350 barrels daily, and one in Orango county, at Fullerton, is 2404 feet deep and produces 300 barrels daily. The heaviest producer reported is at Coalinga, Fresno county. It is 1020 feet deep and produces 1200 barrels daily.

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A NORMAL SOLUTION is one containing in one liter the equivalent of one gram of hydrogen. When standard solutions are to be prepared, in which the active reagent cannot be weighed in an absolutely pure state, it is customary to dissolve a little more than the amount of the reagent than that which is theoretically necessary and make up one liter, determining the strength of the solution by titration, employing a positive standard. The quantity of water to be added then can be calculated to make the solution of exact strength. The solution may be diluted to 1050 cubic centimeters, and then 50 c.c. taken for determining its strength, leaving 1000 c.c. (1 liter) to be diluted to bring the solution to exact strength. A normal sulphuric acid consists of hydrogen 2 parts, sulphur 1 part, oxygen 4 parts. The respective atomic weights are hydrogen 1.00, sulphur 31.83 and oxygen 15.88, making a total in the compound of 97.35, or 48.675 grams to one liter.

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BISMUTH is not mined extensively in the United States. The reported production in 1901 was about 318 tons and in 1902, 375 tons, worth about $87 per ton at the place of production, Colorado. The State ore sampling works at Denver has been a buyer of bismuth in the past. Johnson, Matthey & Co. of London, England, are buyers. Bismuth is often associated with silver, gold, tin, cobalt and other minerals. Bismuth is obtained from low-grade earthy material containing it by heating in inclined tubes or pipes placed over a charcoal fire. The metal, owing to its low fusing point, flows out from the crushed material, runs down the inclined pipe and falls into pots placed there to receive it. By wet method bismuth oxychloride is obtained by treating finely pulverized bismuth ore in tanks having filter bottoms, with a solution of common salt, saltpeter and sulphuric acid. The liquor flows through a series of vats, which results in the formation of a concentrated solution of bismuth, which passes to a vat where it is diluted with water, and the precipitate collected, dried and smelted into metal. Bismuth has the property of lowering the fusing point of alloys, in some cases to a lower point than that of either of the metals composing the alloy.

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THE magnetic north varies with every change of position along an east-west line. The lines of variation are not straight like the meridian lines, and, moreover, they are slowly changing at every point. Lines of abrupt variation are roughly coincident with the trend of mountain ranges. In the United States the line of no variation is far from straight, though it has a general trend to the west of north. It enters the country from the southeast, near Charleston, S. C., passes through eastern Tennessee and Kentucky, through Ohio and Michigan and northward into Canada. The variation in southern California is about 15° east of north; in Oregon, about 20° east of north; in the Lake Superior copper region, about 2° east of north. In addition to this magnetic variation the magnetic needle is also influenced by iron, magnetite, etc., in the rocks and in mines. For this reason surveying in and about mines with the needle is unsatisfactory. There are other causes which influence the magnetic needle, electric storms, etc. In the United States the annual change in direction of the needle is from five to fifteen minutes, the declination becoming more westward. True north can be ascertained in the northern hemisphere by observations of Polaris (the north star) taken at the proper time.

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CORPORATIONS (mining or otherwise) organized under the laws of another State or Territory, or of a foreign country, which are now doing business in the State of California, or maintaining an office in that State, must file in the office of the Secretary of State of California a certified copy of their articles of incorporation, or a copy of their charter, if a chartered company, and a certified copy thereof, duly certified by the Secretary of that State, in the office of the county clerk of the county where its principal place of business is located, and also where such corporation owns property. Failure to comply with the requirements of the law as above indicated when commencing operations subjects such company to a fine of not less than $500. It is the duty of the Secretary of State when advised that any corporation has failed to comply with the law in this regard to inform the Governor, who shall instruct the district attorney of the county wherein such corporation has its principal business, or the Attorney-General of the State, or both, as soon as practicable, to institute proceedings to recover the fine provided for. The foreign corporation must also designate an agent who shall be its legal representative in the State upon whom all legal processes, etc., may be served. The mere selling of stock cannot be considered as actual operation, as that is not supposed to be the sole purpose for which the corporation was created.

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IN taking samples from a diamond drill hole, where the material being cut through is soft and affords no core, as is often the case in soft slate and schist, or friable granular rocks, it is essential that the sample can placed under the pipe be not permitted to overflow. As often as it becomes full it should be removed and another can placed in its stead. All of the material coming from the hole must be saved, the water allowed to settle and the greater part poured off when clear. The balance is then filtered or evaporated and the sample for assay taken from all of the sediment resulting from the operation. If the can is allowed to overflow the sample is either impoverished, as is likely to be the case if the values are associated with tellurides, or enriched, if values are in sulphides. Where solid cores are obtained these represent almost exactly the rock being drilled through, the only loss being where the rock occasionally breaks off in joints. While the drillings which are carried out with the water do not afford an absolutely reliable knowledge of values, it has been found that they will average up fairly well. This is due to the fact that the material being cut will be distributed throughout the length of the drill hole, often several hundred feet in length, and the heavy particles will have a tendency to cling to the rough surfaces along the lower side of the bore hole, but it is all eventually washed out. If a rich, narrow streak is cut by the bit several hundred feet from the beginning of the hole, and a wider barren streak follows it, if no core is produced, the slow progress of the drillings from the bit backward to the mouth of the hole may lead inexperienced drillers to believe the wider streak to be the one carrying the values, particularly in the case of free gold, which washes out slowly. Diamond drilling is work requiring experience and care, and the work, to be of value, should be in competent hands.

Concentration of Low-Grade Copper Ores.

NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by W. J. ADAMS, E. M.

GRADE No. 2.—This grade had an approximate assay value of 2.9% of copper.

FIRST SERIES.—Taken 11.67 kilos, crushed dry to pass a ¼-inch mesh screen. Speed of jig, 350 revolutions a minute, with throw of eccentric ⅝-inch, and an artificial bed of lead shot. This parcel assayed 2.682% copper, or 53.646 pounds copper in each ton.

JIGGING.

CLASS.	Assay Copper Per Ton, %	Per Cent Weight Saved	Pounds Copper Per Ton Saved Referred to Ore	Per Cent Copper Saved Referred to Ore
Hutch	6.42	3.770	4.840	9.022
Bed	8.50	7.540	12.818	23 893
Middlings	4.50	10.968	9.871	18.400
Tailings	0.90	60.840	16.913	31.527
Slimes	3.70	14.653	9.204	17.157

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay Copper Per Ton, %	Percentage of Weight Saved.	Per Cent of Copper Saved	Per Cent of Copper Lost
Jig Concentrates:				
Hutch	6.42	3.770	9.022	.....
Bed	8.50	7.540	23.893	.....
Oil Concentrates:				
Middlings	10.46	30.1% of 10.968% = 3.300	12.465	.....
Tailings	8.00	11.324% of 60.840% = 6.890	19.994	.....
Slimes	6.80	5.204% of 14.653% = 0.760	1.933	.....
Final Tailings:				
Middlings	1.35	.....	.....	5.935
Tailings	0.55	.....	.....	11.532
Slimes	2.94	.....	.....	15.224
Totals	.....	22.26	67.307	32.691

In the individual steps of the oil conceutration there were saved from each class as follows:

From one ton of middlings.....67.743%
From one ton of tailings.....63.420%
From one ton of slimes.....11.266%

Here the tarnishing of the mineral is very strongly shown, and is proved by the tests in the other two series.

SECOND SERIES.—In this the parcel of ore weighed 2 kilos and assayed 2.77% copper. It was crushed dry to pass a screen of 30 mesh, was then thoroughly moistened and fed to jig, into which had been placed the artificial bed of lead shot. The middlings were treated with oil without drying; and the sand and slimes of tailings were mixed together, aud after siphoning off the clear water were also treated by oil.

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay Copper Per Ton, %	Percentage of Weight Saved.	Percentage of Copper Saved	Percentage of Copper Lost
Hutch	4.10	25.00	36.939	.....
Bed	6.90	4.75	11.802	.....
Oil concentrates from middlings	3.25	6.79	7.951	.....
Oil concentrates from tailings	6.57	13.75	32.555	.....
Tailings of middlings	0.38	.....	.....	2.944
Final tailings	0.76	.....	.....	7.806
Totals	.....	50.29	89.247	10.750

The oil was cold and viscous and it absorbed an excess of gangue, which materially reduced its value in copper content.

THIRD SERIES.—In this the parcel of ore weighed ½ kilo, or 500 grams, and assayed 2.659% copper, was crushed to pass a screen of 30 mesh, and was treated by oil direct.

CLASS.	Assay Copper Per Ton	Percentage of Weight Saved	Percentage of Copper Saved	Percentage of Copper Lost
Concentrates	4 50%	56	92.89	.....
Tailings	0.43%	..	.....	7.11

Again the oil was cold and viscous and the concentrates coutained an excess of sand, while the same objections apply to direct application of oil on this grade, as were stated to exist in that of the poorest grade, No. 1.

GRADE No. 3.—This grade had an approximate assay value of 3.8% copper.

FIRST SERIES.—Taken 10 kilos, crushed dry to pass a ¼-inch mesh screen; speed of jig 350 revolutions a minute, with throw of eccentric ⅝-inch, and an artificial bed of lead shot. This parcel assayed 3.8% copper, or 76 pounds copper in each ton.

The middlings from jigging carried so much sulphurets that they were crushed after drying to pass a screen of 30 mesh; were then rejigged, and the operation of oil concentration carried on as previously, but the speed of jig was increased to 400 revolutions a minute, and the throw of eccentric was reduced to ⅜-iuch.

The surface of the tailing tank was bronzed with chalcopyrite, but through the siphoning of the water none of this was lost.

JIGGING.

CLASS.	Assay Copper Per Ton, %	Per Cent of Weight Saved.	Pounds Copper Per Ton Saved Referred to Ore	Per Cent Copper Saved Referred to Ore
Hutch	7.00	2.5	3.500	4 605
Bed	11 00	9.8	21.560	28.368
Middlings	4.50	18.6	16.740	22.026
Tailings	1.87	51.0	19.074	25.097
Slimes	4.56	16.6	15.139	19.908

MIDDLINGS JIGGING.

CLASS.	Assay Copper Per Ton, %	Per Cent of Weight Saved.	Pounds Copper Per Ton Saved Referred to Middlings	Per Cent Copper Saved Referred to Middlings
Hutch	6.00	14.444	17 333	19.258
Bed	9.46	11.111	21.022	23.357
Middlings	2.81	30.000	16.860	18.733
Tailings	3.03	44.444	26.933	29.925

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay Copper Per Ton, %	Percentage of Weight Saved	Percentage of Copper Saved	Percentage of Copper Lost
Jig Concentrates:				
Hutch	7.00		2.500	4.605
Bed	11.00		9.800	28.368
Second Hutch	6.00	14.444% of 18.6% =	2.686	4.242
Second Bed	9.46	11.111% of 18.6% =	2.066	5.145
Oil Concentrates:				
Tailings	6.83	10.684% of 51% =	5.448	10.587
Slimes	9.27	7.340% of 16.6% =	1.218	2.996
Middlings	11.77	14.58% of 30% of 18.6% =	0.813	2.403
Second Tailings.	10.59	5.02% of 44.444% of 18.6% =	0.135	4.914
Final Tailings:				
Tailings	1.00	.....	.....	14.509
Slimes	3.84	.....	.....	16.911
Middlings	1.23	.....	.....	1.723
Second Tailings.	2.85	.....	.....	5.530
Totals	.....	.....	24.666	63.250 38.673

In the individual steps of the oil concentration there were saved from each class as follows:

From one ton of tailings.....42.186%
From one ton of slimes.....15.050%
From one ton of middlings.....58.240%
From one ton of second tailings.....16.420%

As far as could be observed, the priucipal losses, outside of the 0.3% locked up in coarse sand, was entirely tarnished mineral, as this could be detected by the eye, but which, with the greatest persistency, could not be made to adhere to the oil.

SECOND SERIES.—In this the parcel of ore weighed 2 kilos and assayed 3.54% copper. It was crushed dry to pass a screen of 30 mesh, was then thoroughly moistened aud fed to jig into which had been placed the artificial bed of lead shot. The middlings, and sand and slimes, were separately treated without drying by oil, after siphoning off the clear water.

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay Copper Per Ton, %	Percentage of Weight Saved.	Percentage of Copper Saved	Percentage of Copper Lost
Hutch	8.20	17.00	39 389	.....
Bed	9.10	6.00	15.428	.....
Oil concentrates from middlings	3.80	7.50	8 053	.....
Oil concentrates from tailings	5.50	18.50	28.751	.....
Tailings of middlings	0.50	.....	.....	2.965
Final tailings	0.65	.....	.....	5 411
Totals	.....	49.00	91.621	8 376

THIRD SERIES.—In this the parcel of ore weighed 460 grams and assayed 3.358% copper. It was crushed to pass a screen of 30 mesh and was treated by oil direct.

CLASS.	Assay Copper Per Ton, %	Percentage of Weight Saved.	Percentage of Copper Saved.	Percentage of Copper Lost
Concentrates	6.00	51 087	91.26	.....
Tailings	0.60	.....	....	8.73

In the trials on several other grades higher in copper there was no material differeuce in the results arrived at; practically the same percentage of copper was locked up in the coarse sand and the concentrates were richer, owing to a deeper bed and less proportion of iron pyrites in the ore; but in reality, it became only a question of repetition, and a steady gain of percentage saved, owing to the increased skill acquired by each succeeding test.

After all the grades had been separately treated, every point studied and the difficulties, as much as possible, overcome, a final and conclusive test was made with 5 kilos of ore of about No. 2 grade, which assayed 2.32% copper.

The initial operations of crushing and jigging, and non-desiccation of the middlings and tailings, were the same as in the previous operations; but the oil concentration was that which would be employed in actual practice of three applications only, and with no experimenting throughout the entire test; so that the results can be relied on as proving the percentage that can be saved at the very poorest handling of the ore, as with jigs, for instance.

JIGGING AND OIL CONCENTRATION.

CLASS.	Assay in Copper, %	Percentage of Weight Saved.	Percentage of Copper Saved.	Percentage of Copper Lost.
Hutch	4.92	4.40	9.355	.....
Bed	7.81	5.50	18.563	.....
Oil concentrates from middlings	8.66	4.80	17.963	.....
Oil concentrates from tailings	9.00	6.20	38.893	.....
Tailings of middlings	0.60	.....	.....	1.907
Final tailings	0.47	.....	.....	13.608
Totals	.....	20.90	84.774	15.215

In other words, the ore was reduced from five tons to one, with a total saving of 84¾%, and the concentrates were not only freed from a rebellious and barren gangue, but they were capable of direct and cheap smelting. There was still locked up in the gangue at least 0.4% of copper, which could be freed and saved if the cost of the process would warrant a crushiug through a finer screen of, say, 50 or 60 mesh.

These deductions are borne out by the official facts of the plant established last November at the Le Roi No. 2 mine at Rossland, B. C., where an ore from the dumps, only carrying 0.75% copper, was crushed to pass a 60-mesh screen, and after rapid concentration on tables was treated by oil with a final loss of only 0.1% copper.

(TO BE CONTINUED.)

The Mines of Globe District, Arizona.*

From a Staff Correspondent.

In Globe mining district the Old Dominion Co. is working to its full capacity iu both mine and smelter, and also carrying forward extensive additions to its works. Its new shaft of six compartments, including a manway, is down several hundred feet. It is equipped with a modern hoist and steel gallows-frame, situated 600 feet west of the old shaft. A 1500-gallon pump will be installed on the tenth level and two 750-gallon pumps on the fourteenth level. A modern smelter is being built, with three stacks 42x 180 inches in the clear; also two stands of converters in connection with it. A dust chamber is being constructed with a self-supporting steel stack 14 feet in diameter and 200 feet high. A concentrator of 300 tons daily capacity will be built and will be in operation by fall, and the new smelter will be in operatiou by July. The old plant is turning out 25 tons of copper per day. The illustrations on the front page show the surface works of the mine and the smelter of the Old Dominion Co.

A new power house is iu course of construction, having four boilers of 300 standard H. P. A 500 H. P. engine beltcd to the main shaft runs an electric motor. There are two blowers and two modern converter blowing engines, which supply 3500 cubic feet of free air each per minute; also a 200 H. P. tandem compound steam engine direct connected to a No. 9 blower.

The consolidation of the Old Dominion and United Globe properties is in statu quo in the courts.

Adjoining the Phelps-Dodge property are three claims owned by the Arizona Commercial Co., known as the Copper Hill group, of which W. S. Sultan is superintendent and P. Rose foreman. It has been closed since October last and it is uucertain when its owners—S. W. Fay of New York president—will resume operations. There is a 600-foot shaft on the property and a 1000-foot tunnel, with 3500 feet of drifting.

Northeast of this are six claims of the Iron Cap M. & M. Co., with a shaft 118 feet deep and considerable supplementary work. G. H. Way of Globe is president and manager. Nothing is being done at present.

Buffalo Mountain C. & G. M. Co. occupies the summit and northern slope of that mountain with thirteen patented claims. It lies 1000 feet from the Old Dominion shaft. Ten thousand dollars worth of work has been done, but it is uow idle, pending a sale.

J. F. Hechtman of Globe is president and manager of the Globe M. Co. The property is 2½ miles from Globe and includes twenty-two claims known as the Mineral Farm group. It is traversed by iron dikes. Between two of these a shaft has been sunk 170 feet and will be continued to 500 feet. The same company owns a group of seven gold claims 6 miles south of Globe, in the Pinal mountains, called the Eagle Pass

*See illustrations on front page.

group, which it will develop. A gold-bearing ledge from 2 to 20 feet wide outcrops from the bottom of a canyon to an elevation of 2000 feet on the length of four claims.

R. M. Force controls the Arizona Copper Belt G. M. & M. Co., 3 miles from Globe. There are twenty-one claims, all of which have been prospected. There is one incline shaft 153 feet and another double-compartment shaft 200 feet, now in ore. The ore is red oxide of copper and carries values in gold and silver. The property is well equipped and development work is being carried forward. Mr. Force has recommended the installation of a smelter.

The Black Oxide group, owned by P. Rose, consists of ten claims lying east of the Copper Hill. There is a 300-foot tunnel and other development.

An important property adjacent to the Old Dominion is the Globe-Boston Copper Co., locally known as the Mallory group. Geo. Andrus of Globe, deputy United States mineral surveyor, is superintendent and R. L. Bell foreman. They have a hoisting plant and considerable work has been done.

Work will start soon on the Old California, owned by Lyman C. Woods Co. It has copper and silver-bearing ore in the 300-foot tunnel and there is a 65-foot shaft on the property. Mr. Woods is manager of the Copper King and Copper Queen, lying north of the Old Dominion.

The Black Warrior mine, 6 miles west of Globe, has a large plant, which appears not adapted to the ore. A large sulphuric acid plant stands above the leacher and smelter and the acid for the process was made on the ground. Mr. Niles, the superintendent, is in Mexico. It is stated that development work will be resumed.

South of the Black Warrior is the Pinal Copper Co., in charge of Chas. W. Slack.

South of this is the Keystone mine, owned by Finletter & Harvey. It contains a large deposit of chrysocolla. It occurs in a fissure vein. On the upper levels the vein was 2 feet wide, with occasional larger chambers, and the ore averaged over 20% copper. As depth is attained the vein widens and carries about 15%, and on the 300-foot level there is a 10-foot vein. The ore is hauled to the Old Dominion smelter. About $45,000 worth of ore has been taken from the mine. It is trammed out of a tunnel and then packed on burros 1 mile and rehandled. The owners are planning to install reduction works, in case the property is not sold.

West of the Black Warrior is the Lost Gulch group, owned by E. F. Kellner. Considerable work is being done and the stamp mill on the property is being overhauled and will be started some time in June.

Up this gulch 1 mile is the Kasser G. M. Co., twelve claims, owned by an Eastern company, of which J. J. Gibbons of New York is president. A stamp mill stands on the property. Prospect work is being done by G. W. Hamilton, the foreman.

Aside from its ore deposits, there is, some 8 miles north of Globe, a deposit of marble-onyx, owned by H. F. Sanders and N. Hackney, that may assume importance. It is variegated in color.

Globe, Ariz., May 1.

It has been announced that the electric currents which naturally play around the summit of Pike's Peak, Colo., are to be gathered by collecting devices in the form of lightning rods on the poles of an electric railroad, conducted to some central point and stored for use in running the cars of the road. The promoters of this novel scheme do not explain how this is to be accomplished, and electrical engineers do not view the proposition with confidence. Should the "thing work," there are many places where this free power can be similarly controlled and applied to useful purpose. The electrical displays in the Black Hills of South Dakota during the summer months are often terrific, and enough "electro-motive force" could be stored during a single night in June or July, when a storm is raging, to run all the mining and milling machinery in the Hills for a year—if it works.

Mill Construction, Milling and Amalgamation.*

NUMBER IV.—CONCLUDED.

Written by I. ROSKELLEY.

SCALING PLATES.—Worn out plates, before being cast aside, are scaled to get all the gold from them. The process of scaling is as follows: One-half pound sal ammoniac is mixed thoroughly with one-half pound niter and one-half pound spirits of salt, and a pint of water is added. This mixture is applied to the plate with a soft brush, and the plate is allowed to stand for about fifteen minutes. Afterwards the plate is heated over a good fire. When it has become quite black, which will be in about half an hour, it is dipped into a bath of water, when the scaling can be washed off. Some millmen drive off the mercury before applying the above mixture; others do so afterwards. Should all the scaling not come off, the parts needing it are treated over again. The scalings are afterwards collected and mixed as follows: One part scalings, one part sulphur, one part borax and one part sand. This is melted in a crucible and the gold extracted.

MILL SAMPLES.—Two samples should be taken in the mill—one before the pulp passes over the plates and another when it leaves the mill. The first, if properly taken, should show the value of the rock crushed, and the latter should indicate the value of the pulp leaving the mill, and the two together should show the extraction on the plates. Undoubtedly, the proper place to take the first sample is at the screen. I find that the sample obtained in the following manner is very near the actual extraction. A sheet iron lip, about an inch wide, is bolted to the bottom of the screen to carry the pulp clear. Each shift is supplied with an enamelled bucket with a cover, and an enamel sample tin 1 inch wide, 1 inch deep and 12 inches long, with a handle at one end.

This tin is taken the full length of the screen under the lip once every hour, and the contents are placed in the sample bucket. The contents are assayed separately daily. Each shiftman has his own bucket and tin, so that should a careless sample be taken the offender can be readily detected. When I mentioned this method of sampling in this society some time ago it was suggested that, although it was a sample of the screen pulp, it was not a sample of the ore brought to the mill, since an appreciable quantity of free gold would remain in the sands in the mortar box. This objection I have not found a real one, for when the mortar boxes are cleaned out after three months' running, the sands are but little richer than those which pass over the plates.

The sample taken at the bottom of the plate is obtained in the same way as the screen sample.

In the foregoing notes I have sketched briefly the chief points in mill construction and milling, and in conclusion I should like to emphasize a few of them.

In the construction of a mill it is attention to the details that we require. Some of the improvements I have mentioned may to an outsider seem somewhat trivial, but the cumulative effect of these small defects is great, and causes enormous waste of time and labor.

I would emphasize the necessity for thorough work on the part of the rock crushers, for however good the work done in a mill, it is to a great extent hidden and does not show itself in high crushing capacity if the rock crushers are neglected. In amalgamating, I consider outside amalgamation, pure and simple, has proved itself to be as good as, if not better, than any other method in gold extraction, and to be the method in which losses of all kinds are reduced to a minimum.

Whether crushing should be done in one or more stages is a question which should be taken up experimentally and settled at once. As has been already pointed out, the present, when many mills are not running at their full capacity, is the time for this, so that when labor comes and we are all doing full work, we may have the assurance that nothing is lost through old time methods.

And, finally, I would emphatically state as the result of milling experience that when cyanide is used in the mill every precaution should be taken to most carefully conserve the plate dressings and thus prevent any contamination of the mill water.

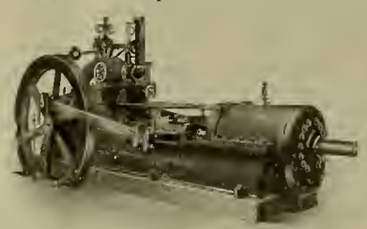
*Abstract Trans. Jour. Chem. Met. and Min. Soc., S. A.

Hudson River Tunnel.

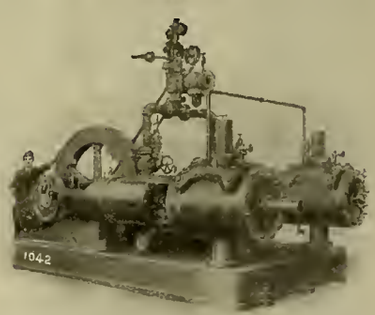
While several other tunnels are in the course of construction under the Hudson and East rivers to connect New York with its neighbors, the completion of the original so-called "Hudson River" tunnel under the charge of Chief Engineer C. M. Jacobs has attracted unusual attention, for, from the start compressed air was used, not only to operate the rock drills, but to hold back the sand and mud and overcome the obstacles, which made subaqueous tunneling so hazardous. The consequent developments of the shield method, in which compressed air is essential, came as the tunnel advanced, and the methods which proved successful in this instance have since been adopted for other undertakings of a similar nature to meet the requirements of the work.

When the Hudson Improvement Co. began operations two years ago, Ingersoll-Sergeant compressors were installed and have supplied the air necessary in the headings on both sides of the river.

There are two power houses, one in Jersey City and the other in New York. The Jersey City power house contains four compressors, one of the class H



Straight-Line Type of Compressor Used in Hudson River Tunnel Work.



Ingersoll-Sergeant Compressor, Duplex Type.

duplex type, with steam cylinders 16 inches in diameter, duplex air cylinders, 20½ inches in diameter by 16 inches stroke, and three of the class A straight line type, with 22 inches steam cylinders and 24 inches stroke. Of the latter, two have air cylinders 26¼ inches in diameter and the other with an air cylinder 22¼ inches in diameter.

The equipment at the New York power house includes two duplex class H compressors, similar in size to the one at the Jersey end of the tunnel, and one straight line class A machine with steam cylinders 22 inches in diameter, air cylinders 22¼ inches in diameter and 24 inches stroke. These machines are being used in building the second bore, which is to be parallel to the other.

The New Camp of Goldfields, Nevada.—See Page 354.

Concrete in Mining and Metallurgical Engineering.*

NUMBER V—CONCLUDED.

Written by H. W. EDWARDS.

CONCRETE STRUCTURES.—In the construction of concrete flues for work 4 inches in thickness and under, I recommend the use of rock or slag crushed to pass through a 1.5-inch ring. Although concrete is not very refractory, it will easily withstand the heat of the gases from a set of ordinary lead or copper smelting blast furnaces, or from a battery of calcining or roasting furnaces. I have never noticed that it is attacked in any way by sulphur dioxide or other furnace gas.

DUST CHAMBERS.—Shapes the most complicated can be constructed of concrete. The least suitable design, so far as the construction itself is concerned, is a long, wide, straight-walled empty chamber, which is apt to collapse, either inwards or outwards, and, although the outward movement can be prevented by a system of light buckstays and tie rods, the tendency to collapse inwards is not so simply controlled in the absence of transverse baffle walls. The tendency, so far as the collection of mechanical flue dust is concerned, appears to be toward a large empty chamber, without baffles, etc., in which the velocity of the air currents is reduced to a minimum and the dust allowed to settle. In the absence of transverse baffle walls to counteract the collapsing tendency, it seems best to design the chamber with a number of stout concrete columns at suitable intervals along the side and end walls—the walls themselves being made only a few inches thick with woven-wire screen or expanded metal buried within them. The wire skeleton should also be embedded into the columns in order to prevent the separation of wall and the columns. This method of constructing is one that I have followed with very satisfactory results as far as the construction itself is concerned.

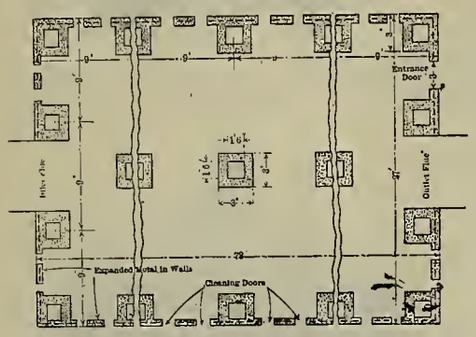


Fig. 2. Concrete Dust Chamber for Smelter at Sudbury, Ontario.

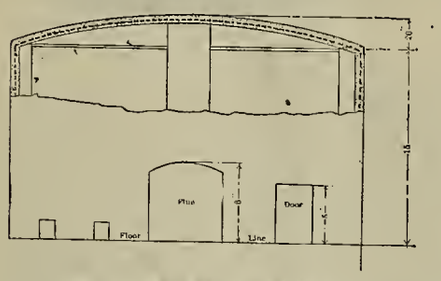


Fig 3.—End Elevation of Fig 2.

Figs 2 and 3 show a design for the smelter at the Murray mine, Sudbury, Ontario, in which the columns are hollow, thus economizing concrete material. For work of this kind the columns are built first and the wire netting stretched from column to column and partly buried within them. The crib is then built on each side of the netting, a gang of men working from both sides, and is built up a yard or so at a time as the work progresses. Doors of good size should be provided for entrance into the chamber, and, as they will seldom be opened, there is no need for expensive fastenings or hinges.

FOUNDATIONS FOR DYNAMOS AND OTHER ELECTRICAL MACHINERY.—Dry concrete is a poor conductor of electricity, but when wet it becomes a fairly good conductor. Therefore, if it be necessary to insulate the electrical apparatus, the concrete should be covered with a layer of asphalt.

CHIMNEY BASES.—Fig. 4 shows the base for the 90-foot brickstack at Don Guillermo, Palomares, Spain. The resemblance to masonry is given by nailing strips of wood on the inside of the crib.

RETAINING WALLS.—Figs. 5, 6 and 7 show three different styles of retaining walls, according to location. These walls are shown in section only and show the placing of the iron reinforcements. Retaining walls are best built in panels (each panel being a day's work), for the reason that horizontal joints in the concrete are thereby avoided. The alternate panels should be built first and the intermediate spaces filled in afterward. Should there be water behind the wall, it is best to insert a few small pipes through the wall in order to carry it off; this precaution is particularly important in places where the natural surface of the ground meets the wall, as shown in Figs. 6 and 7. If a wooden building is to be

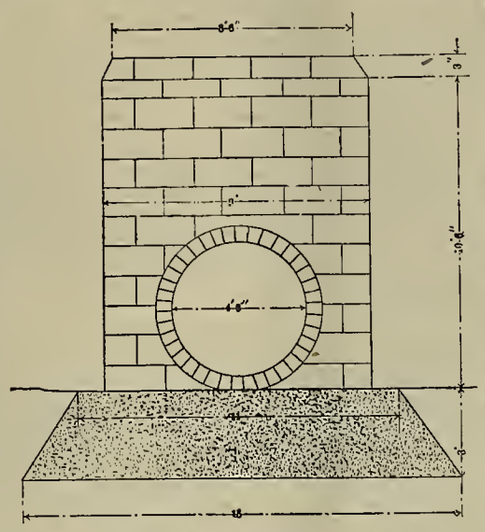


Fig. 4.—Concrete Base for Chimney at Smelter.

erected on the retaining wall, it is best to bury a few 0.75-inch bolts vertically in the top of the wall, by which a wooden coping may be secured (Figs. 5, 6 and 7), which forms a good commencement for the carpenter work.

Minimum thickness for a retaining wall, having a liberal quantity of iron embedded therein, is 20 inches at the bottom and 10 inches at the top, with taper preferably on the inner face. In the absence of interior strengthening irons, the thickness of the wall at the bottom should never be less than one-fourth the total height, and at the top one-seventh of the height; unless very liberal iron bracing be used, the dimensions can hardly be reduced to less than one-seventh and one-tenth, respectively. Unbraced retaining walls are more stable with the batter on the outer face. Dry clay is the most treacherous material that can be had behind a retaining wall, especially if it be beaten in, for the reason that it is so prone to absorb moisture and swell, causing an enormous side thrust against the wall. When this material is to be retained, it is best to build the wall superabundantly strong—a precaution which applies even to a dry climate, because the bursting of a water pipe may cause the damage. In order to avoid horizontal joints it is best, wherever practicable, to build the crib work in its entirety before starting the concrete. In a retaining wall 3 feet thick by 16 feet high this is not practicable. The supporting posts and struts can, however, be completed and the boards laid in as the wall grows, in order not to interrupt the regular progress of the tamping. A good finish may be produced on the exposed face of the wall by a few strokes of the shovel up and down with its back against the crib.

In conclusion, I wish to state that this paper is not written for the instruction of the civil engineer, or for those who have special experience in this line, but rather for the mining engineer or metallurgist whose training is not very deep in this direction, and who is so often thrown upon his own resources in the wilderness, and who might be glad of a few practical suggestions from one who has been in a like predicament.

*Abstract Trans. Am. Inst. Min. Engs.

Quicksilver Recovered in the Cyanide Process.

Written for the MINING AND SCIENTIFIC PRESS by E. J. SWEETLAND.

Before considering the quicksilver recovered in the cyanide process, it is not out of place to briefly consider the manner in which it enters into the tailings.

In careful plate amalgamation very little quicksilver is lost, and that which is lost passes into the tailings as metal in a very finely divided or "floured" condition; but in pan amalgamation the loss is not as easily accounted for, nor is it as easily prevented. This loss is usually attributed to "flouring," but in some instances the loss is due to certain reactions among the chemicals added to the charge, the constituents of the ore and the mercury.

The chemicals added to the charge are usually salt (NaCl) and bluestone ($CuSO_4$), and many of the reactions that take place are obscure; but we have good reason to believe that a large amount of the quicksilver lost in pan amalgamation passes off, chemically combined with other elements.

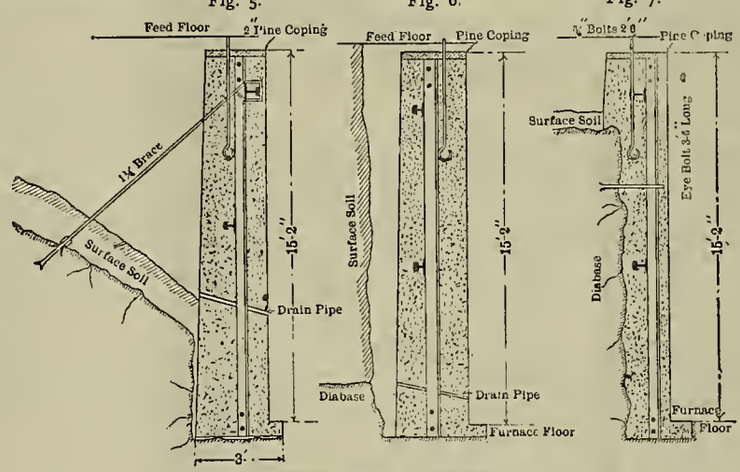
The amount of quicksilver known to exist in Comstock tailings is about 1½ pound per ton, and only about 33% of it is dissolved by the cyanide solutions after six days contact. From this it is reasonable to assume that a large part of that which is dissolved is in the form of a salt more readily attacked than the metal, since metallic mercury is known to be very sparingly soluble in cyanide solutions.

Notwithstanding the low percentage above mentioned, I have seen as high as 1500 pounds of the liquid metal recovered at the monthly clean-up of a plant treating 2400 tons of tailings per month.

This is not merely of interest from a chemical standpoint, but from a commercial basis as well, since such a production as above cited increases the profits of the plant by about 30 cents per ton. This is, perhaps, a better recovery than is enjoyed by most plants, but I dare say that most cyanide plants working on pan-mill tailings recover sufficient mercury to materially increase the profits of the plant.

The income from this source should not be underrated, as it is produced without any additional effort or inconvenience other than retorting the precipitates after they have been refined with sulphuric acid in the usual manner. In other words, if we take care of the gold and silver extraction, the quicksilver will take care of itself. This is easy, indeed; but investigation upon the subject might show that some modification of the processes ordinarily employed would result in a further recovery that would amply repay the operator for the extra trouble involved. Of course, nothing could be considered that would effect the extraction of the gold and silver.

Fig. 5. Fig. 6. Fig. 7.



Retaining Walls of Concrete.

As the mercury enters the solution it combines with its equivalent of potassium cyanide, as is shown by the following equation:

$$4KCy + Hg + 2H_2O = K_2\,Hg\,Cy_4 + 2KOH + H_2.$$

But a smaller loss of cyanide is really experienced in practice than would be expected from the above reaction, the total consumption in the case above referred to being only about 1½ pound per ton.

As the mercury-charged solution comes in contact with the zinc in the precipitation boxes a reaction of especial interest takes place, since through the deposition of the mercury upon the zinc a medium is formed whereby the most dilute gold and silver-bearing solutions are perfectly precipitated.

I have seen solutions, so dilute as to show no trace of free cyanide when tested with silver nitrate, enter the zinc boxes assaying from $1 to $3 in gold and silver, and leave carrying only from 6 cents to 10 cents per ton, which I consider practically a perfect precipitation.

This unusual precipitation is due to the formation of a galvanic couple between the zinc and mercury, which I consider more effective than the lead-zinc

couple formed by immersing the zinc in a solution of lead acetate.

When the solution carrying the double cyanide of potassium and mercury comes in contact with the zinc the following reaction occurs:

$$K_2 Hg Cy_4 + Zn = K_2 Zn Cy_4 + Hg.$$

the metallic mercury forming a gray deposit upon the zinc.

During the action of this galvanic couple an amount of zinc is consumed proportional to the amount of quicksilver recovered. This proportion depends upon the atomic weights of the two metals and is as 65 : 200, or about one part of zinc consumed to three parts of quicksilver recovered.

Ore Deposits of Rossland, B. C.*

NUMBER II.—CONCLUDED.

Written by EDMUND B. KIRBY, E. M.

The Josie and Center Star - Le Roi vein, being crossed more squarely by the fault system, afford the best indications of its effects. The Josie dike, or more probably an undetermined fault accompanying this dike, has caused a displacement, which is indicated in the Josie and Number One to be a north throw going east. Proceeding east from fault to fault they are found to have the same throw up as the faults at the junction of the Le Roi - Center Star territory, after which the steps occur in the other direction, with a throw to the south.

DISTRIBUTION OF ORE AND ORE SHOOTS. — The pyrrhotite mineralization has been abundantly distributed through the larger veins, but the secondary deposition of gold and copper-bearing minerals has been more localized, occurring in the more favorable places. The bodies of favorable ore thus found are sometimes lenses, tapering out at the edges, and sometimes blocks terminating against faults or dikes. These ore bodies are found distributed within more limited portions of the vein area, which in the practical sense thus constitute the ore shoots, and indicate those portions of the area to which the gold and copper bearing solutions had the best access. The shoots are upon a large scale and of such irregular form that their shape and limits have been developed slowly, and the largest and best defined up to the present date are those of the War Eagle, Center Star and Le Roi mines.

The War Eagle shoot has a dimension of 300 to 450 feet along the vein, and an almost perpendicular trend upon its plane. It is so located that its median line roughly coincides with the line of the main shaft.

The Center Star main shoot is located in the space between the shaft and the Le Roi end line, and appears to have a dimension of 300 to 500 feet along the vein, with a steep trend to the east. The Center Star east ore shoot is several hundred feet east of the shaft, but has not yet been sufficiently developed to determine its length along the vein or its trend, although the latter now appears to be either perpendicular or very steep towards the east.

The Le Roi ore shoot on the 350 level is near the east end of the claim, and descends perpendicularly, then assuming a westward trend. The structure of the shoots and of the pay ore bodies within these shoots everywhere points to the conclusion that their location and shape are due entirely to the accidental conditions directing the upward flow of the mineral bearing solutions.

The marked difference between the proportions of gold, silver and copper in the Center Star ore shoots and those of the other mines suggests that the solutions in the Center Star came from a different region than those which furnished the other deposits. The fact that the Center Star was somewhat nearer to the volcanic center than the others, and that its ore shoots trend in that direction, may account for this.

These shear zone fissures, more or less shattered by repeated movements, have afforded permeable channels for the ascending mineral solutions, which have penetrated and decomposed the country rock, replacing its rock minerals wholly or partially by metallic minerals. In places the entire width of the shear zone has thus been transformed into ore, while in other places the mineralization has been narrow. The solutions have frequently jumped across from one set of plating fissures to another, shifting the pay streak from the hanging to the foot side, or to intermediate positions, as the case may be. In the Center Star-Le Roi vein the foot wall fissure is the one which is the most regular and distinct, and is marked by a vein of small interlacing calcite seams, which has been found a very reliable indicator of the position of the vein. As a rule the heaviest ore deposition has taken place near this foot wall, and mineralization extends to irregular distances on the hanging side, gradually falling into the country rock. In the War Eagle vein the hanging wall is generally the most distinct and best mineralized, with irregular extension into the foot wall side.

While many of the dikes and faults merely occasion small displacements, with no effect upon the mineralization, a number of them evidently occurred before this mineralization was begun, or at least before its completion, and acting as partial barriers to the flow have so deflected the solutions as to greatly increase the deposition on one side, although they have not themselves been mineralized. In the War Eagle sixth level solutions rising through the fractured ground, caused by a fork in the vein, have been stopped by a large dike, and were so deflected and accumulated in rising along its under side as to produce exceptionally large and rich ore bodies. In the Josie vein the Tramway dike has in a similar way produced the Annie ore shoot, and the Josie dike has had the same effect upon the Le Roi and Black Bear veins. In both these veins the solution towards the west end seems to have been more or less confined to the space between the Josie dike and the partial barrier afforded by a fault. The phenomena throughout the Center Star ground everywhere show the tendency of mechanical barriers to deflect or accumulate the solutions. In the Center Star the principal channel has been that portion of the vein between faults. In the lower levels heavy deposition has occurred on both sides of a fault, while on the second level it has been mainly on the east side, and, at the horizon, is also accompanied by a deposition of ore along the plane of the fault. This is exceptional, and is the most clearly marked case of deposition within fault planes. In the few other instances there is some doubt as to whether the material is not dragged ore or an original vein. As a rule, the faults do not appear to have been accessible to the solutions.

The numerous instances of displacements by faults and dykes where the severed portions of the vein on each side are alike, prove that some of the dikes and some of the faulting occurred after the ore formation. If the dikes were studied in detail and classified they would probably be found to belong to two or more different periods, some of which were later than the deposits. As to faults, the facts observed accord fully with what is known as dynamic action during the long period while volcanic activity is expiring. Shocks and movements occur repeatedly at increasing intervals. Early fractures would afford planes of weakness, which would not only be kept open by the repeated movements, but would be multiplied and extended by branches and interlacing fissures. Such action probably continued long after the ore deposition and also after the dike formation, since these are found to be cut by faults.

It is noticeable that the later solutions introducing the gold and copper bearing minerals with quartz have as a rule followed the pyrrhotite deposition, and do not seem to have sought or found new permeable channels in the rock where these minerals might deposit by themselves. On the contrary, they seem to have been unmistakably restricted to the ground already impregnated with pyrrhotite, and the greatest enrichment has as a rule occurred where the previous pyrrhotite deposition was most extensive.

There seems to be no reason to believe that the pyrrhotite had chemically any more influence on the subsequent deposition than ordinary country rock would have. It may have been that the friable pyrrhotite ore presented such local weaknesses as to become especially shattered by subsequent movements, and thus afforded the most permeable channels. What probably occurred, however, was that there was one continuous flow which gradually changed in chemical contents and conditions of deposition. The altered solutions at the time of the secondary deposition merely followed the channels of flow which were already established, possibly modified more or less by a refracture or brecciation of the pyrrhotite ore.

CONCLUSIONS. — The conclusions derived from a study of these deposits are as follows:

(1) The pyrrhotite was deposited from aqueous mineral solutions ascending through the more fractured and permeable portions of the shear zone fissures.

(2) The gold bearing chalcopyrite, pyrite and arsenopyrite with quartz were deposited later from the same flow rising within the same channels but restricted to those portions of the channels which still remain unfilled, or which were reopened by further fracturing of the friable pyrrhotite ore.

(3) The main faults and some of the dikes existed before the formation of pyrrhotite began, or at least before its principal deposition.

(4) Their intersections with the shear zones made barriers which more or less directed the flow, accumulated the solutions, and determined the position of the main ore bodies.

(5) After the ore formation more dikes appeared. Faulting was repeated intermittently, continuing probably up to recent times, and the early fractures were kept alive.

The writer is well aware that the origin of pyrrhotite is still in dispute by eminent authorities, but believes that a study of the Rossland deposits must remove any remaining uncertainties as to this question. All observations, from the occurrences of the pyrrhotite as mineral replacements, veinlets and films in the rock to the effect of dikes and fractures in massing its formation, point to deposition from mineral solutions. In these deposits at least, it is impossible to even consider "direct igneous origin" or "magnetic segregation," and no evidence has been found to suggest any difference between their origin and that of ore deposits of pyrites or other minerals whose genesis is now established.

The evidence does show, however, that the conditions necessary for pyrrhotite deposition prevailed at an earlier time than those required for chalcopyrite, pyrite, arsenopyrite and quartz. It is well understood that during the period while heated waters are ascending in the vicinity of cooling eruptive masses the chemical contents of the solution slowly change, and so do the conditions of deposition. For the same flow to first yield pyrrhotite, and then so alter as to produce the other minerals, is no more exceptional than the well-known excessive deposition in veins of the more common minerals. It may be that the only difference between their origin and that of pyrrhotite is that the latter requires exceptional depth, heat and pressure. The heat would be greatest during the earlier stages of circulation, and the great erosion noted by the Geological Survey indicates the prevalence of unusual depth and pressure at that time.

EFFECT OF STRUCTURE UPON MINING METHODS.— There are peculiar difficulties presented to exploration work within an ancient volcano. Every dike and every zone of fissures constituting a fault creates a gap or blank in the formation and to these are added the gaps due to vein displacement. Systematic crosscutting aided by diamond drilling is necessary on account of these displacements, vein-branching, the variations of vein thickness and the shifting of ore from one set of planes to another. If carelessly placed a crosscut or drill hole encounters so many of these blanks as to afford no information, or what is worse, indecisive results. It is very difficult to make such work efficient, and it calls for every resource of care and skill.

In the War Eagle and Center Star mines structure details are carefully kept up, and it is endeavored, so far as possible, to make crosscutting effective, to avoid work in belts of dike systems or belts of shattered ground, and to direct the principal explorations to the main channels of flow.

*Abstract Trans. Canadian Mining Institute.

Cyanide in Amalgamation.

TO THE EDITOR:—In the issue of May 14th, during the continuation of the article on "Mill Construction," etc., by I. Roskelley, I have read with interest his ideas on the use or disuse of cyanide of potassium in amalgamation, and I wish to add my quota of knowledge to those millmen of practical experience as against the cyaniders; that the employment of this chemical is necessary in gold amalgamation on plates, as well as in the clean-up pan in both gold as well as silver amalgamation. It does not hurt subsequent cyaniding, but helps it, because it removes the grease. It does not dissolve gold that could be saved afterwards unless put in the battery with the ore and used to excess. In other words, cyanide of potassium acts first on grease, and if any surplus remains is then destroyed entirely by the quicksilver before the fine gold can be attacked. Of course, if put into the battery it will dissolve the fine gold before the quicksilver has absorbed it, and if used in great excess on the pulp after leaving the battery might affect the floured gold, but these suppositions imply very faulty mill amalgamation and should not be considered.

Nothing has been found to take the place of cyanide for dressing of plates and the most efficient amalgamation; and it has yet to be proved that its proper employment has diminished the extraction by subsequent methods, or increased the total loss in the original value of the ore. W. J. ADAMS, E. M.

San Francisco, Cal., May 16.

Mining Methods in Alaska.

C. W. Purington, geologist and mining engineer, will investigate placer mining methods in Alaska for the United States Geological Survey. Accompanied by Sidney Paige, he will visit the most important and interesting camps of the Territory. After spending a few days in the vicinity of Juneau they will make the rounds of the Atlin, Klondike, Forty Mile and Birch creek regions, and possibly the newly discovered placers of the Tanana. In the Seward peninsula, the more important camps of the Nome, the Council City, the Topkok and the Solomon river districts will be visited. As a result of the summer's work, Mr. Purington expects to write a report on the present conditions of placer mining in Alaska, supplying information for which there is at present much demand.

L. M. Prindle, assisted by F. L. Hess, will continue work of the past season in the placer district between the Yukon and Tanana rivers and along Forty Mile and Birch creeks. The party will start from Eagle, moving southwest toward Fairbanks, where the important discoveries of the last two years will warrant careful studies. From there they will go north toward Rampart, finishing the season's work in an investigation of the mining district about Baker and Minook creeks.

Petrified Forests and Painted Desert of Arizona.*

Written by PROF. OSCAR C. S. CARTER.

The physiographic division of Arizoua is extremely simple and well marked. There is a high plateau in the northern half of the State and a low desert area in the south; a high wall or escarpment separates them. This escarpment enters Arizona from Utah on the north and trends from the northwest to the southeast; it is really the southern border or end of the great Colorado plateau, which includes parts of Utah, Arizona and New Mexico, and extends from part, near the middle, the desert is about 75 miles wide. The slope, of course, is toward the Colorado river. It is called the Painted Desert on account of the bright colors of the sandstones, shales and clays.

Mesas of bright red sandstone are commou. The shales are eroded into bizarre and fantastic shapes; all of these forms of erosion are colored—blue, yellow, red or green, as the case may be—and, with the brigbt sunligbt and clear, dry air, the coloring is ofteu brilliant. The petrified forest is near tbe southern border of the Painted Desert, between the Rio Puerco and Zuni river, which are tributaries of the Little Colorado. The Painted Desert is not much of a depression in this southern part of its area, as the average elevation is over 5000 feet above tide; the still smaller station of Carrizo, which can be reached by a drive of 20 miles or more. If we take a folder of the Santa Fe Railroad, we will see a flag station named Adamana, which is the best place to reach the forest. It is simply a signboard or mile-post marked 233 Adamana, and is near the southern border of the Paiuted Desert, although the desert does not have the rich colors wbich the shales give it farther north. The forest is found scattered over from 8 to 10 square miles of territory, principally in Township 17. Adamana is about 21 miles east of Holbrook. The conductor will have no compunction about dumping you down in the desert among the sage and soapweed, providing you keep on the alert aud remind him not to run past the mile post. Wheu the train rushes by you can see Adam Hanna's ranch iu the distance, from which the station takes its name. The river fringed with cottonwoods (Populus monilifera), known as the Rio Puerco, or Dirty river, runs lazily past the ranch. It is well named dirty, for it is always the consistency and color of strong chocolate. It is so muddy that no living creature is fouud in its waters.

On consulting a map we get the impression that it is a fair-sized river; but it is a river merely by courtesy. There are no large rivers in the arid district of the Southwest. The rainfall is slight, only 10 inches

View of Part of Petrified Forest, Arizona.

Natural Bridge of Agate, 111 Feet Long.

Agatized Log Called the Cannon.

Utah southward, often as a series of gigantic steps. It is called the Colorado plateau on account of the river of that name, which has cut in the plateau the most stupeudous gorge in the world—"the Grand Canyou of the Colorado." Portions of this plateau are more than a mile higher thau the desert area in the southern part of the State, and, as Merriam has pointed out, it acts as a barrier to the passage of animals and plants, but it must not be supposed that the boundary is always a cliff.

In this uorthern plateau in Arizona there is a vast depressiou or basin called the Painted Desert, which is the drainage area of the Colorado Chiquito or Little Colorado, which empties into the Colorado. The corrosiou of the stream and its tributaries, which are often dry, and all the other forces of erosion have cut this basin and its channel aud wideued it. From near the mouth of the Little Colorado this Paiuted Desert extends southeasterly for a distance of 200 miles, and even enters the border of New Mexico. In its widest

neither has it any conuection whatever with the low desert area in the southeru part of the State. It is wholly in the plateau country. The petrified forests of Arizona may be classed among the strange corners of our couutry and lie more or less off the beaten track. The general public do not as yet visit this locality as they do the Yellowstone or the Yosemite, yet it is quite accessible. More than 3000 people visit the Yellowstoue annually, and the number is increasing; yet Adam Hanna informed me in 1889 that he had about a dozen visitors annually to his ranch ou the Painted Desert, which is the nearest place to the petrified forest.

Thousauds of visitors at the World's Fair became iuterested in the petrified forest when they admired the logs and polished slabs of petrified wood of various colors, bright red predominatiug. Sometimes they are cut iuto tabletops and pedestals. Very few, however, had any idea as to how the forest may be reached. The Mormon town of Holbrook is always associated with the petrified forest, probably because it is the only town of any size near the forest, except

a year, often less, and evaporation rapid; hence, large rivers are out of the question and some of them disappear entirely under the summer's torrid sun. It is no unusual sight, in the desert region farther north, to see a copious shower of rain falling from the clouds above, which never reaches the parched and dry shales of the desert because the hot, dry air above the desert evaporates and absorbs it so quickly that it soon disappears. Even when a cloudburst occurs and the rain comes down in sheets, a common occurrence in July and August, and the arroyos are full of turbid streams of liquid mud several feet iu depth, in a few hours the desert is dry aud there is no evidence of a shower, except the alkaline water standing for a short time in the mud-bottomed pools. The Rio Puerco in the summer can be forded by horses, but after cloudbursts in the higher plateau country a stream of liquid mud 10 feet deep spreads from the mesa to the Santa Fe road.

Adamana is the nearest and best place to reach the forest.

There is a charm about the desert, with all its dis.

*Abstract of Journal Franklin Institute of Philadelphia, Pa., to whom we are indebted for the engravings herewith presented.

advantages. The sunsets are beyond description. No matter how hot it is during the day, the nights are always cool. In that rare and dry atmosphere radiation is rapid, and the earth cools so rapidly that out of doors a blanket is comfortable at night. Cool nights on the desert are the rule much farther south also. The Giant cactus (Cereus giganteus), which attains a height of from 40 to 50 feet, and the large and striking cactus called pitahaya by the Mexicans, afford no shelter worthy of the name.

An interesting fact about subterranean water for irrigation is that abundance of soft water is reached at a depth of less than 50 feet on Adam Hanua's ranch. The underground water of the Southwest is often hard; Adamana is an exception.

The trip to the petrified forest is made in an hour after fording the Rio Puerco. The mesas rise to 60 or 70 feet above the desert. They are made up of white disintegrating sandstone, held together by a feldspathic cement. Between the layers of sandstone are layers of red shale. It is at the base and between these mesas that the petrified trees are found. The first indication of petrifaction one sees is bright red and yellow pieces of agate and chalcedony, showing the outlines of the bark; these are scattered over the ground long before one reaches the mesa, but no logs or large pieces are met with. A turn around the edge of the mesa and we see scattered over many acres enormous logs completely changed to agate, jasper or chalcedony. The sections or ends of the logs show brilliant reds, yellows and dull blues. The

Weathering of Shale and Sandstone in Petrified Forest.

Agate Logs 15 to 20 Feet in Circumference.

bark is not brilliant, but dull and wonderfully well preserved, being almost lifelike in its naturalness. Some trees show even the knots to perfection; but even these trees, spread over many acres, are not the finest.

After a short drive between the mesas and another turn, we come to some large logs. These are 4 feet in thickness and from 10 to 12 feet long. They have no branches, but the hundreds of small pieces, varying from a couple of inches to 1 foot in diameter, are probably in some cases the remains of branches. After a drive of several miles along the base and on top of the mesa, through many hundreds of petrified trees, we failed to see a tree with branches or one standing upright. Another important fact is that no tree, except one, was found which showed the entire length. There were many logs from 3 to 30 feet long. The one exception to this was well worth a visit. After clambering across the mesa, we come to a ravine 50 feet in depth in the deepest part. In the bottom is growing a clump of cedars, the only trees about the mesa. Spanning this ravine, which is 44 feet wide, is a petrified tree which measured 4 feet in diameter in the thickest part. The tree does not end on the edge of the chasm, but continues across the sandstone mesa and enters a ledge of sandstone, making the length of the tree that is visible 111 feet. How far it extends into the sandstone we can not tell. This is the only perfect tree we saw. It is interesting to account for the preservation of this entire tree and also to account for the fact that logs, instead of trees, are the rule.

(TO BE CONTINUED.)

THE speed with which sinking has been carried on at the Long Tunnel mine, says the Australasian, was due to the enthusiastic co-operation of the men working in the shaft. This has been accomplished by taking advantage of even the physical features of the rock. The sinking was with the strata, and the country was alternate bars of slate and exceedingly hard elvan, so that "fitchering" was a common experience. To overcome this, cruciform steel bar bits were brought into use. Then the bottoms of the skips were shaped at the angle at which the rock would blow out from the face, and with the use of extension rails the skip was lowered to the level of the dirt, so that 3 feet of a vertical lift in the shoveling was saved. As each skip contained a ton and a half of material, and these went to the surface at the rate of twelve per hour, the labor saved in this way alone was very great. Apart from that, the drilling was always done from the western side of the shaft, and, as the shooting was from east to west, the dirt was heaped up by the force of the explosion on the western side of the shaft above the level of the skips. This also allowed the skips to be filled most expeditiously. At the surface, also, owing to the automatic appliances provided, bracemen were entirely dispensed with, and the whole of the dirt hauled each day was removed from the bin in two hours' trucking by one man, using 27 cubic feet side-tipping trucks. The same man during the rest of the shift was occupied in sharpening drills for the drill machines, two of which were employed in each section. The result of all this method in both the survey and the planning of the actual work was that the two sections of the shaft met true to line and that 2250 feet sinking and about 358 feet of driving was done in a little over twelve months.

Method of Working Mines of Santa Eulalia, Chihuahua, Mexico.*

NUMBER II.—CONCLUDED.

Written by EDWARD G. CAHILL.

In some of the mines which are working on deep vertical pipes of ore the system described above was attempted; but, either through carelessness or lack of knowledge, the filling was neglected and great caves occurred, as much as a thousand vertical feet of the ore going down 60 or 70 vertical feet bodily. The situation now is this: A block of ore 1000 feet high by from 50 to 150 feet in diameter is loose sand and boulders. In the midst of the ore are great blocks of lime broken off the casing walls as the ore body slipped by. By the old method only one of the 70-foot levels can be entered and worked. This is so because the ground under foot is no longer solid. It is loose stuff which will furnish no footing for timbers. You can enter it at the top and work down safely, but it is impossible to produce a sufficient tonnage from a bottom of such limited area to make the low-grade ore pay. If the ground is entered below, there is no telling at what moment another cave will occur which will engulf the upper levels; so the plan of working with square sets from more than one level must be abandoned. It is possible to enter the caved ground with bulkheads from one level only.

The plan that is adopted is this: The vertical pipe of ore will in general have an approximately circular cross-section. A drift is run in the solid limestone entirely around the ore body and about 15 feet from the contact. The caved body is then tapped every 20 feet by a short crosscut. This is done on each level. The mine is now ready to produce. Miners stationed in each crosscut attack the soft ore in front of them with picks, shovels and hoes. They stand all the time in the ends of the solid lime crosscuts perfectly safe from any movement of the ore body, and draw the soft, earthy ore into their tunnels and cars. The ore body, being bled all around at every 70-foot level, keeps moving down all the time as the support under foot is hoed out from beneath it. Occasionally the boulders arch up over one of the tapping crosscuts and nothing comes down for a long time. When a crosscut hangs up in this manner it is left for a while. Sooner or later the continuous movement of the mass will break the arch and the tunnel will again become a producer. There is one advantage to this system. The caved ore brings down with itself hundreds of tons of lime boulders. When possible, they are allowed to pass on and go down; but they often get stuck in the mouths of the tapping tunnels, and thus considerable waste must be broken and handled. To work this system successfully, an absolutely solid limestone casing around the ore body is necessary. If the crosscuts tap the ore through lime which has been shattered by the force of the original cave, through the 10 feet next to the contact, they are of no use, because sooner or later any piece of broken rock, even if it weighs 100 tons, in contact with the moving mass, will be carried down. Obviously men can not work with such a shattered rock for footing. This is purely a caving system and is very difficult to operate successfully. It is, however, very cheap, the ore being mined and delivered to the shaft chutes for 80 cents a ton, Mexican silver. The best example of the method in Santa Eulalia is the Santo Domingo mine of the American S. & R. Co.

The third system of mining employed in the district is applicable to the more or less horizontal lenticular masses. If possible, the shaft is sunk in solid lime. This is a common feature of the three methods. Crosscuts are run to the ore body; a raise is made on the contact of the limestone and ore. It is continued until the roof is found, then across the entire body and down on the other side. Similar raises are made along the whole length of the body, which may be from 100 to 1000 feet. Then the top 5 or 6 feet of ore is taken off the body over the whole of its area, leaving a space some 6 feet high between the solid lime roof and the ore. This having been done, skilled miners are put into the stope, who shoot the hard lime roof into an arch, clearing off all boulders, corners and projections of lime and all pieces of ore which may be sticking to it. When the roof is solidly arched, the mine is ready for production. The ore is mined by underhand stoping entirely, and one slice after another is taken off the body until none is left. The stope is worked by a series of benches where the ore is hard, but most of it is so soft that it is merely shoveled into the cars. As successive slices are removed from the top of the body, the ore gradually recedes from the roof. No timbers are, however, necessary, as the hard arched lime supports itself. As they go down, the miners thoroughly clean off projecting corners of lime from the walls, so that they, as well as the roof, will be safe when the work is hundreds of feet below. The shaft is kept down below the workings and the ore handled from the stope bottom to the levels by means of chutes. Boulders of lime will inevitably be met with as the ore is sliced off. If they are small, they are broken and hoisted to the dump. If large—100 tons or more—they are not touched. The slicing of the ore goes on all around a big one until the general surface level of the ore is some 30 or 40 feet below its base. Then a box or two of dynamite is put under one side of the rock, and it is tipped over the edge into the stope level. After that the ore which was under it is taken out. Later this process is repeated and the boulder thrown back. Thus it is shunted from side to side out of the way, time after time, and is carried to the bottom of the stope and eventually left there. Of the three systems this is by far the best and most economical. There is absolutely no danger of caving. The lime roofs of the old caverns, hundreds of feet in width and height, which were worked out by the early Spaniards, have stood for hundreds of years. The great saving is effected in the timber bill. None is used. Another advantageous feature is the small amount of waste which is handled.

The diamond drill is extensively used in the Santa Eulalia district for prospecting. The tripods dot the hills for miles around the camp and many companies use them in the drift and crosscut faces. The value of the diamond drill as a prospecting agent is illustrated by the fact that the Santa Eulalia Mining Co., owned by the Hearst estate, has drilled over 9000 feet in six months.

The Santa Eulalia ore being entirely a smelting proposition, the subject of cheap transportation soon became an important question in the development of

*Abstract Cal. Jour. Technology.

the district. To-day two narrow gauge custom railroads move the ore from the camp to the Mexican Central line near Chihuahua. One of them comes to within 2 miles of the camp. The other takes the ore from the mine chutes.

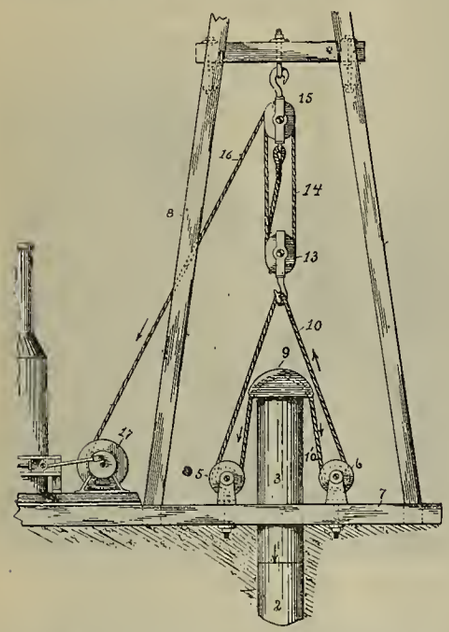
The Santa Eulalia ore is almost self-fluxing, requiring only silica to go into the furnace. Mexican smelters are overburdened with siliceous ore, and therefore seek this ore eagerly and smelt it at about $3.50 gold per ton. After deducting mining, transportation and smelting charges, the uet profit per ton varies from $3 to $6. The companies producing large tounages are making fortunes, new companies are being organized every day and mining in the camp is booming.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 10, 1904.

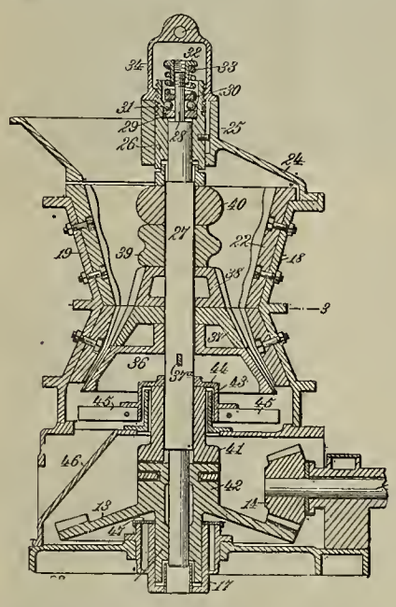
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MEANS FOR SINKING OIL WELL CASINGS.—No. 759,412; E. J. Beane, San Francisco, Cal.



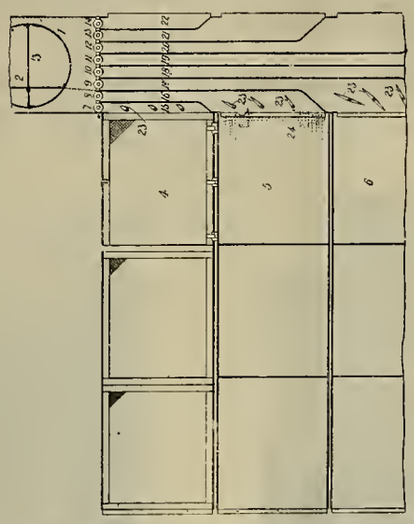
Mechauism for sinking well casings, same comprising endless pressure cable, anchored sheaves located at opposite sides of well and through which endless pressure cable works, one bight of cable passing over top of casing section to be forced downward, and hoisting means connected to opposite bight of cable, so that upward strain exerted thereon imparts to first-named bight of pressure cable downward strain.

CRUSHING AND GRINDING MILL.—No. 759,643; T. L. Sturtevant, Quincy, and T. J. Sturtevant, Wellesley, Mass.



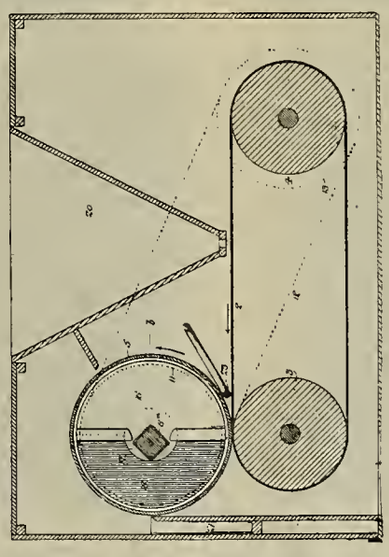
In vertical crushing machine, combination with vertical shaft having portion which is of polygonal shape in cross-section and which shaft is provided at upper end with hoisting head, of rotating crushing elements loosely strung on polygonal portion of shaft, upper bearing from which shaft is supported, mill casing formed in two parts one of which is vertically hinged to other so that it may be swung aside horizontally when access to crushing member of mill is desired, and removable key which supports lowermost of rotating crushing elements; whereby, when key is removed, shaft may be hoisted out of mill, leaving rotating crushiug elements free to be removed horizontally from chamber of mill when hinged portion or door of casing is swung aside or opened.

APPARATUS FGR SEPARATING METALS FRGM THEIR CRUSHED ORES GR MATERIALS CONTAINING SAME.—No. 759,775; W. N. Turner, Ipswich, England.



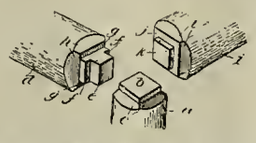
Ore separating apparatus, combination with separating tables, of receiving vessel, division plates therein, and means for distributing matter under treatment to several tables, consisting of series of chauuels, vertically adjustable gate at one eud of each channel, and series of sets of adjustable baffles, one set for each table, sets progressively increasing in size from set nearest receiving vessel.

MAGNETIC ORE SEPARATOR.—No. 758,655; W. L. Imlay, Philadelphia, Pa.



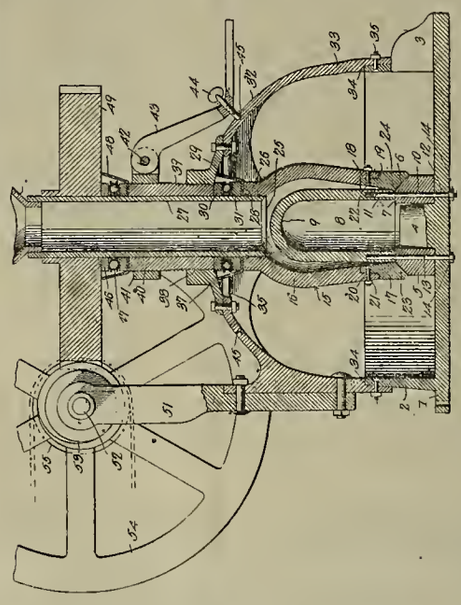
Magnetic ore separating apparatus cousisting of rotating drum containing magnet, magnet having hub carrying two sets of segmeuts forming drum and wire wound ou drum, certain of segments being of magnetic material and forming pole pieces of magnet and others beiug of non-magnetic material and serving to retain wire in position.

MINE TIMBER.—No. 759,418; D. W. Brunton, Denver, Colo.



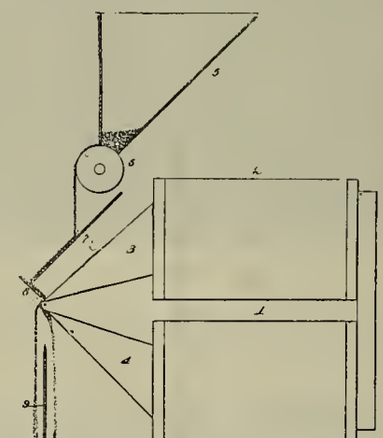
Round mine timbers having rectangular tenons projecting from flat bases at ends of timbers, sides of timbers next bases being beveled.

QUARTZ MILL.—No. 759,497; E. Booker, San Diego, Cal.



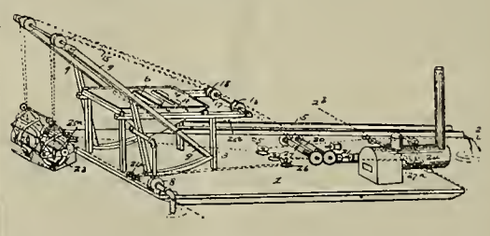
In quartz mill, base having upwardly tapering centering plug, annulus eugaging plug and having beveled portion at outer upper edge, cylindrical member supported upon flat upper edge of annulus and having screw-threaded bores, screw-threaded rods extending through base and annulus into bores, and nuts upon lower threaded ends of rods.

MAGNETIC SEPARATING APPARATUS.—No. 759,358; T. A. Edison, Llewellyn Park, N. J.



Magnetic separator, comprising two tapering magnetic poles sustained adjacent to each other, with narrow gap between and upper pole slightly overlapping lower, in combination with meaus for feeding pulverized magnetic and non-magnetic particles directly to upper surface of upper pole near its edge, whereby magnetic particles will by lines of force be deflected toward and fall below under surface of lower pole without passing through gap, and dividing board below lower pole for separating the magnetic and non-magnetic particles.

APPARATUS FOR EXCAVATING AND SLUICING GRAVEL OR OTHER MATERIAL.—No. 759,108; F. K. Hoover aud A. J. Mason, Kansas City, Mo.



In apparatus of character described, combination with suitable platform, of boom swinging thereon on rockers, excavator suspended from boom and actuating devices for excavator which by continued movement first raise the excavator and subsequently move it, with boom inwardly over platform, in substantially vertical plane of boom's movement.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

The United States Census Bureau has issued a preliminary report on mines and quarries in the United States, which shows that in 1902 the total value of all minerals produced was $884,040,869, as compared with $444,012,998 in 1889—an increase of nearly 100% in the thirteen years covered by the statistics. Pennsylvania was the leading mining State both in the number of wage earners and in the value of products; Ohio was second in value of products and third in wage earners; Illinois second in number of wage earners and sixth in value of products and Michigan third in value of products and fourth in number of wage earners. California ranked seventh in value of products, but first in diversification of minerals, with Virginia second in this class and New York and Pennsylvania tied for fourth position, each reporting twenty-three of the different classes of minerals. The report says: "Accepting the census of 1900 for manufactures and agriculture and the census of mines and quarries of 1902 as representing conditions at the beginning of the twentieth century, the total gross value of products of the productive industry, exclusive of fisheries, amounted to $18,575,224,735. Of this amount, manufactures formed $13,039,279,566, or 70.2%; agriculture, $4,739,118,752, or 25.5%, and mining $796,826,417, or 4.3%."

ALASKA.

Arrangements have been made between Manager J. MacDonald of Treadwell mines at Douglas and the Nowells to resume on the Kensington property at Berner's bay. The deal carries with it an option on the Nowell holdings at the bay and an agreement to carrry out a certain line of development work already agreed upon. MacDonald says men will be put on the Kensington tunnel next week.

Prospectors returning from the Sawtooth range, 60 miles north of Nome, report quartz finds, all free gold, the decomposed material on the surface panning $1 to the pan. The ledge is said to be traced for 4 miles, and locations have been made the entire length. Benches along many of the Nome creeks have been prospected the past winter to bedrock, it is reported, and dumps are accumulating that will wash from $10,000 to $30,000 in the spring cleanup. These are along Buster, Cripple, Otter, Center and Dry creeks. On the Blue Stone there is considerable work under way, in anticipation of a ditch being built this spring. More dredgers will be operating in the Nome district this season than ever before, says the Valdez News.

L. M. Prindle, of the United States Geological Survey, assisted by F. L. Hess, will continue his work of the past season in the placer district between the Yukon and Tanana rivers and along Fortymile and Birch creeks. The party will start from Eagle, moving southwest toward Fairbanks, where the discoveries of the last two years will warrant studies. From there they will go north toward Rampart, finishing the season's work in an investigation of the mining district about Baker and Minook creeks.

ARIZONA.

Gila County.

The Old Dominion mine and smelter at Globe made production of blister copper for month of April of 1,500,000 pounds. It is said the company's net earnings for March amounted to $39,000; and as a higher average price was realized for the April product, it is expected the net earnings for last month should be about $50,000. However, the cost of all underground work is now charged against the net earnings, and from the March figures $6000 was deducted, which represented the cost of sinking the new shaft.

Graham County.

The Kenache M. Co., below Solomonville, is reported preparing to put in a concentrating plant. The company is composed of Detroit, Mich., men. Manager Jaynes states its ore will go 12% copper.

Mohave County.

H. F. Best and L. M. Teale of Savannah, Mo., president and superintendent respectively of the Treasure Hill M. Co., operating near Stockton Hill, are preparing to put in a pumping plant to unwater the mines to the 200-foot level. Recently a flow of water was encountered in the mine, which interfered with further exploration of the property.

At the Sun Cloud mine the mill was started up last week. The property is owned by the Sun Cloud M. Co., of which R. Wheeler is superintendent and H. M. Garwood general manager. The mines are said to show a tonnage of ore blocked out averaging $55 to the ton. Twenty-four men are working at the mill and mine, and this number will be added to. The camp is 4 miles south of Signal, on the Big Sandy.

Considerable water is being encountered in the De la Fontaine mine at Stockton Hill. The shaft has reached depth of 400 feet, and at that point levels will be run to open up the ore bodies. It is intended to put in a milling plant at the mine.——Manager Mensch, of the Stockton Hill interests of the Fletcher M. Co., reports satisfactory results from the work being carried on in the Indian Boy and other mines.

Manager W. A. Mensch has men at work on the mines bonded to W. S. Fletcher of Los Angeles, Cal., near Stockton Hill. These claims have produced gold and silver ores. The Fletcher M., M. & S. Co. has been organized in Los Angeles, Cal., with a capital of $5,000,000, to take over all the interests acquired by W. S. Fletcher in Mohave and Pinal counties, Ariz., and in San Bernardino county, Cal. At Needles, Cal., a load stack will be added to the smelter and that plant remodeled and blown in this summer.

Oshorn & Wardwell, who have been working men on a group of mines, in the Empire Flat country, near Needles, Cal., have opened up bodies of gold and copper ores. The mines are near the Colorado river and are easily reached by wagon. The haul to the river is 6 miles, and it is expected that a reduction plant will be built on the river bank.

Santa Cruz County.

Near Harshaw, at the Trench group of mines, being operated by the Humholdt M. Co., President R. Farrel is preparing to increase development. P. E. Murray is manager and A. Morgan superintendent.

Three miles from Patagonia the Santa Cruz M. Co., W. Schwartz manager, is preparing to put in pumps and boilers to handle the water to clear the shafts and resume sinking. This company has several properties, on which three shafts have been sunk, all in ore. The deepest is down 118 feet. In all three workings they have been driven out by water, which is reached at a depth of 100 feet.

Pinal County.

(Special Correspondence).—A body of concentrating ore has been opened in a crosscut on the 800-foot level of the Alice mine at Troy.

The steam hoist at the Copper Butte mine is in operation and sinking the double-compartment shaft is in progress.——The Arizona Pacific Co. is putting in a pump and air compressor.

A considerable area of the country around Mammoth has been located for the purpose of drilling for oil. One derrick has been built and others will go up.

Mammoth, May 15.

W. & H. Beard have a working bond on the Troxel and the Beard-Cansler mining claims, in Mineral Hill mining district, near Florence. They have incorporated a company with Oklahoma and Kansas men, and work was started this week. Two carloads of ore will be taken out and shipped to prove the value of the ore.

Yavapai County.

The Val Verde smelter has been sold to the Bradshaw Mountain C. M. & S. Co., which has mines near Crown King, southeast of Prescott. The consideration for the smelting plant, all the buildings and equipment and the land and water rights embraced in the Bowers ranch, on which are the smelter and town of Val Verde, amounting in all to about 1000 acres of land, was $175,000. The Val Verde smelter has a capacity of 250 tons per day and is a semi-pyritic plant. It is 23 miles southeast of Prescott on the Agua Fria river and has an abundance of water. There is a spur of the P. & E. Railroad, ½ mile in length, that runs to the plant. G. W. Middleton, vice-president and manager of the Bradshaw Mountain C. M. & S. Co., has men at work grading for additional railroad trackage at the smelter and is arranging for enlarging the smelter to 600 tons per day. At the company's mines in the Bradshaw he will put on 150 more men, who will begin taking out ore for the smelter. Custom work will be done and the company's ore will be run when the custom work does not occupy the time of the smelter. The present plant will be started up, however, and run while the addition to the smelter is being made. It is further expected the company will, within the next year or eighteen months, build a steel smelter of not less than 1000 tons daily capacity.

A 5-foot Huntington mill has been set up at the Golden Cross mine, near Prescott. This mill has been added to the 10-stamp mill in operation at the mine and will increase the capacity of the plant to fifty tons per day.

H. L. Dooley of Rock Island, Ill., and P. Federson of Davenport, Iowa, interested in the Cypress and Burlington mining properties, near Prescott, report they will put in additional machinery, among which will be an air compressor. This will be set up at the Cypress mine, near the Burlington, and a pipe line will convey the compressed air to the latter mine for running drills, etc.

D. J. Sayer, president of the Sayer G. M. Co., is opening up the Churchill group near Martinez.

CALIFORNIA.

Amador County.

The Madrone mine in Pioneer district, 5 miles from Volcano, and 2 miles from the Defendor mine, is being operated by C. S. Leslie & Co. About 100 tons of ore are on the dump. A 100-ton test will be worked, and Manager Leslie estimates it at $40 per ton. The $7 rock is set aside until a mill can be built on the property.

At the Defender mine at Defender ore is being taken from the south drift on the 200-foot level, the breast of the drift being 200 feet south of the shaft. The stamps in the mill are dropping steadily.——G. S. Andrews is unwatering his mine, the Grand Prize, the south extension of the Horn mine.——At the Glenn & Robinson mine, the Whitmore, Glenn and the Robinson Bros. have a 4-stamp mill running steadily. The ledge is said to be 3 feet wide and has a porphyry hanging wall and a blue slate gouge on the foot wall. The mine is easy of access.——O. Lofsted will begin operations on the Red Tape mine next week. He will unwater the shaft and sink it deeper.——Superintendent Nowman, in charge of the Sawyer mine, will begin operations before June 1st, and is getting the mine in readiness to start up.

At the South Eureka mine, at Sutter Creek, the mill has been shut down temporarily, or until a larger one can be built, says the Amador Ledger. About thirty men are working underground, cleaning out the tunnels at the various levels, to ascertain value and extent of rock already in sight.

At the Oneida mine, near Jackson, the 60-stamp mill continues in steady operation. The rock being milled is from the 2200-foot level. There are 130 men employed.

About sixty men were laid off at the Kennedy mine at Jackson last week as the company proposes to stop milling and hoisting operations at the old works. The 40-stamp mill will be taken down, and rebuilt as an addition to the 60-stamp mill near the east shaft, making 100 stamps under one roof. The addition to the mill will be hurried to completion this summer. The reduction in the number of men is thus only temporary, although a permanent saving is expected to be effected in the working force and material, by the concentration of the milling capacity, and the hoisting of all ore through one shaft.

Calaveras County.

The Black Oak mine near Altaville is being prepared to resume operations. It is owned by the Black Oak M. Co. and the water has been taken out. The shaft is down 220 feet, with a dip to the east below 60 feet from the surface. There is also another ledge to the west of the shaft. F. A. Moore, superintendent, says work of crosscutting will be let by contract.——Eighty acres of the Biasch land on the Calaveras river at Petersburg, near San Andreas, has been bonded to G. Prusia, E. L. Atkinson and W. Goldsworthy for mining purposes. The channel of the river runs through the land.

W. B. Lake of the Cataract and Wide West placer mines at Echo, 5 miles east of Murphys, is enlarging operations. A derrick has been put in place to handle the large boulders. Piping will be started next week.

At the Chris Anderson mine, near San Andreas, Superintendent Juchter says he is working within the rim of the channel and that from $12 to $15 are daily taken out of the cemented gravel that is being removed in development work.

In the Emma mine at Campo Seco, on the 400-foot level, a strike is reported made last week. At a point 250 feet north of the shaft the main vein has been cut with satisfactory showing, says Superintendent Maher. The vein at the 200-foot level is opened up for 215 feet, both faces, north and south, being in ore. There the vein flattened out to 50° dip. The pitch of the vein is so flat that it will give about 600 feet of ore from this level to the surface. A 10-stamp mill on the Birdina mine, owned by the same company, will be moved to the Emma.

El Dorado County.

J. C. Moore is putting up his 2-stamp steam quartz mill, near Garden Valley, and will begin to crush rock next month.

Inyo County.

The work on the traction road being built by the Pacific Coast Borax Co. between Ivanpah and its borax mines in Death valley has been completed. The engines and wagons are expected to arrive this week.

Kern County.

The S. K. M. Co. has been organized in Los Angeles and will begin active operations on its ground, 2 miles from the Angelus group, near Randsburg. —— The Angelus placer claims at Fremont's Peak, 18 miles southeast of Randsburg, have been sold to C. A. Giffen, chief owner in the Midnight Sun M. Co. of Alaska, and G. M. Giffen of Los Angeles. Water has been developed and the new owners will put in a 200-ton cyanide plant. M. Wilson, former owner, is manager for the company.

Mono County.

The Crystal Lake mill at Lundy is not running at present, but will probably start up next week. About thirty-five men are working at the tunnel, mine and at the power plant. Ore is being taken out.——A. A. Travis has men at work digging the canal to drain the upper part of Lundy lake. This will allow the tailings in the lake to be gotten at and worked by the Lundy Cyanide & Development Co.

Supplies are on the ground for remodeling the Standard Con. M. Co. cyanide plant at Bodie for use of the Moore filtering process, says Superintendent T. Hoover. Operations on the slum pond will start next month.——The Bodie Railway Co. is extending its track as far as the old Standard dump. A number of men are also at work clearing and repairing the roadbed. Trains will be running this week.

Nevada County.

At the Standard mine, near Grass Valley, work is under way on the hoisting works under W. C. Body.

A company headed by J. C. Camphell, superintendent of the Mountaineer mine at Nevada City, has closed a deal for the East Orleans mine, on Gold Flat, and operations will be started this week.

The Osceola G. M. & Dev. Co. has been incorporated by E. B. Power, C. W. Alisky and A. C. Porterfield of San Francisco; C. P. Wells of Oakland; C. W. Porterfield, G. J. Rector and L. S. Calkins of Nevada City, to develop the Osceola quartz mine in Osceola ravine, a mile south of Rough and Ready. Machinery will be set up and a shaft will be put down. The vein has been prospected near the surface and carries gold values.

Superintendent H. Egan of the Spanish Ridge mine, near Nevada City, proposes enlargement of his milling plant and will in July make an addition of twenty stamps. The mill has twenty stamps at present and is crushing steadily. Egan has seventeen men employed and is running a tunnel to crosscut the ledge. The tunnel is expected to tap the ledge at a distance of 150 feet more.

At the Zeibright mine in Little Bear valley, south of Grass Valley, the mill is running steadily on ore from the ledge on which the tunnel has been driven a distance of 270 feet. This ledge varies in thickness from 10 to 18 feet. A high-grade shoot is reported opened at a point 800 feet above the level of the tunnel. The tunnel will be driven to tap this and is expected to reach it within a distance of 600 feet. The company will put in an air compressor plant, and later will increase the milling capacity by adding to the present complement of ten stamps. Seventeen men are at work. F. Zeitler, of Nevada City, is manager.

Placer County.

At Ophir the Three Stars mine is running with sixty men at work. The 20-stamp mill is crushing ninety tons of ore per day. B. F. Hartly is superintendent. While fitting up some of the lower levels for stopiug, part of the ore is coming from the Peardon & Hawken dump. The management have been laying a track to the Almont, and when opened and going another ore producer will be tributary to the mill. The Gold Blossom is being made ready to start to pump. Men are overhauling the machinery and the pipe line, says Superintendent Harmon.——C. A. Reed is repairing his mill preparatory to running.

Plumas County.

J. Rawling of Grass Valley says he will begin development next week on a group of claims near Eclipse. The ledge is large and shows free gold. A tunnel will be run in on it. Later a mill will be put up.

E. J. and H. Skewis of Minneapolis, Minn., having bought the Golden Star quartz mine on the Middle Fork of Feather river, near Quincy, intend to run another tunnel for development. This tunnel will be lower than the present one and is expected to be between 300 and 400 feet in length.——J. D. Whitney, superintendent of the New York mine, near Greenville, reports work in the mine progressing and he has twenty men on the payroll.

San Bernardino County.

The Fletcher M. M. & S. Co. of Los

Angeles has bought the Needles smelter at Needles and will put in two new stacks, one for copper and one for lead, says the Needles Eye.

Sierra County.

M. H. Mead of the Keystone mine at Sierra City says the company operating the mine is making preparations to build a quartz mill this summer.

Manager J. W. Morrell for the Alleghany M. Co. of Alleghany has made final payment on the $10,000 for the Telegraph gravel claim of 160 acres. This gives the company 1100 acres of land lying in one body along the Red, the Blue and the Keystone channels. There are said to be a number of promising quartz ledges in the claims to which attention will be devoted later. One of these veins is thought to be an extension of the Plumbago. The main tunnel, in 270 feet, will be driven ahead. There is another tunnel in 920 feet tapping the front channel, and this shows a body of gravel. Tunnel No. 3 will be put through, and through this latter the gravel will be handled by water pressure, says Superintendent J. F. Bovee.

Siskiyou County.

A. Pereira took out of his claim at Hawkinsville, between McBride and Rocky gulches, below Hawkinsville, 2 miles north of Yreka, a quantity of nuggets last week, and among others was one which weighed thirty-four ounces, worth about $600, says the Yreka Journal. It contained a small amount of quartz. This find was taken from an old pillar in the claim. An $800 nugget is said to have been taken out near the same locality some years ago.——J. Frager reports cleaning up $2000 from the winter's work at his claim near the above claim at Hawkinsville. It is a dry section in summer, hence must depend on winter rain and snow for ground sluicing and box sluicing.

Work is being increased in the Poverty Point hydraulic mine on Klamath river, near Oak Bar, under superintendence of H. J. Barton.

Tuolumne County.

The new shaft and the old workings at the Don Pedro mine, south of Chinese, have been connected by a tunnel 487 feet long and at depth of 160 feet. The steam hoisting machinery has been set up.

M. Bottini has bought the Gem (formerly the Monitor) quartz mine, 4 miles east of Confidence; also the Royal New Brunswick adjoining, and the Gem millsite and water right on Sugar Pine creek.

The cyanide plant at the Confidence mine at Confidence is in operation and twenty-five men are at work. The number underground will be increased this week. The mill will start up June 1st.

Water power will be put in to run the mill at the Republic mine, near Parrott's Ferry, near Columbia. The gasoline engine used was reported unsatisfactory.——A 10 H. P. gasoline engine was put in last week at the quartz mine on Saratoga hill, north of Sonora, being operated by Restano Bros. & Sierra.

Manager R. B. Stanford says he is putting in a boiler and engine at the Doyle Ranch gravel mine, near Columbia. Work was started last week at the Doyle Ranch gravel mine. A gallows-frame is being built and they will also put in a 3-stamp mill to crush the gravel.

T. F. McAvoy, of Alameda, for $10,000 has bought a three-quarter interest in the New Era (the Hunter) quartz mine; the Chilcoot Pass quartz mine, being south extension of the New Era: the Plateau quartz mine; also water right of 500 inches flowing in Hunter creek, southeast of Carters.

Fourteen men are at work in the Crystalline mine, near Jamestown. A drift is being run east of the shaft to strike a shoot which was worked in the Little Gem mine and which is said to dip into the Juanita mine, owned by the company operating the Crystalline.

At the Draper mine, near Soulsbyville, they are putting in a dynamo to furnish electric lights for the mine and surface works. A 10-drill compressor is being set up and repairs are being made to the mill. There is still 60 feet of water to be pumped from the shaft. —— The Black Oak mine at Soulsbyville is running full handed and the 40-stamp mill is crushing high-grade ore, says Manager G. W. Campbell.

COLORADO.

Boulder County.

(Special Correspondence).—The Maxon Gold Leasing & Mining Co. has a shaft down 65 feet and expects to sink 75 feet deeper. The company is operating through a tunnel, which cuts the vein at a depth of 600 feet, and is drifting each way from the tunnel on the vein. Telluride and free gold ore is said to be obtained in both drifts. Ore in a 4-foot vein averages $16 per ton. They are not shipping any of the ore at present, but expect to put in a mill. R. C. Lamb is superintendent.

Gold Hill, May 15.

(Special Correspondence). — Plans for extending the Colorado & Northwestern Railroad to Eldora, Jimtown, Gold Hill and Rowena up Left Hand gulch are being prepared. It is understood a plant for handling the ore will be built by the railroad company at or near Boulder.

Boulder, May 15.

The Big Five M. Co., of Idaho Springs, is preparing to complete its Dew Drop mill in Boulder county, and President Daniels says next week they will begin to build the sampler and concentrator at the Central tunnel. The plans for the mill are completed and all surveys made. The track from the tunnel to the site of the mill with bridge and trestle across the creek has been in place for some time and preliminaries to actual work on the mill are completed. The management expects to have the mill in operation by January, 1905.

The Surprise G. M. Co. has bought two mines at Sunshine and one at Magnolia. The Surprise mine at Magnolia is near Keystone, near the Mountain Lion, Keystone and Senator Hill mines. The company is running a tunnel on the trend of the Surprise vein and expects to cut other mines and feeders before it reaches a point under the top of the mountain, which will give a back for stoping 1000 feet in depth. The Nelly Bly mill is said to be treating the ore for $5 a ton and saving 90% of the metals contained. At Sunshine the company has bought the Climax and Cardiff gold mining claims. These mines are being developed by tunnels from opposite sides of the same mountain and may be operated through the Cardiff tunnel.

Chaffee County.

The company operating a group of claims on Free Gold hill, east of Buena Vista, under supervision of H. Segoin, intends to place machinery on the group with another shaft and increase development work. The vein is a contact between porphyry and granite, the general trend being east-west. They have 3 feet of ore in the bottom of a 100-foot shaft which assays $40 in gold. They have saved a car for shipment.

The Buena Vista S. & R. plant at Buena Vista has been rebuilt and is ready to be blown in. Manager Hinkson says no date has been set for reopening, but it is expected the smelter will be in full operation next month. The ore being taken from the Mary Murphy at Romley is being milled at that point. They are also blocking out ore awaiting resumption at the smelter.

Clear Creek County.

The Ward mill, near Idaho Springs, began operations last week on ore from the Ward lode, owned by Anderson, Carlson & Tanner. The mill has a battery of ten stamps, plates and a concentrating table. It is intended to add the cyanide process for treatment of the slimes.

J. J. White has a bond and lease on the Washington lode, in Montana mining district, near Georgetown, for $15,000. He is arranging for operations and men will be put to work next week.

Idaho Springs reports say work of extending the Sun & Moon raise from the Newhouse tunnel will be resumed next month. It is understood arrangements have been completed with the Gem management for the extension of a line of air pipe from the Sun & Moon compressor plant down the Gem shaft to furnish air for the drills to operate in the raise. The Sun & Moon mine is producing steadily 1600 tons a month from the lower levels of the upper workings. It is understood that work there will be continued as heretofore and this production will not decrease until the completion of the raise, after which all work will be done through the Newhouse tunnel.

Custer County.

Arrangements for the 200-ton mill of the Silver Bar M. Co. at Rosita are going ahead. It will treat chloride ores.——It is reported that the Little Bernice Co. proposes the introduction of a matte smelter to handle ore from its property.

El Paso County.

The $15,000 cyanide plant just completed in Colorado City by the United States R. & R. Co. was started up last week. As soon as the tanks are leached the concentrator attached to the Colorado-Philadelphia mill will be put in operation. The two plants will treat the dumps lying around the Standard and Philadelphia mills. After the dumps are exhausted the cyanide plant will be used to treat Cripple Creek ore.

Fremont County.

The refinery of the United Oil Co. at Florence is treating all the oil produced in the Florence field, with the exception of the Florence Oil Co.'s output, and 3200 barrels are put through daily. About 500 barrels of this are produced by the independent companies. From time to time, according to the increase in petroleum production, additions have been necessary to care for the oil output. In this refinery thirteen distinct products are said to be made from the crude oil.

Gilpin County.

During the month of April the shipments of smelting and other ores, tailings and concentrates from the Black Hawk depot to the Denver smelters and to outside points for treatment reached a total of 213 cars, or 4260 tons.

The Penobscot M. Co., operating near Rollinsville, in which Valley Falls, Kan., parties are interested, is preparing to build a stamp mill. The company has been driving a tunnel to open up the Penobscot group and has been in ore through the last 100 feet. It also has ore in the shaft at a depth of 200 feet. Two shifts are at work.

The stamp mill built at Phœnix for the Blue Grass M. Co. is dropping its ten stamps steadily on ores from the Champion, Lone Star and Tenderfoot mines of that company.

Sternberger Bros. are getting ready to work their East Calhoun group in Leavenworth gulch, near Central City, which has been idle for several years. A steam plant of machinery will be set up and a shaft building erected. This shaft is reported to be down 200 feet, is filled with water. They will sink the shaft another 100 feet.

The Hall mine in Russell district has been leased to H. Snyder, E. A. Came and G. S. Crilly of Central City and the lessees have started operations in the 100-foot level. They are working on both sides of the shaft, where there is said to be both milling and smelting ore, and they are hoisting, milling and concentrating. The shaft is down 130 feet.

The Ingalls G. M. & L. Co. is increasing developments at its Straub or main shaft on Gunnell hill, near Central City. At the 400-foot level crosscutting is being done for exploring the known ore body opened up above that point. The 500-foot east level is being extended. The ores opened up are said to give values of one and a half ounces gold per ton. The company has sunk the shaft to the 515-foot point, or an increased depth of 400 feet. They have also extended the levels for about 500 feet and done some 520 feet of crosscutting since taking the group. It is intended to put in a larger plant of machinery, made necessary by reason of deeper workings. They will also add to their top buildings. W. Ballantyne is superintendent.

The Gilpin M. Co. has taken a lease and bond on the London mine on Gunnell hill, near Central City, and W. Kiley is superintendent. A 12 H. P. gasoline hoisting plant was put in last week and the shaft building has been enlarged. The shaft is 160 feet deep and it is intended to sink another 100 feet as well as carry on drilling. Milling ores have been taken out and the smelting ores are reported to have brought net returns of $50 per ton.

Gunnison County.

The Brooklyn M. Co. is operating the Harper group on Galena mountain at Elko. A tunnel is being driven to cut the ore bodies at depth. In the upper workings ore is showing and when the tunnel cuts it the company expects to have a heavy producer.——The Gothic S. & M. Co. is preparing to start operations on its group, near Gothic. It last fall completed a smelting and milling plant, but decided to wait until spring before starting up its plant permanently. The sylvanite mine will furnish ore for the plant. Other properties in the district will be operated.

The Racine M. Co., composed of Denver, Colo., and Racine, Wis., men, is increasing development work on its group on the ridge east of Tomichi dome, near Bowerman, says Manager Belden of Racine, Wis. B. E. Burnett is manager. The company owns ten lode claims in Crook's gulch, southeast of Bowerman. An air compressor and other machinery will be put in. A body of lead ore is reported in the tunnel, running 12% lead. The tunnel is in 100 feet and cuts the vein 65 feet from the surface. The shoot crops at the surface. The main vein carries gold, copper and silver values. A wagon road will be completed this month and then the company expects to start shipments.

Lake County.

(Special Correspondence).—A strike is reported in the Annie mine on Long and Derry hill in Iowa gulch, near Leadville. The Annie is owned by Mansfield Bros. of Leadville, and adjoins the Ready Cash mine. It is stated they have a vein 4 feet wide which runs eight ounces in gold per ton. These properties are said to be on the projected line of the Leadville-Denver M. T. & T. Co.

Leadville, May 16.

C. T. Carnahan, at Leadville, says the Resurrection mill will resume this week. The Resurrection mill was closed down during the winter. Repairs have been made. During the inactivity of the mill the Resurrection mine has been shipping about 600 tons of ore a month. The resumption of the mill will give employment to more men and will turn out 150 tons of ore a day from the mill. The shipment of ore will also continue.

Manager Owers says the second drill hole on his properties on Western Rock hill, near Leadville, will be started by the United M. & Dev. Co. The machinery is being set up by Superintendent Stanton. This hole will be sent down at least through the formations disclosed in the first drill hole on the Mike, and probably to a total depth of 1000 feet. The original plan of the company was to sink ten holes on the Owers properties on a line drawn east and west through the drill hole on the Mike. The second hole will be 1½ mile west of the first hole.

Last February the Harvard shaft of the Fryer Hill M. Co. at Leadville was started, and at a depth of 375 feet the ore body was cut. The shaft is ½ mile from the El Paso, north, and about 1000 feet from the Cady shaft of the Progressive M. Co. The finding of the ore body in the Harvard proves that the Fryer hill shoot extends into Big Evans gulch, and possibly farther north into Canterbury hill, says the Times. The drift run from the El Paso to connect with the Harvard shaft is nearly all in ore, a distance of 3000 feet. This drift will have to be driven about 75 feet farther to get under the Harvard shaft, and the connection will be made by June 1st. When this is done the Harvard will become the principal shaft of the company and will be equipped with hoisting apparatus and will have double-decked cages. The work of sinking the Harvard is being retarded by a heavy flow of water. When the sinking on this shaft is finished work will be resumed on the Pride of the West shaft, which is north of the Harvard and was closed down last fall on account of the heavy flow of water. The shaft is 400 feet deep. Another shaft that will probably be started on the same ore shoot and north of the Pride of the West is the Price shaft, which had to suspend operations on account of the water. The territory will be drained when the Harvard reaches the El Paso drift. In addition to the work carried on at the El Paso and the Harvard, the company is shipping ore from the Tip Top and the Silver. From the El Paso shaft, south, a drift is being run to the old shaft of the Miami and is in 300 feet. The drift has gone through a porphyry dike, with ore on both sides of it.

The zinc situation in the Leadville district continues to improve and there is much activity among the zinc producers and increased production, says the Times. The present zinc tonnage amounts to 250 tons a day, about 90 tons of which are zinc concentrates. The heaviest zinc producer in the camp is the Moyer mine of the Iron Silver M. Co. The latest shipper is the Quadrilateral property. The Wolftone is also arranging to resume shipments.

J. F. Campion of Denver, manager of the Ibex M. Co. at Leadville, says that while the company will operate Nos. 4 and 5 shafts, the territory embraced in shafts Nos. 1, 2 and 3 will be leased in blocks. There will be from 300 to 400 men at work on this property next month. In addition to work by lessees, the company will open new ground at a depth of 1300 feet through the Ibex No. 4 shaft, at which point the Yak tunnel has tapped this shaft.

La Plata County.

(Special Correspondence).—Prospectors are coming in daily for the season's work. The district has hardly been scratched by the pick, except close down to the La Plata river and at the head of the East Mancos. The ore bodies vary in character from high-grade telluride veins a few inches in width to veins of sulphide ores up to 14 feet thick, carrying $8 to $10 per ton in gold on an average. It is proposed to build at Mancos a plant for the treatment of these sulphide ore bodies by making sulphuric acid, which will be largely utilized to leach the copper from the low-grade copper ore found at the head of the East Mancos creek and Bedrock gulch.——Near Mancos are veins of bituminous coal, much of which makes good coke.

The May Day mine is working fifty men on mining and construction and it is expected the air drills will be in operation this week.——The Chief M. Co. is putting up additional buildings and working a few men in the mine. They have the extension of the May Day and are steadily shipping ore. Returns give $300 per ton. A twenty-five-ton shipment was made last week.

The Empire M. Co. has started its com-

pressor and air drills and is making good headway in development work.——The Comstock mine has made a ten-ton shipment to the Durango smelter and shipments will be continued regularly.

Mancos, May 15.

Pitkin County.

Aspen reports say n rovival in mining is taking place in Aspen district. Operations are being increased by D. M. Hyman et al. on the Enterprise mine and they report a body of ore opened up showing values in silver and lead. This strike has been made between the A. J. workings and the shaft in the Enterprise ground. D. R. Brown will begin development work on the Homestead mine, near Aspen. Operations on this property will be carried on through the Cowenhoven tunnel, under management of G. B. Brown. He is changing the course of the Cowenhoven tunnel. A drift will be run around the Smuggler stope which will do away with the anneyance caused by gas from the Smuggler workings, which has in the past interfered with operating of the tunnel. Bodies of lead ore have been found in the Homestead, but development has been retarded by water. With installation of an electrically operated Cornish pump planned by the company work will proceed.——The Percy-LaSalle mines, operated through the Newman tunnel, have resumed operations after a temperary shutdown caused by repairs on the flume and setting up of more machinery. H. R. Woodward is manager.

Rio Grande County.

The Golden Income M. & I. Co. of Embargo, G. P. Wilson president, proposes to build a mill on its mine, near Del Norte.

San Juan County.

The Ruby Basin mine, in the Ruby basin, south of Mineral, near Silverton, has been under development during the winter with satisfactory results, says the Silverton Standard. The Ruby Basin M. & T. Co., G. A. Schemerhorn president and T. J. Hurley manager, increased its number of men to twenty last week and the erection of a fifty-ton capacity roll-jig mill will be started next month.

San Miguel County.

The Yellow Mountain M. Co., owner of the Carriheau-Montezuma group of mines, 1 mile from Ophir, has the Carriheau mill running, after an idleness of eight months. While the present capacity of the mill is only ten stamps, capable of treating thirty tons of mineral in twenty-four hours, it is expected it will be enlarged and additiens made from time to time as extended development in the mine justifies, says F. T. Axtell, resident manager.

On the property of the Ophir Con. M. Co. at Ophir Loop a vein of tungsten ore is reported opened up. While driving the fifth level on the Ida vein a branch vein was cut, which, on being followed, shows a streak of tungsten ore. The ore will not be treated extensively at this time because of the mill being utilized for the treatment of Ida ore, which is free milling gold rock, says the San Miguel Examiner.

The Mayflower group is in Gray's basin, a tributary of Bridal Veil, 5 miles south of Telluride. E. L. Davis, resident manager, says the company has a lease on the Philadelphia 10-stamp mill, at head of Bridal Veil, 1½ miles below the group, and as seon as the snow disappears a wire rope tramway will be built connecting the mines and mill. It is expected this and other improvements will be ready for operation in June, when the mill will be started. The operators plan to equip the property with a larger mill, trams and heavier machinery.

A portien of the Gold King 40-stamp mill, in Gold King basin, near Telluride, was started up this week. Leasers have been at work in the Gold King mine all winter, and have blocks of ore cut out ready for breaking down and transportation over the tramway to the mill. The product is free milling and no attempt is made to save the values other than on the plates by amalgamation. The ore is low grade, but the vein is large and is said to carry uniform values.

The Tomboy mine, near Telluride, is increasing development on its properties, near Telluride. Work has been resumed on the Cincinnati shaft, which has been sunk on the Cincinnati and Argentine vein to a depth of 180 feet. The shaft will be sunk 100 feet deeper, and it will be enlarged throughout. It is from the Cincinnati and Argentine vein that the Tomboy Co. has been getting its principal returns the past three or four years, says the San Miguel Examiner. It carries gold values. The smaller Tomhoy mill, which has been idle during the winter for lack of water for milling purposes, will be started up by June 1, as there will be an abundance of water from the melting snow. This plant has a capacity of 225 tons daily. It will treat ore from the Tomboy mine proper, on which a number of lessces have been at work during the winter.

The E. Field half interest in the lease on a dump of the Sheridan mine on the Smuggler vein, near Telluride, has been sold to J. Wagner for $3000. The other half interest in the lease is owned by M. Robbins. The lessees have put men to work sortiug ore from the dump, and have started the 20-stamp mill at the head of Marshall basin to treating the product The lease also includes the claim on the Smuggler vein known as the 76, which will ho worked this season by the lessees.

Summit County.

Hoyle & Hoyle are steadily working their lease on the Puzzle-Gold Dust group, near Breckeuridge, and are keeping the Westside concentrating mill running one shift a day on second-class ore from the lease. Owing to heavy inflow of water from above, the driving of the raise was suspended until the water lessens. The concentrates made from the Puzzle-Geld Dust ore carry iron and lead sulphides, with values in gold and silver. Hoyle & Hoyle's shipments average two carloads per week.——The 500-ton mill run on ore from the mine, made at the 40-stamp and cencentrating mill of the Jessie group in Gold Run, was satisfactory, says T. R. Griffith, who with others has a lease on hoth mine and mill. They are putting up additional buildings and are having additieral foundation prepared for an air compressor which will drive the power drills. The 14-foot vein shows 200 feet of stoping ground between the Quincy and the Jessie levels. Besides the gold secured by amalgamation on the ceppor plates of the mill, several carloads of auriferous concentrates were made. The concentrates will he shipped.

Teller County.

The Cripple Creek Enterprise G. M. Co. has a twenty-year lease from the city of Cripple Creek to werk under the streets and alleys and resumed operatiens last week after a close-down of several months. Manager Hanley started the pumps to working to drain the shaft of water and will lower it to the 300-foot point. Since work on the Enterprise was started a great advantage to the company is that tho drainage tunnel has taken away a considerable flow of water that was formerly encountered and the advantage will be increased as the drainage tunnel advances.

It is estimated there was distrihuted threughout the Cripple Creek district last week $520,000 to miners and others engaged in the mining industry for the month of April. The payroll is increasing. There are nearly 4000 miners at work on the different mines in the district. Miners alone drew from the above figures $450,000, the rest going to ore haulers, assayers and men employed in mining offices and other men allied to the mining industry in this district. With the exception of the Gold King-Hull City placer and Last Dollar mines every old-time producor in the camp is working a full force and the number of lessees at work exceeds that for several years past. There are more men employed on the Gold Coin mine under the leasing system than there was by the company.

The new rates established by the American S. & R. Co. and the United States R. & R. Co. have been announced, effective fer Cripple Creek ores as follows:

	Per Ton.
Up to one-half ounce gold	$ 5 75
Up to three-quarters ounce	6 50
Up to one ounce	7 00
Up to one and one-half ounces	8 00
Up to two ounces	9 00
Two to five ounces	10 00
Five to ten ounces	11 00
*Over ten ounces	7 50

*Plus the freight.

Manager Balderston of Stratton's Independence at Independence, says he is sending out 165 tons of ore daily on an average. Sylvanite ore is reported being taken out. The pump at the 1400-feet level has been hoisted to surface and the lewer levels of the mine, at least for the present, abandened. There are two pumps at the 900-foot station and whenever necessary they will be called into use, as to that depth the property can be profitably worked. About 400 men are working on Stratton's Independence. Manager Baldersten says the rush of applications for leases continues, but nothing is being done with them as yet. It is thought no leases will be let for several months to come.

The Homestake G. M. Co. of Cripple Creek has taken over the Magna Charta, Quartzite and Annex lodes for $85,000, says the Gazette.——The Ajax company is pumping out the water in order to reach the bottom level of the mine, which is 1200 feet in depth. When the water is out work at that point will be started.

Work has so far progressed on the Ophelia tunnel, near Cripple Creek, that it has become necessary to discontinue the work of the 40 H. P. air-compressor locomotive at present and mules are being used to haul out the train of cars, says the Gazette. The locomotive heretefore used is designed to run 2½ miles without recharging the air. The tunnel being over 1½ miles in length, the locomotive cannot make the trip without recharging. The management expects to put in a station in the tunnel so that the engine can he recharged in the mine.

The El Paso M. Co. at Victor shipped during the month of April thirty-four carloads of ore, hut from this comparatively light tonnage the net smelter returns were $78,000. The net profit of the company was $57,000. There were shipped the first ten days of May fourteen cars of ore of an average value of $60 a ton. The shaft has attained a depth of 720 feet. A station will be cut at the 700-foot point, which is 104 feet below the drainage tunnel level. When this station is completed Manager Bainhridge says he will explore cautiously for water. The flow, it is anticipated, will he struck in the main El Paso vein that on this level lies 35 feet west of the shaft. The Tillery vein, another producer, according to surveys, will he cut in the station, hut no flow will he feared there. Every precaution will be taken as the main vein is approached, and the crosscut will be hulkheaded at the first sight of water in any volume. At the same time the company is prepared to handle any ordinary flow. The bulk of the ore is coming from the main El Paso and C. K. & N. vein. The new vein at the 480-foot level (the Eaton vein), has been drifted on for 100 feet and averages 7 feet in width. The mineral between walls is said to average $30 a ton. Under instructions from Colorado Springs last week, work ceased in the Elkton heading on the drainage tunnel. The main Elkton contact was between 100 and 150 feet distant when work ceased, hut as the water flow has shown no increase for weeks and the tunnel is effectually draining the mine which centributed mainly to its construction, the managoment decided to cease operations on the tunnel fer the present. The water in the Elkton shaft is now but a foot or two above the eighth level and the working of that level is expected to bo recovered by June 1st. The Mary McKinney lower workings are dry and other properties on the same water course are lowering their water level and the flow continues from the tunnel portal at the rate of 7000 gallons a minute.——The Julia V. Co., oporating the Henry Adney, anethor Beacon hill mine, under bond and lease, sent out a shipment of twenty-five tons of ore last week of a value of $200 per ton.

IDAHO.

Ada County.

The Ironsides mine, in Black Hornet district, near Boise, will be worked this season. The property has been idle for several years. Mrs. H. Adams is manager of the company.

Boise County.

The Checkmate mill at Pearl was burned last week. It had not been in operation for some time, says Superintendent Linney. The plant cost $17,000. It was insured for $10,000. E. H. Dewey, the owner, says he will rehuild.

G. W. Stiffler and A. George of Missouri and F. W. Pralle, superintendent of the X-Ray Co., owners of the Three Brothers quartz claims, Nos. 1, 2 and 3, on Banner creek, near Idaho City, are starting development work to determine the value of the claims.——H. J. Kinkaid has a lease and hond on one of the claims of the Twin Sisters group, near Centerville.

The mill at the Lincoln mine, near Pearl, of which J. T. Hodson of Salt Lake City, Utah, is manager, will start up this week. The plant has been undergoing repairs.

Lemhi County.

The Salmon City Recorder reports that E. Benedict and E. E. Edwards of Gibbonsville and F. W. Vogler of Red Reck have bought the A. D. & M. mines and mill at Gibbonsville. The deal includes thirty patented mines and the cyanide mill. This property has been tied up in litigation for the last feur years. The price is reported at $10,000.

Shoshone County.

B. F. Wells of Boston, Mass., a stockholder in both the Cœur d'Alene M. Co. and the Eagle Creek M. Co., near Murray, has a lease on all the properties of the Cœur d'Alene M. Co. and has started work. He has fourteen men repairing ditches and flumes and preparing to work the high wash between Dream gulch and Missoula gulch.

MICHIGAN.

Mining operations for April in the Michigan copper district recorded the largest output for any month in its history, covering a period of sixty years, says the Mining Gazette. The official figures of production are not reported monthly by all of the mines. The output, however, is estimated at 8700 tons of copper, which would indicate a present rate of production per annum of nearly 209,000,000 pounds of copper.

MONTANA.

The receipts of gold from Montana at the United States Assay Office in Helena for month of April amounted to $191,333, as compared with $172,365 for April last yoar. An increase in almost every mining county in the State is shown. Fergus county loads with $111,589. Outside of Montana the amounts received were: Idaho, $3352; Nevada, $4456; Washington, $379; British Columbia, $7439.

Broadwater County.

J. Johnson reports making profitable shipments to the East Helena smelter from the slag dump of the abandoned smelter near Townsend. The saving of precious metals was not close, with the result that Johnson is having the slag resmelted for its gold, silver and lead values. Johnson has taken over the slag heap at the Gregory smelter, 20 miles south of Helena. They were worked by hand and jig, hut are still found profitable to smelt again.

Choteau County.

To develop the oil fields of northern Montana, the Great Northern Oil Co. has been incorporated with headquarters at Chester. The company has leases on 800 acres of land, and it is expected hering for oil will be beguu by June 1st. The directers are G. Bourno of Hill, L. Crichten, F. B. Wilbur aud P. A. Heater of Chester, and G. E. Howe of Browning.

Fergus County.

In Cone Butte section operations are said to he progressing on the McIntyre properties on West Maginnis creek near tho Chicago mine, near Kendall. On the Blackhird greup (the McIntyre claims) the place has been reached in the tunnel where the ere assumes the vortical position, and as depth is gained the appearance of the ore improves. A mill will he built on the Blackbird this summer by Caird & Hawksworth of Helena, part owners.

Superintendent J. H. McCormick of the North Meccasin M. Co., operating near Kendall, says the new hoist for the North Moccasin group is in place on the Santiago claim and has started working. The hoist has been placed on the shaft in the gulch at the south end of the group, near the gulch in which is the Kendall mill. The shaft was sunk 120 feet last winter and will be continued to depth of at least 200 feet, after which drifting for the ere will begin. A milling plant is also proposed for the North Meccasin group.

Jefferson County.

The Minah group of mines near Wickes has been bonded to a Butte company composed of Wayne, Kirk & Clinton.

Jensen & Co. of Norwich, Conn., have secured a controlling interest in the Rose gold mine, at head of Golconda creek. They will build a mill to treat the product of this and other mines taken over. There is said to be a 95-foot vein of ore in the Yellow Jacket mine.

Lewis and Clarke County.

The company organized by Canell & Martin of Helena to develop the Whitlach-Union properties at Unionville is heginning work with F. L. Sizer as manager. Machinery will be put in consisting of a steam hoist, pumps, cables and other equipment to sink the shaft. The heist is capable of sinking 1000 feet. Manager Sizer will sink a vertical shaft 500 feet as the first undertaking, and no attempt will be made to utilize the old workings in the present development.

J. H. Morrison of Helena reports copper at his claim, west of Fort Harrison, between Helena and the Red Bird mine. It will be developed.——The Amador copper mine, on Cedar creek, 12 miles from Helona, is increasing development. The machinery is run hy water power. The company is alse building a flume 2½ miles long to develop water power fer tho smelter, which will be built at Iron Mountain statien. A townsite is being laid out. An electric tram, cennecting the mine and railroad station, will be built this season.

M. Edwards is putting in a cyanide plant at the Gloster mine, near Marysville. He says there is ore on the dumps which will average $5 a ton.

Madison County.

J. J. Maloney, manager of the Toledo and Grant mines, near Brandon, says the Toledo mine is showing progress in development. The vein carries values in gold. They are shipping four carloads of concentrates per week. As soon as they are sure of the water for power purposes they will put on the third shift in the mill, which will make it possihle to ship a carload of concentrates daily. The company is furnishing the town of Sheridan with electric lights.

Meiklejohn & Northey have leased the

Mascott lode and will operate it during the coming summer. D. F. Meiklejohn has charge of mining operations near Norris, including the Gold Hill mine, operated by the W. W. Wishon Ore Co., and the Standard, owned by F. Lohse. The Gold Hill is shipping from Norris two carloads of ore per week and the Standard one.

The Carmin mill, at Pony, will begin crushing ore from the Oregon mine this week. Water was turned into the ditch this week to soak up the wheel, and the mill is being overhauled. C. T. Wiedeman has the lease on the Oregon and will treat the second-class ore taken from the mine.

R. Knox, manager of the property of the Montana Revenue M. Co., at Revenue, says he is preparing to build a mill at the mines of the company, 6 miles from Norris. The mill will have a capacity of 75 to 100 tons of ore per day. There has been a mill at the mines of the company, but they are tearing it down to make room for the new one, which Manager Knox expects to have in operation by Aug. 1. The mill will be a dry crusher and will have a cyanide annex. The old mill had a cyanide plant in connection with it, and some of the tanks used in it will be set up in the new plant. The mine continues in operation and high-grade ore has been taken from its levels and shipped. The shaft is 300 feet deep, with crosscuts and levels from surface to bottom. There are 15,000 tons of ore on the dump ready to be run through the mill and ore blocked out in levels.

Silver Bow County.

The mine property bought by J. C. Cory in Mitchell gulch, near Helena, has been turned over to its new owner, and, with a clean ditch, a strong head of water is flowing that is expected to last until late in the fall. The prospect is good for the season's run. Below the Cory group Young Bros. began on their placers last week. They have a ditch.

All of the principal mines of Butte are at present in operation, says the Record. These mines include those of the Anaconda C. Co., Boston & Montana C. & S. M. Co., Butte & Boston Co., Washoe C. Co., Parrot Co., Pittsburg & Montana M. Co., Colusa-Parrot Co., Speculator Co., Colorado C. Co. and the United C. Co., the latter of which takes in the property of the Montana Ore Purchasing Co., the Hypocka Co., the Johnstown M. Co., the Cora & Rock Island C. Co. and the Basin Reduction Co. Outside of these corporations, there are several other companies operating on a smaller scale, one of which is the Reins C. Co., which is developing the Combination claim in Meaderville; the Brittania Co., the property of which, southwest of the city, is being worked under lease, and the Butte C. M. & S. Co., the property of which, the Dutton mine, is being worked under lease. The Lexington M. Co., the Alice M. Co. and the Moulton, silver and gold producers of the district, are doing little, so far as reduction of ore is concerned, but all of their claims are yielding ore under the leasing system. The east end of the Lexington contains copper ore, but it is said no portion of the veins of either of the two companies contains this class of rock in commercial quantities. In addition to these mines of the companies, there are other claims from which large quantities of ore are being extracted by individuals. The Sunnyside, under lease, is yielding good rock; the Wild Bill, also under lease, is another producer, and also the Old Glory, in Centerville. The latter is owned by the Amalgamated C. Co., J. B. Leggat and F. A. Heinze. The Ophir is also yielding ore, but the mine is not being worked extensively. —— The daily output in the Butte district is estimated at 13,000 tons, of which quantity the Amalgamated Co. mines 9700 tons, the United C. Co. 1500 tons, W. A. Clark 1000 tons and the other companies and individuals 800 tons.—— F. A. Heinze is putting in a larger air compressor for his Cora mine.

NEVADA.

Churchill County.

Oil is reported struck in the new town of Fallon in Churchill county. The strike was made on the property of R. L. Douglas at a depth of 40 feet. Fallon is said to be located at the point of greatest depression in the State.

Esmeralda County.

Superintendent Colcord of the Esmeralda Con. M. Co. reports the mill running steadily, with fifteen stamps dropping.

C. D. Lane of San Francisco, Cal., has an option from F. M. Ish at Diamondfield, near Goldfield, on two claims for $200,000. Men have been put to work by Lane, with C. W. Tozer in charge, to develop the property. The claims are Black Butte, Nos. 1 and 2. They adjoin the Vernal M. Co. ground near the Harvey lease. The agreement contemplates the installation of a stamp mill. Lane says the water question will not bother him, but he will pipe water from White mountain or Rye Patch.——The pay streak in the Sweeney & Hennessey lease on the Florence group is reported maintaining satisfactory values. The coarsest gold in the camp is said to be found there. —— The January is taking out values to exceed $2500 per day.——The Combination is hoisting good grade of sulphide ore and shipping large quantities weekly. —— The completion of the pipe line from above Rabbit springs has brought a supply of living water for Goldfield. —— Goldfield, an engraving from a recent photograph of which is shown on page 345 of this issue, is 28 miles south of Tonopah and west of the Nye county line. The principal properties include the January-February group, the Combination, the Jumbo, Blue Bull, Daisy and Red Top. The January is under lease to Z. Kendall, Reilly, Jones & L. L. Patrick. The January and the Combination are as yet the only shippers of much ore. J. F. Bradley has a lease on the Red Top near the base of Columbia mountain.——In the Combination the drifts from the 135 and the 185-foot points are being driven ahead. The Combination is held by the Marquette Exploration Co. of Chicago, Ill., on a $75,000 bond.—— The camp is 60 miles from a railroad, but when the road gets into Tonopah in June it will be only 20 miles from railroad transportation.

Humboldt County.

At the Sheba mines, south of Mill City, the mill is running and turning out concentrates. The company has under construction a gravity tramway, ½ mile in length, which will connect the lower tunnel with the mill. C. D. Morrison is superintendent of the mine and mill of the Sheba G. & S. M. Co., operating the group. Samples which show the presence of silver have been taken from the face of the south drift off the lower tunnel, at which point are 2 feet of ore.—— At the De Soto mine, adjoining the Sheba, work has been started with a few men, who are taking out ore.

Lincoln County.

The work of putting in plants at the April Fool and the DeLamar tailings dumps at DeLamar has been started. It is estimated that there are 500,000 tons in the dump averaging $2.50 per ton, which can be treated at a net profit of $1 per ton.

At Knob Hill, 18 miles north of Searchlight and west of El Dorado, the Knob Hill G. M. Co. reports work progressing. Since absorbing the Wagner mines the company owns twelve claims, together with a 3-stamp mill and water rights. Manager L. W. Walker reports that he is making mill tests on the Daisy Bell ore. He finds that only part of the values are saved on the plates and that the bulk are in the concentrates, which he will ship. The main shaft on the Daisy Bell is down 105 feet. W. P. Dewey is president of the company.

The Iyanough M. Co. of Searchlight has been incorporated to work in Camp Duncan, near Searchlight, by P. Thacher, C. D. Houghton et al. of Los Angeles, Cal. They have taken over the O. K. group, consisting of the O. K., Peek-a-Boo and the Peek-a-Boo No. 2. P. Thacher is manager. Assays show gold, silver, lead and copper values. A contract has been let to sink a 100-foot shaft on the O. K.

Nye County.

The Tonopah stamp mill at Tonopah has resumed operations after being shut down eight weeks for alterations and repairs.

The annual report of the Tonopah M. Co. of Tonopah, submitted to the stockholders last week, shows that notwithstanding the fact that the mine development has been discontinued since January 1, 1904, the net returns received from ore shipments for the past fiscal year aggregate $598,224. The management has discontinued further development work till the railroad is completed to the camp. It is expected to have the road in operation for the full 60 miles separating Rhodes and Tonopah by July 1. The report of President J. W. Brock covers the operations of the company for the fiscal year closing February 29, 1904. The company is having practical tests made of the ores found in its property, both at the mines and elsewhere. An experimental plant to treat the ores coming from this company has been built at Waverly, N. J. The following work was done during the year: Sinking, 1884 feet; drifting, 4631 feet; crosscutting, 2028 feet; raising, 286 feet. During the year 15,000 tons of ore were hoisted through the shaft, as well as 22,687 tons of waste. During the same period 4066 tons of ore were shipped and 11,228 tons of ore placed on the dump. Since the first of 1904 the operations at the mine have been limited to the shipment of such quantities of ore as could be transported on a favorable basis. The report states that the company has closed a contract with the American S. & R. Co. for the sale of 100,000 tons of ore, with the option on the part of the smelting company to buy an additional 50,000 tons on a basis, both as to smelting and transportation charges, that will enable the company to realize from the medium grade ores produced a better result than could be obtained by milling from any of the processes thus far tried. The contract will commence to show results from the first of June. The Tonopah Railroad, being built by the Tonopah M. Co., is to have a 3-foot gauge, corresponding with the road it connects with, and is being laid with 50-pound rails. For present requirements three locomotives and thirty-five 20-ton freight cars have been secured to start iuitial shipments. The receipts for the year were as follows: Balance March 1, 1903, $187,329.10; receipts from smelter for ore, $598.224.29; royalties, $12,430; other receipts, $4821.03; total, $802,804.42. The disbursements, including operation, mining, superintendence, machinery, insurance, taxes and freights, total $480,-404.74. F. A. Keith succeeds F. J. Siebert as superintendent and T. L. Oddie has been appointed general agent.

NEW MEXICO.

Grant County.

(Special Correspondence).—Near Lordsburg there is little work being done at present. The American Con. C. Co. has a concentrator at Lordsburg, and it is expected the mine will be opened up by June 1st. The concentrator is equipped with four Huntington mills, four Wilfley tables, three Standards, one Bartlett and a 65 H. P. Corliss engine and 80 H. P. boiler.

F. J. Campbell and W. Blackburn own the Nellie Bly group of three claims in Pyramid mining district, 9 miles south of Lordsburg. There are four shafts, respectively 60, 60, 90 and 75 feet deep, with several hundred feet of drifts and showing bodies of sulphide copper ore. Development is in progress.

Lordsburg, May 15.

Superintendent Patterson of the American Con. C. Co. has started work on the company's mines at Lordsburg.

OREGON.

Baker County.

It is expected extensive placer mining will be carried on on Eagle creek, near Baker City, during the coming season, says the Democrat. The Hillsboro Placer M. Co., of Hillsboro, after having tested the ground and performed preliminary work last season, is preparing to increase work. The company owns the Merritt ditch. They will repair it and increase its capacity to 3000 miner's inches. A hydraulic elevator will be put in. The holdings consist of 250 acres of auriferous ground, seven claims having been acquired by purchase and the remainder by location.

The Red Boy mine, near Baker City, was last week sold by the receiver, under order of the court, being bid in by A. Prussing of Chicago, Ill., at $80,000. Reorganization will be effected and operation resumed.

At his Monumental mine, near Sumpter, C. J. Allen is preparing for the season's operations. The roads are improving sufficiently to permit preliminary work. The Monumental stamp mill, with its roaster, pan amalgamators and silver devices, will be converted into a plant for saving gold and silver values by amalgamation and leaching. The ore bodies in the mine have been proven on the lower level, and raises were made through to the upper or old level last year.

Either a 10-stamp or Chilean mill of about same capacity, with concentrators, cyanide percolating tanks and slimes agitation plant, will be put in by the Mountain View G. M. Co., near Sumpter, this season, says W. Techow, manager. The power plant for the mill will be gasoline, as wood would be costly at the altitude of the Mountain View. Should the Rock Creek Co. deliver electricity in the Cracker basin, that would be considered by the management. The Mountain View is a Portland company, composed of H. M. Cake, H. L. Pittock et al. It has been developed by crosscuts, shafts, raises and drifts until depth of 300 feet has been attained on the vein. A shaft is being sunk below the lower adit level to prove depth of ore body. Development will be continued steadily while the milling plant is being set up.

H. M. Cake, president of the Mountain View mine, near Sumpter, reports it is the company's intention to build a mill on the mine this season.

Gleason & Doane are arranging to start development work on their Buckeye group in Rock Creek district, near Sumpter.——The Cracker-Highland mine, near Sumpter, has changed its general offices from Sumpter to Portland, with W. G. Perkins as secretary.

Crook County.

The Oregon King mine has been taken over by the Geiser-Hendryx Co. of Sumpter, says A. Geiser. He is arranging for opening work and effecting improvements with a view of increasing the output of shipping product and concentrating the milling grades of ore. Manager Hendryx says a milling plant is proposed, and it is intended to build a concentrator of 200 tons daily capacity. Mine equipment will be looked to first. The Oregon King has been regarded as a silver producer, with gold values and a percentage of galena. Hendryx says gold will dominate. The mine has been opened by a shaft 600 feet deep, from the six stations of which drifts have been extended on the lode and numerous crosscuts made. This lateral work is said to have proven the mineralized zone is 600 feet wide, and through it run veins carrying ore bodies of 4 to 16 feet in width.

Josephine County.

A company is being formed by H. Perkins et al. to operate on Mt. Reuben creek, near Leland. A saw mill is being built on the creek. Hoisting works will be put up to handle the boulders. The miners report having done well this winter, as they have had a long run and more ground washed than before. On Jump-off-Joe creek, Superintendent Crane of the Lucky Queen is running two tunnels—one over 100 feet. He has struck paying ledges in both tunnels. Rich rock is sacked up to send away for milling. The property is under bond. It is expected a mill will be built. Across the creek is the Dick mine. The owners have run a tunnel 200 feet.

The Golden Drift M. Co., of Grant's Pass, shipped last week six bars, weigbing twenty pounds in the aggregate, representing one-half of the annual cleanup for these mines for the season, says the Telegram. But one giant was operated and this one but for thirty-five days. The six bars are valued at $5000, and aside from these Manager Ament says he bas picked up a number of nuggets and larger pieces. All the gold from the Dry Diggings, which is the field covered by tbe placers of the Golden Drift Co., is said to run over 900 fine. Nearly all the sluices and the boxes are yet to be cleaned up. The Golden Drift Co. will put men to work next week completing the power dam across the Rogue river below the Dry Diggings, and to place the heavy machinery — pumps, turbines and power plant equipment — next season. Three giants will be operated.

In Galice district, near Grant's Pass, among the hydraulic properties that are working is the Royal Group, formerly the Old Channel. These placers are under management of J. R. Harvey. Two 6-inch giants, under a gravity pressure of 500 feet, are operated, and this battery will have ample water till late in June. The Galice Con. Co. is preparing to make available for pipe and giant all the territory recently added to its holdings at the mouth of Galice creek. The main ditch is being extended, and with the 1000 feet of new piping that will be laid, all of the ground at lower end of the creek and out on Rogue river bar will be in reach of the giants. A tubular elevator will also be put in, says Manager A. B. Cousin. The battery of three giants is in steady operation.——T. K. Anderson is operating the Harmon & Green hydraulic mines under lease this season. Two giants are operated and the water supply is expected to hold out till July 1st. —— The Rocky Gulch placers are operated this season by Lewis & Jewell. The main body of the gravel of this group lies along Rogue river.

Lane County.

L. Zimmerman, of the Lucky Boy mine at Blue river, states the mill will begin dropping its forty stamps this week.

SOUTH DAKOTA.

Lawrence County.

Work of unwatering the workings of the Dizzy M. Co. at Maitland is completed and development work will be resumed.

The territory of the Potsdam M. Co. in the lime belt of the Ragged Top plateau, west of Lead, is surrounded on two sides by the Spearfish G. M. & R. Co., operating a 250-ton cyanide mill, and the Deadwood-Standard G. M. Co., running a 100-ton mill. The Spearfish company has developed two ore deposits, one on the surface of the lime having a known length of 1500 feet, and average thickness of 12 feet. Underlying the surface ore shoot, another of equal proportions and value is developed 34 feet lower down; on still another floor below the latter the third deposit is being developed. These, the Black Diamond ore bodies, and other developments are said to be estimated to give the Spearfish company five years' run of ore for the mill of 250 tons daily capacity. The output of this mill is about $40,000 per month. Across John-

son gulch from these deposits, and bounding the Spearfish company on the west, is the Potsdam ground of 550 acres, extending on the east to within 400 feet of the Spearfish mill, adjoining the Gold Hill Co. on the south, the Deadwood-Standard on the southeast, and Spearfish creek on the west. Ore is shown in open pits, drifts and shafts at points on the Potsdam ground. Among recent developments is an open pit being driven from the escarpment of the plateau overlooking the Spearfish, into the surface blanket, showing 20 feet in thickness of ore, from the surface down. The cut has penetrated this ore 60 feet. The canyon of Spearfish creek, which surrounds this group of mines on the west and northwest, shows the Carboniferous lime formation to have a thickness of 700 to 800 feet overlying the Cambrian shales and quartzites and limestones.

UTAH.

Beaver County.

M. Lorin and C. Morrison, who are developing the Indian Queen group of mines 1½ milo from Newhouse, report work progressing with satisfactory results. The tunnel with which it is proposed to tap the ore-bearing channel in the Queen on its dip has advanced 100 feet, with connection to be made at a point 200 feet farther in. The ores contain silver, lead, copper and gold.

Iron County.

Manager Wobber, working the Good Hope mine, 2 miles above Stateline and on the main road to the Deer Lodge district in Nevada, has a bond and lease on the Creole mine at Stateline and has men at work there. This property has been idle for five years.

Manager C. E. Milner, of the S. B. Milner iron lands, says little is being done on the property at present. He proposes first to secure patents for the ground before doing anything on a large scale. The Colorado Fuel & Iron Co., he states, has started prospecting at Desert Mound with diamond drills. The machinery has capacity for depth of 1500 feet. At least four drill holes will be put down at Desert Mound, to ascertain the thickness and further determine the value of the deposits there.

Juab County.

The headquarters of La Reine M. Co., operating near Eureka, will be at Provo hereafter, with R. E. Allen, secretary, in charge. Plans are being perfected for the consolidation of the property with that of the Bullion-Beck Tunnel Co.

Salt Lake County.

The Alta-Peruvian M. & M. Co. has been incorporated to operate a group of mining claims in Little Cottonwood mining district, near Alta, viz., the Utah Nos. 1, 2, 3 and 4. The officers are F. J. McAuliffe, D. O. Ashcroft, J. Henderson, A. Johnson, W. A. Warthen and T. R. Kelley.

The management of the American S. & R. Co. proposes the addition to its smelter at Murray of two furnaces, says the Salt Lake City Reporter. This will give the plant a battery of ten furnaces and a capacity of 2000 tons of ore per day.

To meet the requirements of an increased output and the levy which is being made on its Murray smeltor, near Bingham, the American S. & R. Co. will, as soon as conditions permit, add two more furnaces to the battery of eight now in commission. The increase in production of lead ores within this jurisdiction has caused necessity for this, says Manager Whitney. With two more furnaces, such as designed, the capacity of the Murray plant will have been increased 25%, enabling it to reduce a volume of ore exceeding 2000 tons daily.

Manager Wiswall, local representative at Salt Lake City of the Green Reduction Co. of New York, which has a lease on the tailings dumps on the Geyser-Marion mine and mill, near Bingham, says preparations for starting the Geyser-Marion mill are being made.

Figures given to the stockholders of the United States M. Co. last week place the cost of the lead smelter under construction at Murray at $500,000. It is figured the company will derive a net profit from this source of $250,000 per annum.

Summit County.

J. McGregor of Salt Lake City, manager of the Pinyon Ridge M. Co., says he is preparing to start work on a tunnel that will ultimately penetrate the ore zone for 10,000 feet.

The superintendent of the New York mine of Park City says the raise from the 400-foot level on the west has broken into 12 feet of ore, assaying fourteen ounces silver with some gold.

Tooele County.

Superintendent E. J. Raddatz of the Honerine mines at Stockton reports the water coming out of the tunnel shows no signs as yet of receding. It continues to pour out of the adit at rate of 9000 gallons per minute.

Uinta County.

J. McAndrews of the Gilson Asphaltum Co. of St. Louis, Mo., owning asphaltum mines near Duchesne, says, pending construction of the line of railway between Mack, on the Rio Grande Western, and the mines, a distance of 54 miles, the production of the hydro-carbons has been practically suspended. However, this will be resumed as soon as connection with them by rail is effected, and the material will be produced from five different sources.

Utah County.

T. P. Rigney, manager of the ozocerite or "mineral wax" mines and reduction works at Soldier Summit, says he will resume sinking and establish another level at depth of 275 feet, or 100 feet below the present workings. He has been forwarding the output to New York and Germany.

WYOMING.

Carbon County.

A. Fehringer of Colorado Springs, Colo., has started work on the Home Run C. M. Co.'s properties, near Grand Encampment. This company owns sixty acres adjoining the Rudefoha mine and is said to be on the same dike as the Rudefeha. The company expects to get shipping ore during this season.

FOREIGN.

AUSTRALIA.

New South Wales.

At the Proprietary mine at Broken Hill the second of the three hall ore-dressing mills has been put in operation with satisfactory results reported. Shipments of sintered material have been increased from 1000 to 1500 tons weekly, while at Port Pirie another smelter has been blown in, and the production of bullion correspondingly increased. The new zinc plant is nearing completion.

Two of the imported blowers for the new nickel works, Dapto, have arrived at the smelting works, and the finishing touches are being put upon the newly erected stack.

Queensland.

Baker Brothers have taken over the Queen Silver mine, on the Severn river, near Stanthorpe, and they propose to unwater the mine, open it up and concentrate the ore. The mine is within 100 yards of river water supply.

Plant's Day Dawn Deep mines, at Charters Towers, has arrangod to build a surface plant, winding gear and compressor, at a cost of £11,000.

Cairns reports state there is activity in the wolfram market, and at the wolfram camp at Lappa Lappa the ore is bringing £70 on the field, and four miners secured nine tons in six weeks.

Victoria.

The Long Tunnel incline shaft, at Walhalla, has reached a total depth of 2240 feet.——The deepest gold mine in Victoria is reported to be the New Chum Railway, at Bendigo, which is 3896 feet deep.

During a period of five months, ended January 9th, the Ovens Valley Dredging Co., at Bright, handled 119,850 cubic yards of dirt for 680 ounces gold, equal to about forty-one ounces per week of the actual time worked. The profit on operations was £1483 15s 3d, and, after writing off £1292 5s 5d for repairs to dredge, a balance remained of £869 18s 1d.

Application has been made by the Iron, Steel & Metals Mfg. Co., Ltd., of Melbourne, for lease of the land containing the iron ore deposits at Lal Lal, formerly held by the Federal Iron Co. The company is adding the area to the concessions it already holds outside of the Commonwealth. The method of reduction adopted is said to be direct from the ore to steel or wrought iron, without requiring an intermediate stage to produce pig iron. Works are being completed in Melbourne for production of the metals on a commercial scale.

BRITISH COLUMBIA.

Boundary District.

During the first four months of 1904 the Boundary district sent out 280,000 tons of ore. The tonnage for month of April was smaller than for March, repairs to several furnaces at the two smelters, after long and successful runs, being accountable for this. In March the total shipments from Boundary mines were 72,000 tons. In April the total was 60,000 tons. The following are the figures from the different mines for the month of April: Granby mines, 42,870 tons; Mother Lode, 14,144 tons; Emma, 640 tons; Oro Denoro, 2214 tons; miscellaneous, 150 tons; total, 60,018 tons. The following are the monthly totals to May 1: January, 75,458 tons; February, 72,007 tons; March, 72,651 tons; April, 60,018 tons; total for four months, 280,134.

Cassiar District.

The Bull Creek Hydraulic & Dredging Syndicate, near Atlin, will resume operations this week, under management of A. Carmichael, says the Atlin Claim. Men with supplies have gone out to the property, and it is expected piping will start by June 1st.

East Kootenay District.

Control of the mines of the Sullivan Co., near Fort Steele, has been taken over by C. Sweeny of Spokane, Wash. The finishing work on the smelter will be started next week and the smelter and mine put in operation. The mine is at Marysville.

Rossland District.

(Special Correspondence).—The annual report of the Rossland Board of Trade for March, 1903-March, 1904, shows the following details of the output of Rossland mines for 1903:

Mine.	Tonnage.	Gold Value.	Silver Value.	Copper Value.	Gross Value.
Le Roi	194,151	$1,326,621	$46,072	$561,818	$1,935,441
C'nt'r Star	82,257	747,303	16,327	205,275	968,905
War Eagle	60,093	518,943	32,803	228,026	780,672
Le Roi No. 2	21,314	.....	.....	.....	325,981
Jumbo	4,395	52,740	.....	.....	52,740
Spitzee	450	3,517	238	1,745	5,500
L. N. L.	2,000	12,000	.....	.....	12,000
Ross.-Koot	7,489	81,460	266	4,737	86,463
Velvet	3,376	.....	.....	.....	67,520
Iron Horse	40	.....	.....	.....	320
Wh'e Bear	300	1,550	79	1,608	3,237
Giant	643	11,410	4	.....	11,414
O. K.	25	625	.....	.....	.....
Homest'ke	90	300	175	200	675
Totals	366,625				$4,251,393

According to the statement of the Associated Boards of Trado, the ostimated value of mineral produced in southern Kootenay and southern Yale in 1903 reached a total of $9,881,639.10, of which Rossland produced $4,251,463.

The following is a statoment (in feet) of the amount of development work done in the mines mentioned during the year 1903:

Mine.	Shafts.	Drifts and Cross-cuts.	Raises.	Diamond Drilling.	Winzes.
Le Roi	140	6,264	588.5	6,125.5	69
War Eagle	..	1,125	125	1,200	23
Center Star	..	1,844	230.5	1,800	79
Ross-Kootenay	..	1,121.8	71.1	....	210
Jumbo	15	250	....	....	...
Spitzee	120	500	....	....	03
Le Roi No. 2	..	1,200	....	3,900	...
Giant	..	135	....	....	...
White Bear	350	4,000	....	....	...

The number of men employed in the principal mines of Rossland in 1903 were:

Le Roi	350
Center Star	138
War Eagle	130
War Eagle and Center Star Concentrator (construction)	70
Le Roi No. 2	150
Jumbo	30
Spitzee	18
L. N. L.	7
Rossland-Kootenay	50
Giant	12
Velvet	40
White Bear	36
Homestake	10

Rossland, May 15.

Slocan District.

For $20,000, the Donelly group at Sandon has been bonded by R. Watson and J. Young. There are seven claims on which considerable work has been done. The group is within the city limits of Sandon and a railway runs near its upper tunnel.

Vancouver Island.

(Special Correspondence).—The Tyee C. Co., Ltd., at Duncans Station, reports the smelter returns for month of April as follows: Smelter ran 30 days; 6715 tons of Tyee ore smelted, giving a return after deduction of freight and refining charges of $80,373. C. Livingston is local director.

Duncans Station, May 14.

The following were the foreign coal shipments from the Nanaimo and Extension mines during the month of April, says the News-Advertiser: Western Fuel Co., 16,972 tons; Extension (Wellington Colliery), 30,135 tons; total, 47,107 tons.

West Kootenay District.

Arrangements have been made for a $20,000 double-rope aerial tramway by the owners of the Triune mine, near Trout Lake, in the Lardeau. The tramway will carry the ore from the mine to the wagon road and do away with rawhiding ore down the mountain side. The mine will also be equipped with air compressor and drills and new buildings are to be put up. The average value of Triune ore is said to be $145 a ton. Last year 11,378 tons were shipped from the mine and the returns were $16,000. The Triune mine is on Triune mountain and is owned by the Metropolitan M. & Dev. Co. of Detroit, Mich.

BRITISH GUIANA

The surtax of 5% heretofore prevailing has been repealed and among others the following articles have been transferred to the free list until March 31, 1905: Rails used for mining purposes and mechanical tools, writes G. H. Moulton, U. S. Consul at Demerara.

CANADA.

Quebec.

U. S. Consul-General W. R. Holloway, of Halifax, Nova Scotia, transmits the followiug from the Halifax Review: Minerals containing radium have been found in the Province of Quebec. The ore from which radium and oxide of uranium have been extracted was taken from a white-mica mine, 18 miles back of Murray bay, in Charlevoix county. White-mica deposits exist at several points in Quebec and eastern Ontario, and these will be developed next summer by an electrical company.

MEXICO.

Chihuahua.

The Pan-American M. & S. Co. is shipping from its Grenadena mine, near Parral, two carloads of ore daily. This ore averages per car 20 grams gold, 600 grams silver and 3% copper, says the Enterprise. They have put in a 60 H. P. hoilor. The company is sinking a new three-compartment shaft on the Iguana mine. This company is shipping from sixty to ninety tons of ore daily from the Quebradillas mine that averages sixty ounces silver and some gold. It is making extensive improvements on the Quebradillas and has two 60 H. P. boilers, a 320-gallon station pump and a sinking pump on the ground, to be set up.

J. D. Knotts is working his Santa Romana gold mine near Guadalupe y Calvo in the southwestern part of the State. He is preparing to put in machinery for a 5-stamp mill and will use plate amalgamation and cyanide.

Near Morelos, B. F. Deathridge, C. D. Hovoy and T. C. Shoemaker of Kansas City, Mo., interested in mining property near Morelos, report development under way. They have a small Huntington sampling mill up and additional machinery will be put in this summer. The company is the Southern M. Co.

C. Barbier and F. Ramirez have the Burns mill at Buenos Aires, in the Cusihuiriachic district, running on ore from La Reina mine.

The new company owning the Pinos Altos mines at Pinos Altos, of which E. M. Ray is manager, is preparing to enlarge the 60-ton mill to 250 tons with a cyanide plant.

Coahuila.

J. J. Murphy of Murphy & Ihlsing, of Chihuahua, is building reduction works and concentrating plant at Muzquiz. The firm has leased some old Spanish mines and dumps which will be treated.

The Mazapil C. Co. of Manchoster, Eng., has been granted a concession for building a smelter at Saltillo. They propose to put in two 100-ton furnaces.

Mexico.

El Oro M. & R. Co., at El Oro, reports for the month ending March 31 mill ran twenty-nine days, crushed 9397 tons, producing from 100-stamp mill $124,177; producing from cyanide plant, $3,774. Total production, $127,951. Working expenses and development were $61,854. The profit from the railway for the month was $11,000. There has been expended on permanent improvements $34,924, including $30,880 expended on new mill.

Michoacan.

The Luz de Borda mine at Tlalpujahua reports a strike of high grade gold and silver ore. B. von Steinaecker is superintendent.

Sonora.

The Transvaal M. Co., O. L. Neer superintendent, will build a silver-lead smelting plant at Cumpas for the treatment of its ores. It is stated the company has 300 men at work on development.

Near Cerro Prieto, in Magdalena district, a Los Angeles, Cal., company is developing the San Francisco and La Maria gold mines. E. A. Grey of Los Angeles, Cal., is part owner.

M. P. Wright and F. Smith of Nogales, Ariz., have taken Los Amigos mining group, east from Llano station, on which they are doing development work. They have a 6-foot ledge giving assays of $15 in gold.

The Cieneguita placer properties, near Altar, formerly held by the Henrietta M. Co. of Washington, D. C., which corporation permitted the lapse and forfeiture of their denouncements, have been redenounced by A. F. Solano, B. Koering et al. of Magdalena, who will develop and operate them.

Operations are under way at La Brisca placer fields of W. C. Greene of Cananea. This gold placer field is on the San Miguel river, near Cucurpe, 75 miles southeast from Magdalena. Supplies and machinery are being freighted in.

E. Verrue, superintendent of the Richfield M. Co., is developing copper mines 12 miles east from Tuape, on the San Miguel river in northern part of the Ures district, near Magdalena district line. There are forty-five men at work in the Richfield camp. There is said to be on

the dump 40,000 tons of high-grade copper ore which has been taken out in course of development work. In grading for two hoists copper ores were uncovered.

Twenty miles east from Imuris, H. P. Griswold, C. H. Sherman and M. Diaz of Magdalena are working the Caballo Rosio mine, an "antigua" property, on which there is considerable old working — one shaft being 110 feet deep. The property includes fifty pertenencias, through which runs a 4-foot ledge, carrying lead, copper, gold and silver. — H. P. Griswold of Magdalena has received titles for the Anita mines near Cucurpe, in Magdalena district, near the San Miguel river. They include thirty-four pertenencias, through which run several ledges, carrying gold, silver and copper. The ledges vary in width from 10 feet to 130 feet, and into them Griswold says he has put 1000 feet of development work, principally tunnels. The Anita is an antigua mine (the Aguirre).

W. O'Neill and L. Coombs of Hermosillo bave bought the Monterey group of mines near Sahuaripa for $20,000. Under terms of tbe contract operations will begin before June 1. Ore has been already developed and further development will be done. The Monterey group has facilities for economical reduction of ores. An extensive water power is 3 miles from the mine, on the Yaqui river, where there is a site for a reduction plant, to which a tramway from the mines could readily deliver ore.

RUSSIA.

U. S. Consul Cbambers, at Batum, reports tbe following figures for output of all petroleum products from Baku district in 1903:

Month.	Illuminating. Gals.	Lubricating. Gals.	Residuum. Gals.	Crude. Gals.	Total. Gals.
January	46,000,000	3,880,000	13,490,000	4,150,000	67,525,000
February	38,795,000	6,455,000	16,570,000	3,565,000	65,385,000
March	68,310,000	7,020,000	128,880,000	11,820,000	210,940,000
April	76,440,000	7,880,000	193,760,000	14,350,000	291,470,000
May	71,175,000	8,710,000	214,880,000	14,040,000	308,805,000
June	67,415,000	7,540,000	213,255,000	15,215,000	303,425,000
July	60,925,000	5,750,000	187,055,000	25,915,000	280,255,000
August	74,420,000	7,940,000	197,410,000	19,340,000	299,110,000
September	73,655,000	7,855,000	180,045,000	14,950,000	276,505,000
October	64,025,000	8,615,000	148,010,000	6,080,000	222,280,000
November	47,790,000	6,170,000	15,580,000	1,485,000	71,025,000
December	42,940,000	5,200,000	17,500,000	485,000	66,525,000
Totals	731,790,000	83,005,000	1,522,765,000	132,025,000	2,403,650,000

The total product for 1902 was 2,554,775,000 gallons. Total number of wells in the Baku fields on Dec. 31, 1903:

Condition of Wells.	Balakhani-Sabunchi.	Ramani.	Bibi-Eibat.	Total.
Producing	1,133	159	128	1,420
Trial pumping (exploitation)	18	4	5	27
Drilling	196	67	95	358
Drilling deeper	53	17	26	96
Cleaning out and repairing	169	48	40	257
Standing idle	1,096	134	46	1,276
Totals	2,665	429	340	3,434
Rigs ready for drilling	38	3	7	48

The total number of wells Dec. 31, 1902, was 3431, with 53 rigs ready for drilling. Wells completed, with average depth and average daily production for month:

Month.	Wells. No.	Average Depth. Feet.	Avera'e Produc'n. Barrels.
January	11	1,499	377
February	9	1,232	256
March	11	1,225	304
April	19	1,305	353
May	24	1,260	610
June	23	1,162	265
July	10	1,484	320
August	17	1,295	156
September	29	1,260	263
October	10	1,386	302
November	16	1,470	268
December	10	1,450	169
Totals	189	1,296	317

The total number of wells completed in 1902 was 236; average depth 1302 feet and average daily production of 292 gallons.

Trade Treatises.

Dean Bros.' Steam Pump Works, Indianapolis, Ind., send a specimen of art, depicting their several makes.

Dixon's Ticonderoga Graphite Grease is described in a leaflet issued to those interested in lubricants by the Jos. Dixon Crucible Co., Jersey City, N. J.

Personal.

C. H. FENNER of Sumpter, Or., is in Tonopah, Nev., on mining business.

J. M. DAVIDSON, a mine owner of Yreka, Cal., is in San Francisco, Cal.

E. HILDERBRAND, a mine owner of Tepic, Mexico, is in San Francisco, Cal.

H. E. ROBINSON is superintendent P. I. Mining Co., Manila, P. I., U. S. A.

F. W. HOAR of Globe, Ariz., is in Michigan visiting the Lake Superior copper section.

J. S. BROWN of Duluth, Minn., is examining his mining interests in Baker county, Or.

H. K. WHEELER of Los Angeles, Cal., is examining gold properties in Nye county, Nev.

W. E. DOWNS, a civil engineer of Sutter Creek, Amador county, Cal., is in San Francisco, Cal.

G. MOORE of Salt Lake City, Utah, inventor of tbe Moore slimes process, bas gone to Europe.

E. W. GRIFFITHS and G. Wilson of Salt Lake City, Utah, are examining mines in Nevada.

M. BIEN of the United States Geological Survey is in San Francisco, Cal., from Washington, D. C.

O. A. TIBBITTS of Salt Lake City, Utah, is in southern Arizona sampling a copper proposition.

A. MCLEAN of the Enterprise mine of Trinity county, Cal., bas gone to Australia on mining business.

H. A. COHEN of Salt Lake City, Utah, is in California on mining business after an absence in Alaska.

F. MANDEL of Hailey, Idaho, returned tbere last week from a business trip to Salt Lake City, Utah.

D. R. FINLAYSON, JR., of Reno. Nev., will go to Chihuahua, Mexico, where he will engage in mining.

W. KILEY is superintendent of tbe London mine operated by the Gilpin M. Co., near Central City, Colo.

J. W. DUNN of Brandon, N. D., is visiting mining property in Crook county, Or., in which he is interested.

L. T. WRIGHT, general manager of the M. C. Co., returns from London, England, to Keswick, Cal., this week.

D. R. THOMAS is superintendent of Le Roi Two C. Co. mines at Rossland, B. C., vice F. J. Stevens, resigned.

E. M. HOLLAND of Sonora, Cal., interested in Tuolumne county mines, is in San Francisco, Cal., on business.

H. C. BOSWORTH of Denver, Colo., proposes to engage in the business of assay supplies in the City of Mexico.

BERNARD MACDONALD, manager of the Cornucopia mines near Sumpter, Or., is examining mines in Mexico.

WM. MAGENAU bas taken an engagement as cyanide metallurgist for the Rossland Power Co. of Trail, B. C.

A. L. JACOBS of Salt Lake City, Utah, manager Butler-Liberal mines, has returned from a trip to Germany.

STATE MINE INSPECTOR BELL of Idaho has returned to Boise from a business trip to Salt Lake City, Utah.

F. HARRIS of Salt Lake City, Utah, interested in mining in eastern Oregon, has gone East on mining business.

WALDEMAR LINDGREN has completed the resurvey of the Cripple Creek, Colo., district and is in Washington, D. C.

A. H. MAYNE of Salt Lake City, Utah, has gone to Sodaville, Nev., to manage an Esmeralda county mining property.

B. E. BURNETT is manager of the Racine M. Co. of Racine, Wis., operating at Bowerman, Gunnison county, Colo.

L. COCHRANE of Denver, Colo., is in Mexico looking after the assay department of the Mine & Smelter Supply Co.

C. T. CARNAHAN returned to Leadville, Colo., last week from an extended trip through the mining sections of Mexico.

J. T. THOMPSON is superintendent of the Kenross mines at Whisky Slide, near Mountain Ranch, Calaveras county, Cal.

G. P. WILSON is president of tbe Golden Income M. & I. Co., operating near Del Norte, Rio Grande county, Colo.

J. W. BURTON of Salt Lake City, Utah, is in Piocbe, Nev., inspecting recent developments at the Pioche-Nevada Con. mine.

E. F. FREUDENTHAL, manager of the Manbattan M. Co. group of mines, near Piocbe, Nev., has returned from an Eastern trip.

V. H. ROOD, vice-president and general manager Jeanesville Iron Works, has returned to Jeanesville, Pa., from a California visit.

S. MCINTYRE, president and manager of the Mammoth mine of Tintic district, Eureka, Utah, returned last week from the West.

C. KIRCHEN, assistant superintendent of the United States smelter at Bingham, Utah, returned last week after a visit in New York.

A. FEHRINGER of Colorado Springs, Colo., is at Grand Encampment, Wyo., resuming work on the Home Run C. M. Co.'s mines.

J. H. COX is in Denver, Colo., after a three years' stay in Seckondi, West Africa, where he is manager of mines for an English company.

E. H. STAGG, manager of the Bagdad M. & M. Co., operating at Bagdad, San Bernardino county, Cal., has gone East on a business trip.

A. E. CHODZKO, M. E., has returned to San Francisco, Cal., from Shasta county, Cal., where he went to make examination of mining property.

T. H. OXNAM of Los Angeles, Cal., of the Palmarejo & Mexican G. F., Ltd., operating in Mexico, is in London, Eng., on company business.

R. B. STANFORD is manager of the Ranch G. M. Co. operating the Doyle & Woodside gravel mines, near Columbia, Tuolumne county, Cal.

L. D. SIVYER, a mining engineer of Los Angeles, Cal., is in San Francisco on professional business in connection with mines in Tuolumne county, Cal.

G. A. HANCOCK last week returned to Salt Lake City, Utah, after an extended visit in tbe East and will again devote his attention to mining interests.

M. L. REQUA, president of the Pacific Steel & Wire Co. of San Francisco, Cal., has returned to San Francisco from New York and other Eastern cities.

P. THACHER is manager of the Iyanough M. Co. of Searcblight, Nev., whicb has been organized to operate at Camp Duncan in Lincoln county, Nev.

PRESIDENT T. JACOBSON of the Columbus Con. C. Co. of Salt Lake City, Utah, has returned from Chicago, Ill., and other Eastern cities on business.

E. VERRUE, formerly at the Amarillas mine near Opodepe, Sonora, Mexico, is superintendent of the Richfield M. Co., east of Tuape, near Ures, Sonora, Mexico.

H. M. CROWTHER of Salt Lake City, Utah, manager of the Continental-Alta mine at Alta, Utah, returned last week from an examination of mines in Mexico.

THERE is no truth in nor foundation for the statement that W. S. Cole succeeds Lewis T. Wright as general manager Mountain Copper Co., Ltd., Keswick, Cal.

F. H. PERKINS, a mining engineer of Salt Lake City, Utah, returned there last week from Kansas City, Mo., where he bas been for several months on mining business.

M. B. PLACE, vice-president and manager of the Pittsburg & San Jose R. & R. Co., operating at San Jose del Sitio, Chihuahua, Mexico, is in Chihuahua from Mexico City.

H. A. TOBELMANN has resigned as chemist for the Old Dominion C. Co. He has accepted a similar position with the Compania Metallurgica de Torreon at Torreon, Mexico.

E. W. SEBBEN, M. E., Denver, Colo., examined the Clover Mountain Con. Mines Co.'s properties at White Pine, Colo., last week, in the interest of Rochester, N. Y., clients.

F. W. BRADLEY, E. M., of San Francisco, Cal., has gone to the Oneida mine, Amador county, Cal., and later will visit mines in Mariposa county, Cal., of which he is general manager.

P. S. COULDREY, manager of Le Roi No. 2 Co. mines at Rossland, B. C., for nineteen months, has gone to London, Eng., from which place he will go to Australia for the same interests.

MAJOR CASSIUS E. GILLETTE, U. S. Corps of Engineers, returns to his former station at San Francisco, Cal., as engineer officer of that division, relieving Lieutenant Colonel T. H. Handbury.

W. F. MCINTIRE of Chicago and F. W. Downs of Davenport, Iowa, owners of the Cripple Creek-Homestake Co., visited the Spar mines, White Pine, Colo., last week, which they recently purchased.

G. A. ROBERTSON, formerly superintendent of the Sioux-Ajax tunnel at Eureka, Utah, will go to British Columbia to look after development of a mining proposition for the same company.

G. W. CROWE of Nogales, Ariz., consulting engineer for the Ruby G. & C. Co., has gone to New York on company business. From New York he will go to South America on mining business.

C. D. MORRISON is superintendent of the mines and mill of the Sheba G. & S. M. Co., south of Mill City, Humboldt county, Nev., with J. A. Kunkel as mine foreman and G. E. Forrester mill foreman.

J. A. EDE, consulting engineer for the Illinois Zinc Co., and for several years Utah representative of Messrs. Leiter, has returned to Salt Lake City, Utah, from Mexico, after an examination of mining properties.

F. J. STEVENS has resigned as superintendent of Le Roi Two C. Co. mines at Rossland, B. C., to accept a similar position with the Guanajuato Con. M. & M. Co. at Guanajuato, Mexico. E. M. Macdonald is manager.

PROFESSORS W. R. APPLEBY AND VAN BARNEVELD, with eleven students from the School of Mines of the Minnesota State University at Minneapolis, Minn., are at Grass Valley, Cal., studying the mines of Nevada county. Before going to California they spent six days at the smelters at Pueblo, Colo., and two days at the chlorination works at Colorado City, Colo.

C. W. PURINGTON of Denver, Colo., is in Washington, arranging the details of an extended Alaska trip. As special envoy of the United States Geological Survey, Mr. Purington will make a thorough inspection of the placer fields of Alaska and northern British Columbia during the coming season. On his return a report on the dredging, hydraulic and otber methods employed will be issued by the Alaska division of the Geological Survey, in charge of A. H. Brooks.

Commercial Paragraphs.

THE Globe Engineering Co. of San Francisco, Cal., have moved from their old quarters, 146 First street, to 115 New Montgomery street.

THE Standard Paint Co. of 100 William street, New York City, have an exhibit in block 65, Palace of Liberal Arts, Exposition, St. Louis, Mo.

THE Wellman-Seaver-Morgan Co. of Cleveland, O., will supply twelve Hulett patent excavating buckets to the M. A. Hanna & Co. ore docks, Ashtabula, O.

MANUFACTURERS' CATALOGUES in great variety and of the latest editions are kept on file in this office for the convenience of our readers and visitors.

THE Chrome Steel Works has its new plant at Chrome, N. J., completed. Geo. W. Myers, Hayward building, San Francisco, Cal., is the company's Western representative.

IN the great Exposition at St. Louis, at block No. 30-B, Mines and Metallurgy building, tbe Wood Drill Works of Paterson, N. J., bave a nickel-plated drill, with several other of their appliances, showing their various specimens of machinery for different kinds of mining and quarry work.

Obituary.

F. S. MATTHEWS, a mine operator of Eureka, Nev., died at Salt Lake City, Utah, on the 6th inst. Deceased was 38 years of age.

J. W. BOOTH, a pioneer miner of Colorado and California, died at Pueblo, Colo., on tbe 10th inst. Deceased was born at Columbus, Ohio, in November, 1825.

J. S. DYMOCK, vice-president of the Calumet & Arizona M. Co., and interested in other Michigan and Arizona mining properties, died on the 18th inst. at Calumet, Mich., aged 66 years.

W. H. BROWNE, Secretary for Mines of Queensland, Australia, died at Brisbane, Queensland, April 12th. Deceased was born in London fifty-seven years ago, and went to New South Wales in 1866, engaging in mining, later to Tasmania, tbence to Queensland. He was a member of the Legislative Assembly from Croydon for the past eleven years.

Latest Market Reports.

SAN FRANCISCO, May 20, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25 15/16d (standard ounce, 925 fine); New York, bar silver, 55½c, refined (1000 fino); San Francisco, 55½c; Mexican dollars, 44½c San Francisco, 44½c New York.

COPPER. — New York: Standard, $13.12½; Lake, 1 to 3 casks, $13.12½@13.25; Electrolytic, 1 to 3 casks, $13.00; Casting, 1 to 3 casks, $12.85; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £57 2s 6d spot per ton.

Copper shows signs of weakness, with a slight drop in price, due to no unusual demand. The foreign stock on hand is comparatively light, being 6576 tons on May 2, 1904. On May 1, 1900-01-02 there were over 20,000 tons in stock, and on May 1, 1903, about 9000 tons. On January 1 last this had gone down to 5601 tons, but has since increased to the above figure. The large bulk of copper sold the past few months has been supplied by dealers from stocks on hand, but these being about exhausted somewhat higher prices may now be anticipated, as the producers are likely to ask more than the dealers.

LEAD. — New York, $4.65; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 1c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £11 5s 6d ₱ long ton.

SPELTER.—New York, $5.25; St. Louis, $5.00; London, £22 3s 2d ₱ ton; San Francisco, ton lots, 6¼c; 100-lb. lots, 7c.

TIN.—New York, pig, $28.00@28.12½; San Francisco, ton lots, 29c; 500 lbs., 29½c; 200 lbs., 30c; less, 30½c; bar tin, ₱ lb., 32½@35c. London, £126 spot.

PLATINUM. — San Francisco, crude, $18.50 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75 @ 82c ₱ gram.

QUICKSILVER. — New York, $44.50@45.50, large lots; London, £8 2s 6d; San Francisco, local, $43@43.50 ₱ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.00c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 40@47c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.60 @13.85; gray forge, $13.00; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00 @23.00; San Francisco, bar, 7c to 12c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.15@2.65 ₱ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ₱ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¾c; Hallett's, 6½c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tapo, $2.65; Hemp, $2.10; Coment No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, Fronch, 3½@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphato, 5¼@5½c; chlorido of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c: raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 25½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 52@57c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., 50c.

BISMUTH.—Subnitrate, ₱ lb., $2.10.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—Best, $2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 70c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

ELECTRIC RAILWAY.—No. 759,453. May 10, 1904. T. Mahoney, San Francisco, Cal. This invention relates to improvements in electric railway systems of the third-rail type. The object of the invention is to do away entirely with a separate feed wire and to obviate the necessity of using the car tracks as return conductors by connecting the two ends of the third rail direct to the dynamo and providing means for shunting the current from the third rail through the track and back to the third rail again.

OIL BURNER.—759,445. May 10 1904. E. W. Jackson, Sausalito, Cal. This invention relates to a device for the combustion of oil in furnaces of various descriptions. It is especially designed for the more perfect combustion of the crude forms in which certain hydro-carbons occur. It consists in the combination in an oil burner of a stove or furnace casing having a non-conducting filling with an inclined surface forming a wall of an air-admission passage; an inclined diaphragm forming the opposite wall of said passage; a damper plate in the passage and movable toward and from said diaphragm to regulate the air supply; a burner; said filling separated from the burner to form a tortuous passage with which the air admission passage communicates, and means for supplying oil to said burner.

PNEUMATIC CARPET RENOVATOR.—No. 759,452. May 10, 1904. A. Lotz, San Francisco, Cal. Assigned to Sanitary Compressed Air & Suction Dust Removing Co. of San Francisco, Cal., a corporation. The object of this invention is to remove the dust from such fixed fabrics without loosening or taking them from the floor or other place where they may be fixed. It consists of a centrally located nozzle in the form of a long, narrow slit through which a blast of air or equivalent fluid medium is forcibly directed against the article to be cleansed, whereby the dust is thoroughly loosened and raised from the surface or nap, and in the combination with said blast nozzle of similar elongated suction nozzles located upon each side of the blast nozzle whereby the dust when loosened is instantly drawn into the suction nozzles and prevented from being spread about or again deposited upon the cleansed article.

QUARTZ SCREENS
A specialty. Round slot or hurred slot holes. Cast Steel or American planished Iron, Zinc, Copper, Brass or Tin Screens for all purposes. CALIFORNIA PERFORATING SCREEN CO., N. E. cor. Fremont and Howard Sts., San Francisco.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING MAY 10, 1904.

759,403.—RECOVERING METALS — I. Anderson, Whitehills, Ariz.
759,412.—SINKING OIL WELLS.—E. J. Beane, S. F.
759,497.—QUARTZ MILL—E. Booker, San Diego, Cal.
759,802.—QUARTZ MILL—E. Booker, San Diego, Cal.
759,810.—PICTURE FRAME—L. Brand, Los Angeles, Cal.
759,591.—LOCK & LATCH—A. M. Carrier, Fruitvale, Cal.
759,673.—DOOR FASTENER—Coleman & Gregory, Index, Wash.
759,505.—MASSAGING INSTRUMENT—M. Doerr, San Jose, Cal.
759,434.—TOOL HOLDER—T. J. Gorman, S. F.
759,290.—TELEPHONE—Houghton & Potter, S. F.
759,813.—WRENCH — M. F. Hudson, Los Angeles, Cal.
759,372.—VALVE—J. H. Hussey, Spokane, Wash.
759,374.—PIPING FLUIDS—Isaacs & Speed, Oakland, Cal.
759,445.—OIL BURNER—E. W. Jackson, Sausalito, Cal
759,378.—GRAIN RIDDLE — E. A. Jones, Sunset, Wash.
759,379.—SWAGE—F. W. Jones, Santa Paula, Cal.
759,618.—DOUGHNUT FRIER — J. Korbel, Los Angeles, Cal.
759,451.—HOLDER FOR BOILING HAMS—H. A. Kurlinke, S. F.
759,452.—PNEUMATIC CARPET RENOVATOR — A. Lotz, S. F.
759,453.—ELECTRIC RAILWAY—T. Mahoney, S. F.
759,454.—FISHING TOOL—Munn & Evans, Oil Center, Cal.
759,738.—HARVESTERS — McCown, Loundagin & Williams, Walla Walla, Wash.
759,822.—OIL BURNER—D. H. Mosteller, S. F.
759,307.—BUTTON SHANK FORMER—Mary V. Quinn, Seattle, Wash.
759,314.—PHOTO EXPOSURE INDEX—H. C. Rosslow, Spokane, Wash.
759,474.—PLOW—E. J. Rubottom, Felton, Cal.
759,637.—BURGLAR ALARM—G. A. Sachs, Eugene, Or.
759,476.—CIGARETTE ROLLER—C. Schopke, S. F.
759,761.—THERMOMETER CASE — H. A. Sievert, Walla Walla, Wash.
759,772.—GARMENT HANGER—M. Terletzky, Goble, Or.
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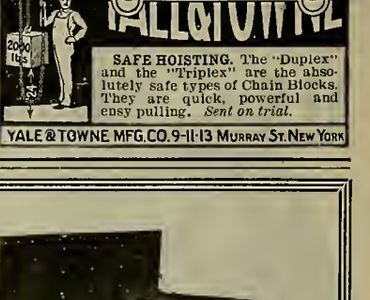
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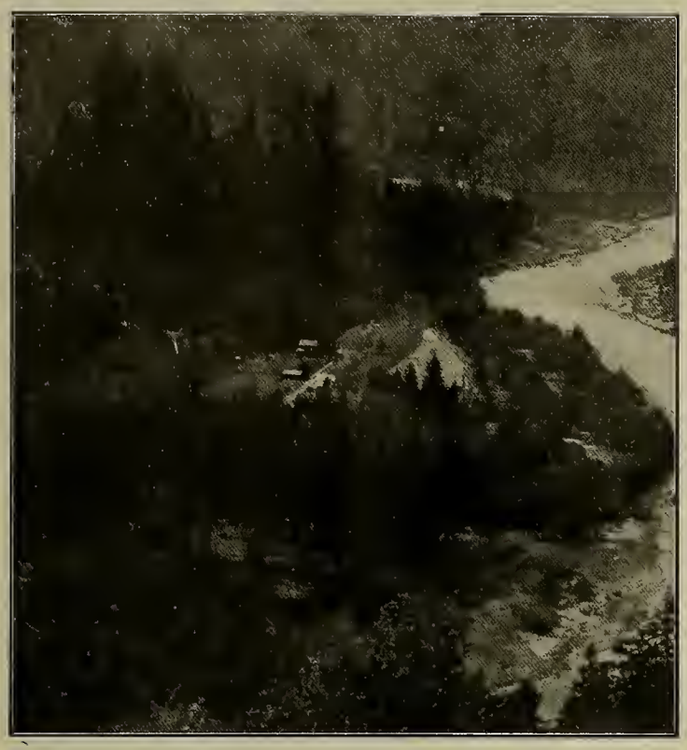

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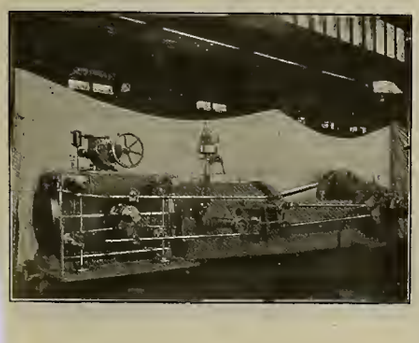

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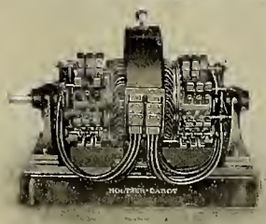

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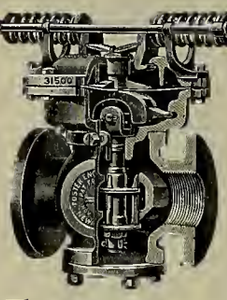

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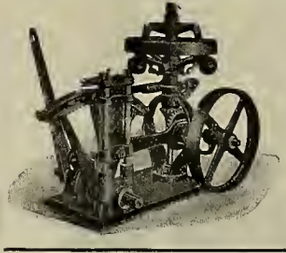

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Whole No. 2288.—VOLUME LXXXVIII. Number 22. SAN FRANCISCO, CAL., SATURDAY, MAY 28, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

A Penalty for Industry.

It is incomprehensible that the majority of the people of a community or section like Shasta county, Cal., will encourage by their silence, or permit at all, the attempt being made to impose a great hardship and unnecessary expense upon the leading industrial enterprise of that county—the Mountain Copper Co.—under the pretext that the sulphurous fumes from the reduction works at Keswick are doing great injury to the agricultural interests of the vicinity, and more recently the claim that the forests were suffering irreparable damage, suit having been brought by the Government against the Mountain Copper Co. All those familiar with the condition of agriculture generally in Shasta county, and of the "forests" near Keswick, know how absurd this claim is. The soil of the bench land in Shasta county is for most part unsuited to agriculture or horticulture. There are scores of ruined, deserted "farms" in that county, and that, too, in districts far removed from the smelters at Keswick or any others, and where the taint of sulphurous gas has never been known. There are always those, however, who can see in every great industry an opportunity to make something from nothing, and this instance at Keswick forms no exception. The Mountain Copper Co. is going through an experience now similar to that of some other companies in other States. In Montana the copper reduction companies have had much trouble over this same plaint. The experience is that wherever a smelter has been closed down and new works built at a distance from the closed plant, and in a region where there are few inhabitants or none at all, that a new town at once springs up about the smelter, and only the limits of the company's property keep the new settlers from getting within a hundred yards of the "obnoxious" stack. It recalls the instance of a miner who was working in a drift gravel mine in Nevada county, Cal., some years since, who expressed the hope that the company employing him would soon resume hydraulicking, for, said he: "I have a little ranch down here a bit that ain't worth much at present, but if this company begins hydraulicking they are sure to cover it up with slickens, and then, I guess, I ought to be able to get about $3000 out of it." There seems to be method in this species of madness, too.

Concentrator Detroit Copper Co. and West Yankee Hoist, Morenci, Ariz.—See Page 361.

Morenci, Arizona; Smelter on Right.—See Page 361.

Metcalf, Arizona; Arizona Copper Co.'s Incline on Right.—See Page 361.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1161 Monadnock Block. DENVER, 906 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, MAY 28, 1904.

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Oil Lands in Nevada.

An interesting situation has developed in the recently discovered oil fields in the Carson sink, Churchill county, Nevada. Prospectors, quickly following the discovery of oil, located a large area of the adjacent lands uuder the placer location Act, as provided by law. The hydrographic branch of the United States Geological Survey is engaged in extensive reclamation of desert lands. This is the outgrowth of the investigations made during the early years of the Survey, when under the direction of J. W. Powell. These projects are located throughout the Western States. The lands which it is intended to reclaim by irrigation methods have been withdrawn from all eutry except under the homestead Act, it being the desire of the Government that these lands be taken up in small farming tracts, not exceeding 160 acres for each person who may make such entry, and the tract in Nevada where oil was recently discovered chances to be within one of these reclamation areas. As the value of the land for the oil it may produce is unknown, and as without irrigation it is practically valueless for any other purpose, the Governmeut may possibly make an exception in this case and allow the original locators to hold their oil claims, for it seems unjust that the original claimants should be dispossessed of their locations of 20 acres each in favor of later locators appropriating 160 acres each, and who at their option may also bore for oil. Notices have been posted informing oil locators that the land is not subject to location in any manner other thau as homestead tracts.

WITH this issue this journal enters upon its forty-fifth year of continuous and successful existeuce.

Efficiency of the Gravity Stamp.

Whether the limit of economy in the weight of stamps at about 1400 pounds has been reached or not is a questiou upon which all mill men do not agree. Twenty-five or thirty years ago stamps ranged from 450 to 750 pounds in weight (with a few possible exceptions). The weight was subsequently increased to 850, 900, 1000, 1200 and to even 1400 pounds. It is necessary, with increasing weight of stamps, to construct mortar blocks—whether of timber or concrete—with increasing care and massiveness, and the battery frames must also be suited to the weight of the stamps and the number of drops per minute. A light frame cannot long endure with heavy stamps, but, when properly constructed and sufficiently heavy, the largest stamps can be operated successfully through a period of years. In the case of the heavy steam stamps, such as are used in the Lake Superior copper region, each stamp has a separate frame, which tapers upward from a broad base. This style of construction has not been attempted in the placing of gravity stamps in batteries of two or more stamps, the usual style being a rigid, upright frame of posts and joining girders. The effectiveness of a single blow of the gravity stamp may be said to be directly proportional to its weight, with the same height of drop and area of crushing surface. The usual method of figuring the effectiveness of a stamp in crushing is by the foot pounds per minute per square inch of crushing surface. This includes the area of stamp on the crushing face; weight of stamp, height of drop and number of drops per minute. In this way a comparison may be made between a heavier and a lighter stamp—the heavier stamp falling fewer times per minute than the lighter stamp when the height of the drop remains the same. The capacity of the stamp changes with any change in auy of the factors affecting it. A stamp of given surface area with stated height of drop and number of drops per minute will crush more ore than another stamp operating under similar conditious but having less area, though of the same weight. In the same way a change iu weight, change in height of drop, or in the number of drops per minute, must directly affect its capacity. When stamps are increased abnormally in weight this demands an increase in the power required to operate them. It would seem that a stamp of somewhat greater diameter than that commouly in use—8 to 9 inches—with the same weight might be expected to have a greater crushing capacity. This increase in diameter is limited by the facility with which ore may be fed under the stamp to advantage. Teu inches is permissible and possibly a still greater diameter might be suceessfully employed, but apparently the limit of economy in this direction would be reached, if not passed, at 12 inches. The discharge is always affected by the distance from the shoe to the screen, but this distance could be maintained with an increased width of shoe, though in most cases it would involve a new model of mortar suited to the wider shoe. In most mills, particularly those crushing low-grade ores, large capacity is desirable and in many cases necessary for reasons of economy. In experimenting, with a view to securing the greatest capacity of a stamp mill with the least expense, it will generally be found that it is more economical to employ a lighter stamp with a greater number of drops than a heavier stamp with fewer drops per minute. If heavy stamps are considered desirable, then, as previously stated, the mortar blocks and battery frame must be constructed accordingly—for a battery frame that gives perfect satisfaction with 1000-pound stamps dropping 6 inches ninety-six times per minute may not be able to withstand the heavy pounding and vibration incident to 1300-pouud stamps dropping 6 inches over 100 times per minute.

IN view of the great value of the detailed investigation of certain mining districts in the United States by the United States Geological Survey, and the publication of the reports and maps—the result of such investigation—the Canadian Geological Survey is being urged by those interested to make a similar investigation of the geology and ore deposits of the Rossland district, British Columbia. The structural geology of that district is complex, and such a detailed investigation as that made of the Cripple Creek district of Colorado by the United States Geological Survey cannot fail to be of interest and value to the miners of that province.

Requires a Deeper Drainage Tunnel.

What is known as the El Paso drainage tunnel, in the Cripple Creek district of Colorado, was first taken under consideration in November, 1902, and a committee appointed to inquire into the necessities of the proposed drainage scheme. It required a great deal of persuasion to bring all directly interested into the scheme in a financial way, but the work on the El Paso tunnel was started early in January, 1903, a report of which was published herein in the issue of January 17th of that year. Subsequently the progress of the work has been reported upon at length and the result has been viewed with interest by mining men not only throughout Colorado, but the mining world. Shortly after the tunnel was well under way, the necessity of making a new survey for a still deeper drainage adit was commented upon, and this was earnestly seconded by those who realized its importance, but nothing has been done in regard to the proposition so far as known, except to discuss it. The tunnel has long since proven its usefulness as well as making it apparent that a deeper tunnel is not only desirable, but imperative, if deeper mining is to be carried on in that portion of the district.

The driving of the El Paso tunnel has been discontinued for the reason that the sum of money subscribed by the various companies interested—$85,000—has been exhausted. It is said, however, that an additional subscription is contemplated to complete the El Paso project, and those who are looking to the future are earnestly advocating the commencement of another and larger tunnel to be driven lower than the El Paso tunnel, the cost of which is estimated at $350,000. It is stated that the contemplated tunnel would give an average depth 750 feet below that of the El Paso. It would require more than three years to complete such a tunnel and the rate of drainage will not be as rapid as that of the older tunnel, as there is an increasingly greater amount of territory to drain with increasing depth.

The new project should be started just as soon as possible to insure the continuous operation of the mines along its line, but it docs not seem possible that this can be done, startiug at this time, though the longer the problem is deferred the greater will be the ultimate loss, unless, indeed, sufficient ore be found in the levels above the El Paso tunnel to keep the mines steadily producing during the interim. It always seems easier to accomplish such dead work during the period of active and profitable production than to undertake it when the mines are forced to close down owing to the great volumes of water which it is kuown exist in the depths of those mines. It is not probable that a dry zone will be encountered in that district at any point above the natural drainage level of the district. In other regions where deep mining is being carried on—below 3000 feet—it has in many cases been proven that at that depth, and below, the mines make comparatively little water, but in each of these instances—as in the Lake Superior copper mines, the deepest mines of California, and those of the Rand, South Africa—the workings are far below the natural drainage level of the region. To enjoy this benefit, it is absolutely essential to tap the water at as low a poiut as possible with a tunnel, or to hoist it by mechanical means from the zone of saturation, and prevent the water from following down the workings to the deepest levels. The work of beginning the proposed deeper tunnel should not be delayed. The El Paso tunnel drains mines along its course to a depth of 1200 to 1600 feet. The amount of ground which would become readily accessible by a tunnel 750 feet deeper is apparent to all students of the geology of that interesting district. There are few mines of importance in the district that have not benefited by the El Paso tunnel, and a deeper drain cannot fail to make its influence felt to a greater extent. Such a tunnel as that now proposed would more than pay for itself in improved and less expensive ventilation, in transportation of ores and materials, and in greatly reduced expense of draiuage, if the operation of the mines below the El Paso tunnel level is possible at all to a material extent.

CONCENTRATES.

THE exhaust from steam engines should never be turned into a brick stack or flue, as it will have a tendency to disintegrate the mortar, and in time render the stack insecure.

✤✤✤✤

TO prevent baling skips leaving the track in an incline shaft upon striking the water, a plank spiked to the hanging wall timbers, arranged to come close to the skip, will usually suffice.

✤✤✤✤

THERE are numerous dams in California mountains over 100 feet high which have stood for many years and are still in good condition. Some of these dams are over 400 feet in length on top.

✤✤✤✤

SOME mine superintendents believe the use of small oil lamps in place of candles underground a means of lessening the likelihood of setting the timbers on fire. Candles carelessly left on timbers have probably caused more mine fires than any other one thing.

✤✤✤✤

BASALTS are among the most recent eruptives. The volcanic rocks flowing from modern volcañoes are all types of basalt. Granite is often referred to as the primitive rock, but many granitic intrusions are known to have occurred within well recognized geological ages.

✤✤✤✤

THE dampers in mine ventilating pipes, employed to deflect the air currents from one portion of the mine to another, should be made of wrought iron plates. Sheet iron is too light to be serviceable, as the concussion of blasting frequently causes them to double up, when they become useless.

✤✤✤✤

ALTHOUGH embankments, when first made, usually occupy more space than the earth in situ from which the material came, they subsequently shrink. The approximate shrinkage of different kinds of earth is stated to be: With gravel or sand, 8%; loam, 12%; clay, 10%; loose surface soil, 15%; puddled clay, 20%.

✤✤✤✤

A NARROW MORTAR will discharge the pulp more rapidly than a broad one when all other conditions are equal, as to character of ore, height of discharge, mesh of screen and amount of water employed. Where slow crushing with inside amalgamation is practiced a broad mortar and high discharge are recommended.

✤✤✤✤

WHERE mines have been opened on agricultural patents, such mines have no extralateral rights, except special agreement be made by the owner with the buyer that the apex owner on such patent shall have the right to follow his vein wherever it may go within the lines of the agricultural patent extended vertically downward.

✤✤✤✤

FOR the inspection of stopes and drift backs which are too far above the head to be readily lighted by candles an acetylene lamp is useful. It can be held at any angle and will throw a strong light 20 to 30 feet in the stope. The lamp will also burn when candles are extinguished by carbonic acid gas, though there is always danger where a candle will not burn.

✤✤✤✤

PEARLS are minerals, but perishable, being composed largely of calcium carbonate, which by ordinary fire is turned to calcium oxide (lime). Sapphires and diamonds are unaltered by ordinary high temperatures, but the latter under the powerful flame of the electric arc in a vacuum swells up and is reduced to a coke-like mass of carbon, and in air is burned to carbon dioxide with a small amount of ash.

✤✤✤✤

IT has recently been suggested that the addition of a small amount of slacked lime to the mortar when making concrete will be of advantage, particularly in cases where the concrete is to be laid in retaining walls, and through which water may subsequently slowly percolate. It is claimed the lime is dissolved out and redeposited on and near the surface of the concrete as an efflorescence, the formation of which will act as an impervious barrier to the further passage of water.

✤✤✤✤

ANTIMONY occurs usually in the form of sulphide, or as oxide, in ores. If it is associated with sulphide lead ores the antimony is generally also in the form of sulphide. In the blast furnace the sulphide of antimony acts much the same as galena, but is more volatile. Should it be decomposed by the metallic iron present, the antimony is more likely to combine with the lead than to unite as speiss with the iron. It may also be volatilized. Its presence in lead is undesirable, as it renders the metal brittle.

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AN experimental cyanide plant for testing ores can be made from a number of half barrels, arranged in terraced form — the uppermost one for stock solution, the next lower for leaching or agitation, a third below that for precipitating purposes, and a fourth for sump tank. No cyanide works should be built until thorough and satisfactory tests have been made of the ore to be treated. A plant such as suggested will handle 100-pound lots readily, and costs little. Small steel tanks may be used in the same manner.

IN ores containing calcium carbonate and pyrite or other sulphide, the roasting of such ore results in the formation of calcium sulphate (plaster of Paris). Such material, when treated with water, as in cyanide vats, will form impervious and very hard floors, due to the setting of the plaster of Paris. In Western Australia, at Kalgoorlie, it was found necessary to blast out layers of partially treated ore where this had occurred. In chlorination vats the crystals of gypsum often accumulate to the thickness of several inches.

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WHERE mine workings cause a cave of the surface ground to the damage of others, it is not a defense on the part of the mine owner to say he had worked the mine in a workmanlike manner. When he removes the ore, which is the natural support of the overlying ground, he substitutes artificial supports, but should these prove inefficient, the miner is responsible for the damage caused by the caving of his workings. Because it was the custom to remove all the ore, including pillars previously left for support, will not strengthen the position of the mine owner in a case of suit for damages.

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WHERE the slag from silver-lead smelting is too rich to be thrown on the dump, and re-smelting is of no advantage owing to the presence of zinc, the silver may be recovered from the slag by smelting with sulphide copper ore or copper matte. An instance of this kind is cited by H. A. Keller in Vol. XX, Trans. A. I. M. E., where he smelted a slag containing 5.3 ounces silver per ton with 13% sulphide copper ore containing 10% copper and 11 ounces silver per ton in a blast furnace, putting through 113 tons of charge with 10.9% coke. The result was 5.3% matte containing 20% copper and 92.7 ounces silver per ton—a saving of 80% of the silver in the original slag.

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LARGE TIMBERS in a shaft will longer resist decay than small ones. When a shaft is being sunk some consideration should be given the question whether the shaft will become an "upcast" or a "downcast" when connected with the other workings (shaft or tunnel) which may also reach the surface. If the collar of the shaft is higher than any other opening on the mine, the probability is that it will be an upcast shaft, and as timbers will rot more quickly in an upcast, carrying the foul air from the mine to the surface, the timbers should be heavier than those required in a downcast. In any event, it is economy to treat shaft timbers with some preservative preparation to prevent rapid decay.

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WHEN setting bolts in concrete foundations for the purpose of anchoring engines, compressors or other machinery, these bolts may be made more secure by turning an "eye" at the lower end and passing a piece of railroad iron through those constituting each set of bolts. This will make it impossible for them to move. By slipping a pipe of larger size than the diameter of the bolts over the latter it makes it possible to give the bolts a little "play" in order to have them enter the bolt holes of the base of the machine without difficulty. The bolts may then be fixed by pouring melted sulphur in the space between the bolt and the concrete, the pipes having first been withdrawn. If the machine does not set level it may be "shimmed up" with thin strips of steel or iron (never use wood for this purpose). Thin cement may be run in to fill any space between the bed plate and the concrete after shimming up.

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A SEGREGATED VEIN or ore deposit is one which is the result of what is known as magmatic segregation from the rocks within which it occurs. Some bodies of magnetite in various rocks and deposits of chromic iron in serpentine belong to this class of ore deposit. A "blanket vein" is a term which is usually applied, in a geological sense, to bodies or sheets of ore lying between beds of sedimentary rock and occupying a horizontal position or one approaching it. Some miners call fissure veins occurring in crystalline rocks dike schists or granite and lying at a low angle—20° or less—blanket veins. This is a misnomer and was not the original meaning of the term. Bedded veins are similar to blanket veins, in that they embrace a class of ore deposits occurring in sedimentary rocks, though they may stand at a high inclination—the difference between bedded vein and blanket vein being more in a mechanical than a geological sense.

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"HURDY-GURDY" WHEELS is the name by which the impact water wheels were originally known. One of the first impact wheels was that made by Hamilton Smith, Jr., at North Bloomfield hydraulic mine, Nevada county, Cal. The wheel was 18 feet in outside diameter and 17 feet 4 inches diameter to inside of the line of buckets, and 17 feet 8 inches diameter to the center line of the buckets which were flat, 4 inches deep, with flanges on the sides. The wheel was operated under heads varying from 312 feet to 335.9 feet, with differing types and sizes of nozzles. This wheel developed from 2.7 H. P. with small nozzle up to 15.9 H. P. with a nozzle 0.1017 foot in diameter. The power measured with a prony break. These experiments were made about 1875, and from this rude form of wheel was developed the various types of modern tangential, or impact wheels. The first curved buckets employed gave greatly increased efficiency over the flat buckets.

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TO ASCERTAIN the number of cubic feet of any particular ore required to make one ton in place in the vein, carefully weigh a good-sized piece—suppose it to weigh fifty pounds. Then, suspending the same piece of ore by a slender but strong cord or wire, weigh in water. (The water should be at 39.2° F., at which it reaches its greatest density, but if above this the result will not differ materially.) The difference of the weight of the ore in air and in water is due to the buoyancy of the water, and represents the weight of water displaced by the mass of ore. Presuming, for example, the ore weighs in water 12.5 pounds. Then divide the weight in air by the weight in water and the quotient 4 is the specific gravity of the ore—say, a mixture of quartz, galena, pyrite and blende. As a cubic foot of water weighs 62.428+ pounds, then a cubic foot of the ore will weigh four times 62.428+ = 249.79+ pounds. Two thousand pounds in one ton divided by 249.79 = 8.00+ cubic feet, the amount required to make one ton of ore.

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BRICK and good stone are both serviceable for boiler foundations. In some mining districts, notably some of those in California, are found beds of white or gray tuff, usually capping ancient river channels, which can be sawed into blocks or hewn with an ax to suitable size to make excellent boiler foundations. The same kind of stone is also employed as building materials. In some localities in that State also are found great massos of steatite, often 200 to 300 feet in width, from which large solid blocks may be sawed for foundations and walls of buildings, and other like purposes. This latter material is very refractory and may be used for furnace linings. It should be heated slowly when employed in this way, to drive out all moisture. If heated too quickly it is likely to spawl off, and render the furnace useless. These masses are found at many places in the counties from Madera to Nevada county, usually east of the mother lode.

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SOME engineers in shaft surveying use very heavy plumb-bobs (250 pounds) suspended from the surface by heavy copper or steel wires. It is claimed by those who use these heavy weights that the vibration can be more quickly stopped and the "bobs" brought to an absolute standstill in a few minutes by carefully retarding the swinging of the weights, and this without the use of a tub of water, oil or molasses, such as is generally employed for this purpose. In a shaft 2000 feet deep a 250-pound weight caused the wire to stretch a distance of 40 feet. The wire is lowered into the mine by attaching it to cage or skip, and the heavy weight is taken down on the skip and made fast below. This does away with any difficulty due to swinging in lowering the weight from the surface. The wire is then wound up at the surface by a reel until the proper height of the weight has been reached and all adjustments carefully made. In this manner the "bob" has little vibration when first raised from the floor of the level, and the desired alignment is quickly obtained and the survey carried forward with the least loss of time.

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AN abandoned mining claim is located in the same manner as though it were a new claim. It is not necessary that a new discovery be made provided a bona fide discovery had been made on the original claim. The new locator may make the former discovery answer for his own, and if he wish may do his assessment work in the same discovery hole, though it is not necessary that assessment work be done at the point of discovery. The most essential feature when locating a mining claim, after first making a discovery, is to properly and completely define the boundaries of the claim by posts or monuments, or both, so that the boundaries may be readily traced; then record the location with the county recorder, and also the district recorder if there be one, and later the assessment work. In some States preliminary work is required to be performed within a specified time, differing in the several States which have passed such laws, and as this is made a part of the act of location, it is necessary that it be complied with. These additional requirements are not in conflict with the federal law, but are an addition thereto, and such legislation is within the province of the States. The United States laws fix the minimum requirement, but this may be enlarged by a State Legislature.

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MINES having large roomy drifts, crosscuts and other workings, are more readily ventilated than those where the workings are small and crooked. Where there are not at least two outlets to a mine, as two shafts, or two tunnels, or a shaft and tunnel connected, mechanical ventilation is necessary, either by means of fans, blowers, furnaces, or other means. It is not the best practice to draw the air from the mine into the compressor to only send it back again laden with the foul gases accumulating in the mine workings. The compressor should take its air from the outside atmosphere where it is uncontaminated by impure gas of any description. Undoubtedly compressed air exhausted from machine drills and leaks along the pipe line help to supply fresh air to mine workings, but leaks are not economical, and the exhaust from the drills is only incidental. The mine should have an abundant supply of pure air from the outside equal to 100 cubic feet to the man per minute. To facilitate ventilation, or to lessen as far as possible the formation of carbonic acid gas in the workings, all old decayed timbers should be taken to the surface and not thrown into a disused drift, crosscut or stope. Timbers in place which are decaying furnish a large amount of this gas, but this cannot be avoided, but old timbers which have been replaced by new should be removed immediately.

The Morenci, Arizona, District.

From a Staff Correspondent.

The Detroit Copper Co. at Morenci has under way important additions to its preseut plant. The concentrator, which has a capacity of 500 tons per twenty-four hours, is being doubled in capacity. One half of the plant will be remodeled and increased at a time, while the other half continues in operation, and it will require eighteeu months to complete the change. It will have a floor area 166x240 feet. When remodeled there will be a total of 120 concentrating tables, 40 jigs, Chile mills, 6 sets of rolls 16x42, and 28 revolving screeus for sizing. Power to operate this plant will be furnished by gas engines with a total of 600 H. P. in 150 H. P. units. The concentrates will all be handled mechauically. Au important featnre of improvement will be the separation of the crushing plant from the concentrator. The new crnshers will occnpy a building west of the concentrator, and will have a capacity of 100 tons per hour, and all the crushing for the day will be done in ten hours. The sampliug mill will be located above the conceutrator aud ore will be conveyed to it from the latter on a belt conveyer 400 feet long. Crusher and sampler will both be operated by electric motors. The company has one of the most complete gas plants in the Southwest, and throughont the entire works—concentrator, smelter and converters—gas engines furnish the power, the only exceptions being steam power nsed on locomotives and miue hoists. New Mexico coal is used in the manufacture of the gas, and it has been found by the Detroit Co. to be the most economical power available. All power, with the exception of the 600 H. P. at the concentrator, will be localized at the new power honse, now under construction near the smelter. At present there is here a total of 825 H. P. developed by gas engines, and this will be increased by 500 H. P., giving a total of 1925 H. P. Steel bins of 2000 tons capacity will be iustalled at the smelter, aud steel trestles, and in this and the conceutrator a total of 700 tons of steel will be used.

At Metcalf the Coronado mine sends 300 tous of ore per day to the Clifton smelter. Recently considerable snrface improvemeut has been going on. Twelve portable dwelling honses, a new store and other bnildings have been erected. This aud the Metcalf mines on the opposite side of Chase creek beloug to the Arizona Copper Co., which also owns the Longfellow, Hnmboldt, Yavapai and Joey mines at Morenci, all of which are prodncers of the red metal. The sulphide ore of Morenci mines is concentrated at the plant there and the product sent to the Clifton smelter by way of Longfellow incline and the Chase creek narrow gauge road. The possibilities of ore production with this company are extensive.

During the past year the Shannou Copper Co. has brought its mines and smelter into the ranks of the producers. The mines adjoin the Arizona Copper Co.'s mines at Metcalf, and an incline road conveys the ore to the level of the narrow gange road in Chase creek, and by contract with the Arizona Copper Co. is hauled to the Shannon concentrator and smelter, 1 mile south of Clifton. As yet it has no converter plaut and the high-grade matte produced is sold to the Arizoua Copper Co. and refined at their Clifton plant. The Shannon concentrator will be operated within a week at its full capacity of 500 tons per day. Within the year a converter plant will be installed. Its two furnaces, 42x170 inches, have a capacity of 300 tons each. Besides their own ore, more or less custom work is done for the smaller properties of the vicinity.

The Monte Cristo property at Metcalf, owued by residents, is under lease to a company of local men, with A. D. McLean president and R. G. Murillo general manager. Mr. McLeau is the Arizona Copper Co.'s superiutendeut at Metcalf and Mr. Mnrillo is also employed by the same company, the Monte Cristo being a side issue. The mine is 1 mile above Metcalf. Since the present company took it, late in December of last year, four shipments of ore have been made to the Shannou smelter, with very satisfactory results, and work is steadily advanciug in its development.

East of the Shannon mine at Metcalf the property of E. Schumann and H. A. Arbuckle, known as the Buckeye and Sharpshooter, is being developed. The former claim has abont 2000 feet and the latter 1000 feet of shafts, drifts and tnnnels. High-grade ore, both sulphide and carbonate, is obtained. The work is in charge of J. A. Stewart. Seven men have been employed for two years past.

Adjoining this is the Antietam, with three claims. Ou this there is a 146-foot shaft. At the 70-foot level is a drift 115 feet long, which exposes a body of ore 36 feet wide, with an average valne of 4.4% copper, $2 gold and 7 onuces silver. At the bottom a crosscut of 26 feet fails to intercept the walls, and the values average 7% copper and $4 gold. More or less high-grade ore has been encountered in stringers throngh the ore body. Of ore takeu out aud shipped, oue lot of 300 tons averaged 16½% copper and a shipmeut of 600 tons yielded 6½% copper. In a total of 446 feet of work Paul L. Crowley, manager and part owner, states that he was never out of ore.

The Standard Copper Co.'s mines are on the east side of Chase creek, a short distance below Metcalf, and have been for several years past steady producers of high-grade ore. An aerial tram 3000 feet long conveys the ore to the Clifton–Metcalf road, and it is sent to the Shannon smelter. The property consists of eleven claims aud lies in the heart of the Clifton-Morenci district. Development is beiug carried forward in accordance with definite plans and its management is making it a payer from the start. About 400 tons per month of high-grade ore is shipped to the smelter.

Leaving Chase creek and passing eastward 2 miles over the mountain to the slopes of the San Francisco river is the property of the New England Copper Co., which by a recent merger with its neighbor, the Clifton Consolidated Mines Co., and now known as the New England & Clifton Copper Co., has become one of the important properties of the district, and comprises eighty claims, on which large bodies of ore have been developed, thongh none of the old New Englaud Co.'s ore has ever beeu stoped or shipped. The Clifton Con. Co. mined and shipped for several years before merging its interests. In the way of development a main tunnel, to be 1 mile in leugth, is being driven through the mountain. Abont midway of this an 800-foot shaft has been sunk, and work on the tuunel is beiug pnshed both ways from the foot of this shaft, and at both ends. Other shafts have been sunk and drifts ruu, all uncovering copper ore. It is the intention to bnild a coucentrator and transport the concentrates to the river by aerial tram, thence to Clifton by an electric line, to one or other of the old smelters, and not to erect their own reduction plant until the ore bodies shall have been blocked out sufficiently to justify it.

The Polaris Co., lying east of the New England and about 6 miles from Clifton, has recently added to its property the Poland–Nelsou claims, and uow has a total of forty claims. There are several leads on the surface, the most important one being the Black Prince, on which seven of the claims are located. This runs northeast aud southwest and is a strongly defined lead, with a maximum width of 70 feet. On it are two shafts, the None Such, 100 feet deep, all in ore, and the Fraction tunnel, 50 feet deep, with ore from within 2 feet of the surface. The Black Prince tnnnel is now being driven under these and has a length of 284 feet on the vein. With a length of 1500 feet it will intercept the None Such shaft. Above the Black Prince tnnnel is the Fraction tunnel, now in 162 feet, one level above the former. In the canyou below a tnnnel is being driveu at right augles to these workings, designed to intercept them and to cut several leads paralleling the Black Prince, and to serve as a main working tunnel to all. It is called the Phonolite tunnel and will intercept the Black Prince ledge 400 feet below the tunnel of that uame. The Phonolite is in 241 feet, almost to the Golden Eagle lead, on which a tunnel is being driven and a winze sunk to connect with the Phonolite. The Golden Eagle tunnel is yielding sulphide copper ore of high grade aud carries good values in gold. The lead is cut by a canyon, on the other side of which is a tunnel known as the Grey Eagle, from which good ore is being taken. L. F. Sweeting is manager.

The Morenci coal field is the most important unsolved problem of the district. It has not as yet beeu opened enough to give any indication of what may be expected. The Detroit Copper Co. promptly bought the prospect of the discoverer, J. Molder, and has opened the lead for a few feet in two places. The first shows a vein about 4 feet wide of mixed coal and clay, but the hole was abandoned and another started 500 feet east, on the creek bank. This at 20 feet depth shows 5 inches of coal of fairly good quality. The work is proceeding slowly and it will be some time before anything definite can be known of its extent. Meanwhile all the land within 3 miles of the original discovery is located by others. The Molder field is south of Morenci 3 miles. At Duncan, 35 miles southeast of Morenci, are coal indications, which are receiving attention, and the same distance beyond are still other prospects. At present it is impossible to say auything definitely in regard to the Morenci coal field. Until considerable work has been done it cannot be viewed as other thau a prospect. There is talk of utilizing diamond drills in prospectiug the field, bnt as yet none have been installed.

Mining and Metallurgy at the St. Louis Exposition.

The gold reduction plant which is being erected at the Exposition to show the milling methods in the Black Hills, South Dakota, and which will be operated and maintained throughont the Exposition by the Black Hills Mining Men's Association, under the South Dakota commission, is one of the many educational featnres of the Fair.

The appropriation made by the State of South Dakota was only $35,000. Out of this all the commission conld devote to the mineral exhibits was $6000. This sum will barely meet the cost of the exhibit in the Mineral Palace, which is original and unique. Each of the five stamps weighs 1000 pouuds, the same as are used in the Homestake mills at Lead, South Dakota. The mortar is of the shape known as the Homestake mortar. The amalgamation plates are full size and silver-plated and the cyanide tanks, pumps and machinery are also full size.

The plant will require 1500 tons of ore to keep it in operation. This will be shipped from the Black Hills, different mine owners shipping down about 100 tons each to keep it going. Separate runs will be made on each shipment, a cleanup made and an official certificate issued showing the value produced from each lot.

The total cost of this exhibit and its maintenance throughout the Exposition will be not less than $25,000. It will be an object lesson on modern methods of gold extraction as practiced in the Black Hills, showing how low-grade ores are treated.

In this plant the ore is handled by gravity, passing through a crusher, under the five 1000-ponud stamps, the free ore being then treated on the silver amalgamatiou plates aud the refractory ore by the cyanide process.

The cleanups will be made twice a month and the bullion retorted in the works, so every stage of the work can be seen.

B. C. Cook of Deadwood, cyanide operator, and R. P. Akin of Denver, representing the Colorado Iron Works, will be in charge of the plant.

The Potter Sulphide Process.

At a recent meeting of mining and metallurgical meu at Melbonrne, Australia, the Potter sulphide process was demonstrated in a small way by placing in a test tube some Broken Hill tailings and pouring on a dilute solntion of sulphuric acid. On heating the solution to near boiling point, bubbles of gas attached themselves to the sulphide particles and carried them to the surface, leaving the gangue absolutely devoid of snlphides. By using a larger vessel, the sulphides were removed as they rose to the surface. Mr. Clark, the demonstrator, stated that one merit of the process lay in the separation it effected between lead and zinc sulphides. As was well known, lead ores were no good if they carried too high a percentage of zinc, and zinc ores were no good if they carried too high a percentage of lead; yet they were both valuable if separated. This could be done to a great extent by Potter's process. The Delprat process differed from Potter's in that sulphate of soda or salt cake was also present in the former; but the acidulated solution used had precisely the same action in causing gas bubbles which attached themselves to and carried particles of sulphides out of gangue. Mr. Clark stated that while the application of Potter's process to such lead-ziuc compounds was most important. yet by a modification of it he believed that certain sulphides, like chalcopyrite, conld be separated from certain siliceous ores cheaper than by any existing method.

The action of the machine for working the process commercially was theu explained. It consisted of a shallow rectangular box with sloping ends and sides, the length being about 10 feet and the width 3 feet. In this shallow box another trough having a V-shaped cross section was lowered along its length, the point of the V not quite reaching to the bottom of the rectangular box and the sloping sides of the V overlapping the sides of the other box. Launders run aloug each side of the treatment vessel. Pulverized ore is fed iu at the npper end of the machine; scrapers draw it continnonsly towards the lower end. A solution containing 2% of snlphnric acid is run into the box. This is heated by a steam coil placed underneath the vessel; as soon as the temperatnre nears boiling (200° F.) the sulphides are attacked and bubbles become attached to them. These carry them to the bottom of the V-shaped box; they pass upwards and along the inclined boards and ultimately reach the side launder, into which they drop. As the ore is scraped along the bottom of the treatment vat, it becomes poorer aud poorer in sulphides, sulphide of zinc passing over readily amongst the first concentrates, sulphides of lead and zinc in the seconds. Assays of the prodncts are as follows:

	Lead. %	Zinc. %	Silver. Ounces. Per Ton.
Original ore	7.5	18.5	7.5
First concentrate	7.3	49.07	11
Second concentrate	10.83	40.51	14
Tailings after removal of concentrates.	7.8	5.48	3.5

The machine, which is very simple and easily constructed, is said to have a capacity of nearly one ton per honr. Later the machine was shown in operation, bnt the separation effected, until towards the finish, was not clean, owing to the temperature of the bath not reaching more than 85° to 88° C.; on the following day much better work was done. The process is iu active operation at Broken Hill Block 14 with profitable returns.

WHERE the mine is at some distance from the nearest eligible millsite the transportation problem is sometimes prohibitive, as far as a graded road is considered. Miuing companies not uncommonly expend thousands of dollars in the construction of a short road between the mine and mill for the purpose of ore delivery to the mill and snpplies to the mine. After construction the road is often unsatisfactory and a source of perpetual expense and annoyance.

Petrified Forests and Painted Desert of Arizona.*

NUMBER II.—CONCLUDED.

Written by PROF. OSCAR C. S. CARTER.

In the writer's opinion, most of these trees were broken into logs after they were petrified, and while they were imbedded in the solid rock. The entire plateau country comprising New Mexico, Arizona and beyond, was elevated in recent geological times (Tertiary) from 4000 to 8000 feet above tide. This elevation was gradual, but the strata, nevertheless, were subjected to pressure and strain, which fissured them and cracked the trees while they were still imbedded in the sandstone and shale, before they were loosened by erosion. This seems more reasonable than the statement that they were split into sections by heat and cold, although, doubtless, some were. This large tree spanning the ravine has been called the natural bridge of agate. Unfortunately, there are several transverse cracks in this tree, and one near the mesa seems to extend entirely through the tree, making the position insecure. This is shown in one of the accompanying engravings. It should be braced in some way so as to prevent the entire collapse of the tree into the ravine below, as it will always be a source of wonder and interest to tourists, when the area is set aside as a Government park, to which end a bill has already passed the House. It may be that these trees are not in situ, but floated there in past geological ages, perhaps, down an ancient river into an inland sea, where they were buried in the sand and mud near the shore after they became waterlogged. These layers of mud and sand became shale and sandstone in after years, when the sea receded or evaporated owing to a change in climate and other causes. It may be, however, that these trees grew along a shore line that was afterwards submerged, and they became buried in sand and mud. They are much crowded and the former view may be the correct one.

These mesas were once a continuous plateau of sandstone and shale, when a break, crevice or line of weakness once began, erosion soon completed the work and the gaps widened until finally the plateau was dissected into a series of mesas. As the disintegration of the sandstone and shale proceeded, the trees imbedded in the rock would be loosened and finally roll down to the foot of the mesa, where the most of them are now found. As these strata are of mesozoic age, many layers of rock must have disappeared since that time by erosion, so that the trees at the foot of the mesas and in the arroyos are not in place, but came from a higher horizon of sandstone which has disappeared by erosion. There are, however, many trees in place imbedded in the solid sandstone rock, their branches and trunks projecting from the edges of the mesas and plateaus; but most of these trees in place are in the highest part of the forest at an elevation of 5700 feet above tide; these trees in place are several hundred feet above the valleys and arroyos in which the loose stranded trees are found. The Natural Bridge is the largest tree in place, and most of the trees in place are found in a coarse-grained sandstone, with a feldspathic cement; the cross bedding indicates shifting currents or drifting of the sand by the wind. That layers of sandstone of immense thickness have disappeared from the top of the mesas one can readily see at a glance, because some of the trees are loose on top of the mesas where they were deposited when the rock eroded away. All of the trees have been changed to some form of quartz, either agate, chalcedony, jasper or opal. By far the greatest number have been changed to the varieties of silica which have a waxy luster. It is a well-known fact that quartz resists erosion of all kinds better than any other mineral. It is practically insoluble in mineral acids and also in cold water. The only solvent met with in nature besides some organic acids, from decaying wood and vegetable matter, is hot water containing the alkalies, potash and soda in solution. So we may consider quartz one of the most insoluble minerals known. When granite rocks are exposed to the action of waves along the shore line, parts of all the minerals of the rock dissolve in the course of time except the quartz, and that forms the beach sands.

We can easily see from this how the mesa in which the trees were imbedded has eroded, while the trees rolled down to the base of the mesa or were left stranded on top. Several peculiar mounds of rather striking appearance were noticed on the desert near the mesa, not far from the trees. These have been pronounced by some, after superficial examination, to be extinct geyser cones. There is no evidence whatever to support such a statement. The mounds are simply mounds of disintegrated colored shale, the peculiar form being due to weathering; no indication of geyserite was found. The mounds are certain to attract attention. They are due to erosion, and some mound-like forms were seen capped with a pin-

Indian Paintings on Rocks, Petrified Forest.

Petrified Logs Lying on Top of the Mesa, Petrified Forest.

Petrified Logs Embedded in Sandstone, Petrified Forest.

Peculiar Sandstone Shaft—a Freak of Erosion.

Agate Logs, in Petrified Forest.

*Abstract of Journal Franklin Institute of Philadelphia, Pa., to which we are indebted for the engravings herewith presented.

nacle of harder resisting sandstone. As soon as this topples over and disintegrates and is washed away by rains, then the underlying and softer shale will be moundlike in form. One of the most interesting forms due to erosion is a mound of peculiar shape at the base, surmounted by a shaft 25 feet bigh, on top of which was a slab; both shaft and slab are of sandstone. When erosion proceeds far enough and the peak topples over, one of those peculiar mounds will be formed. The geological horizon to which the sandstone and shale of the forest belong is in dispute. J. W. Powell, formerly director of the U. S. Geological Survey, claims to regard them as Jurassic, while the other evidence seems to point to Cretaceous age. Sections of this wood under the microscope show that it is conifer. In 1853 Mollhausen discovered a petrified forest in a ravine near the Little Colorado in Arizona. The wood was submitted to Dr. Goppert, who pronounced it a conifer belonging to the Abitineæ. Tbe Rio Puerco is a tributary of the Little Colorado. One of the logs in front of the U. S. Museum at Washington was taken from the mesa 2 miles north of Fort Wiugate, N. M., which is not far from the Rio Puerco and just over the Arizona line. They were studied by F. H. Knowlton, who states that they are the same as Goppert's Araucarites Mollhausianus. Not Araucarites as that genus is understood, but Araucarioxylon Arizonicum from the fact that most of the wood is found in Arizona.

P. A. Dudley, of New York, examined this wood and says it belougs to the genus Araucaria, and that Araucaria excelsa, the present Norfolk Island pine of the South Pacific, grows to a height of 150 to 200 feet. Other pieces, he says, resemble red cedar, Juniperus Virginianus. Be this as it may, many specimens show that the wood was going to decay before it was petrified. The writer believes that most of the petrifaction took place in the sandstone and shale, and was due to soluble silicates derived from decomposition of feldspar, which is the cement binding the sandstone. The silicate of potash or soda produced the petrifaction when it came in contact with the vegetable matter or trees that were imbedded. The silicates are soluble in rain water, and as they percolate through or over imbedded woody material the organic acids derived from the decomposition of the wood will decompose the silicate of potash and set free silica in the amorphous or gelatinous form, which will be precipitated ou the wood and in the pores until the substitution is complete. In Penusylvania pieces of petrified wood are found iu red sandstone; a feldspathic cement binds the grains of sand.

Near Hanna's ranch a small plant was erected by a Denver, Colo., company, who intended to crush the agate trees and use the powder for an abrasive ageut as a substitute for emery. At Sioux Falls, Dak., they polish petrified wood and make magnificent table tops and pedestals.

In the Yellowstone Park (U. S. Geological Survey Monograph XXXII, Part 2) are found many petrified trees, but they are standing upright. They do not rise to great height and are mostly trunks on the slopes of mountains, aud the highest of them rise to only 20 or 30 feet. They are found near Lamar river, the finest exhibit being on Amethyst Mount and Specimen Ridge, near the road between Mammoth Hot Springs and the town of Cooke, Mont. Yancey's fossil forest is 1 mile south of his hotel, on the slope of a hill 1000 feet above the valley. There are only two trees of considerable size, the largest stump being 15 feet high and 13 feet iu circumference. The bark is not preserved, so that the true diameter cannot be ascertained. They belong to the genus Cupressoxylon. Some trunks rise only a few inches above the ground. Some of the trunks near Specimen Ridge are sequoias. In early tertiary times these forests were supposed to have been buried under debris ejected from volcanoes and afterwards surrounded with water charged with silica, which petrified them. The largest trunk in the park is 10 feet in diameter. These trees which grew in tertiary times cannot, of course, be compared in age with the trees of the Petrified Forest, Arizona, which grew in mesozoic times.

U. S. Geological Survey Results.

The members of the United States Geological Survey in Washington recently celebrated the quarter-ceutennial auniversary of its organization. The more important results achieved by the Survey during the twenty-five years of its existence are set forth in its recent bulletin (No. 227) eutitled "The United States Geological Survey: Its Origin, Development, Organization, and Operations." This bulletin is intended for gratuitous distribution, and copies of it will be given away as souvenirs in connection with the Survey's exhibit at the Louisiana Purchase Exposition.

Since the establishment of the Survey a complete topographic map has been made of 929,850 square miles of the area of the United States, the Survey having finished the mapping, on more or less detailed scales, of 26% of the area of the country, including Alaska, or 31% excluding Alaska.

This great map of the United States, of which nearly one-third has been completed, is published in the form of an atlas. The portion completed consists of 1327 atlas sheets printed in three colors from copper-plate engravings.

The geologic mapping of the surface formations has been extended over about 171,000 square miles and 106 geologic folios have been published, while nearly an equal number are in various stages of preparation. Each of these folios presents a practically complete history of the topography, geology, aud mineral resources of the area described.

The Survey, through its hydrographic branch, including the reclamation service, has recorded, during the last fifteen years, the maximum, minimum, and mean discharges of all the more important rivers, and for shorter periods the same facts concerning all the lesser tributaries of the many hundreds of streams in the United States. The physical characteristics of the river basins have been studied in respect to their forestation, soil covering, etc., aud a vast amount of data has been accumulated from which it is possible to estimate closely the volume or run-off of each of the streams.

Data have been gathered concerning irrigable public lands and their relation to possible water supplies. A large number of reservoir sites have been examined and surveyed, and the lands which the reservoirs would serve have been withdrawn from sale or occupation pending more detailed studies. Surveys of the irrigable lands as well as of canal lines have been made, and several irrigation projects have been approved for construction by the reclamation service.

The Survey, by its division of geography and forestry, has examined iu detail 110,000 square miles and has made a classification of the lands as forested, grazing, desert, and arable.

The immediate value to the people of the Survey's work is best shown by the aid it renders in developing the mineral resources and in forwarding important engineering projects. The investigation of the mining geology of Leadville has guided exploration and secured economical mining in a district that has produced between $200,000,000 and $300,000,000. It has also taught the mining engineer and the miner the practical importance of geologic study in their work. The investigation of the origin and geologic relations of the Lake Superior iron ores and the publication of numerous reports on that region have directed the prospector in the discovery of deposits and have suggested to the miner the most ecouomical methods of development. The result is that this region now leads the world in the production of iron ore.

Coal Lands in Alaska.

The last Congress passed a bill relating to the taking of coal lands in Alaska which is briefly in effect as follows:

Auy persou or association of persons qualified to make entry under the coal land laws of the United States, who shall have opened or improved a coal mine or coal mines in any of the unsurveyed public lands of the United States in the district of Alaska, may locate the lands upon which such mine or mines are situated in rectangular tracts containing 40, 80 or 160 acres, with north and south boundary lines run according to the true meridian, by marking the four corners thereof with permanent monuments, so that the boundaries may be readily and easily traced. And all such locators shall, within one year from the passage of this act, or within one year from making such location, file for record in the recording district, and with the register and receiver of the land district in which the lands are located or situated, a notice containing the name or names of the locator or locators, the date of the location, the description of the lands located and a reference to such natural objects or permanent mouuments as will readily identify the same.

Such locator or locators, who are citizens of the United States, shall receive a patent to the lands located by presenting, at any time within three years from the date of such notice, to the register and receiver of the land district in which the lands so located are situated, an application therefor, accompanied by a certified copy of a plat of survey and field notes thereof, made by a United States deputy surveyor or a United States mineral surveyor duly approved by the Surveyor-General for the district of Alaska, and a payment of the sum of $10 per acre for the lands applied for; but no such application shall be allowed until after the applicant has caused a notice of the presentation therefor, embracing a description of the lands, to have been published in a newspaper in the district of Alaska published nearest the location of the premises for a period of sixty days, and shall have caused copies of such notice, together with a certified copy of the official plat or survey, to have been kept posted in a conspicuous place upon the land applied for and in the land office for the district in which the lands are located for a like period, and until after he shall have furnished proof of such publication and posting, and such other proof as is required by the coal land laws; provided, that nothing herein contained shall be so construed as to authorize entries to be made or title to be acquired to the shore of any navigable waters witbin said district.

During the period of posting and publication, or within six months thereafter, any person or association of persons having or asserting any adverse interest or claim to the tract of land or any part thereof sought to be purchased shall file in the land office where such application is pending, under oath, an adverse claim, setting forth the uature and extent thereof, and such adverse claimant shall, within sixty days after the filing of such adverse claim, begin an action to quiet title in a court of competent jurisdiction within the district of Alaska, and thereafter no patent shall issue for such claim until the fiual adjudication of the rights of the parties, and such patent shall then be issued in conformity with the final decree of such court therein.

All the provisions of the coal land laws of the United States not in conflict with the provisions of this act shall continue and be in full force in the district of Alaska.

Concentration of Low-Grade Copper Ores.

NUMBER IV.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by W. J. ADAMS, E. M.

The additional value of gold and silver would, of course, add materially to the amount of ore available, even if very low in copper; but in the tests of the writer no attention was paid to the presence of the precious metals, the sole object being to find out whether a merchantable copper product could be made with only a slight loss in the tailings and knowing well that the other values would go with the sulphurets with which they are combiued, unless in a free state.

From the foregoing the following deductions can be derived: Unless the costs of mining bar the process by being greater than the total value of the ore, or where there are dumps of insufficient size to warrant the outlay of capital requisite for the plant, the concentration by the above method will prove a commercial success.

The following suggestions are given where the ores are similar to those tested, and with proper modifications should apply to all ores amenable to the process:

First—Broken by rock breakers, the ore should be crushed wet, to pass a screen of 30 mesh, or, if of sufficient value in gold and silver, to pass a 50-mesh screen.

Second—It is then to be concentrated on Frue vauners of the corrugated type, or by Wilfley tables, but a clean and coarse concentrate only must be saved, and the only attention paid to the tailings is that there is no loss—or a very slight one—in coarse sulphurets, no observation at all being made on the losses in the slimes. This will require a more rapid progress of the pulp over the machines than is generally employed where low tailings as well as high-grade concentrates are both desired.

Third—The tailings from these machines, water and pulp, sand and slimes, are then passed through point boxes—known as spitzkasten—and separated into their constituent parts of slimes, which overflow, and sands which are drawn out at the bottom of the V of the box. Care and experience must now be employed until such a separatiou is effected (and it can be doue), so that the overflow will carry all the free mineral left in the tailings, and the sands only that modicum of $\frac{2}{10}$% copper or so, still locked up in them, due to the coarse crushing. As the oil will have no effect, or very little, when the contained mineral is exposed, they can be sluiced to the waste dump and reduce by that much weight and bulk the amount to be subsequeutly treated by the oil process. In this way the size of the special oil concentrating plant can be reduced from one-half and possibly even to two-thirds the original size that it would be if the entire bulk of pulp had to be passed through it.

Fourth—These slimes run continuously through the three mixing cylinders of the process and finally flow away to the waste dump. Fresh oil is added to the pulp in each cylinder, and the oil and coucentrates are separated from the pulp, after passing each cylinder, by a spitzkasten, and run by gravity from it to the centrifugal separator, while the tailiug slimes from the last separator flow directly to the waste dump. The concentrates and oil are heated to 80° to 90° F. beforc entering the separator, and where the layer of mineral is so thick that there is danger of loss with the escapiug oil the admission of the saturated oil is stopped, and hot water is added to displace as much of the remaining oil as possible. This oil is then pumped back to be used over agaiu on fresh pulp, and the concentrates and water are transferred to a second separator with a basket filter, where the water is removed, and absolutely dry concentrates are left, except for a small amount of oil, which adds to its fusibility, and, if these concentrates are shipped, prevents any loss on its transit by dusting. This loss of oil is very small, as shown by long-continued work, and does not exceed, at the very most, one and one-quarter gallons per ton of ore actually treated.

With a plant having a capacity of treating 500

tons crude ore per day, there would be removed from 10% to 15%, and perhaps 20%, in the concentrates from the vanners, leaving from 450 to 400 tons only to enter the spitzkasten; and here, from the result of the sliming tests, there will be a further reduction of at least 50% of the weight, or 225 to 200 tons, on the waste sands. This leaves, at the most, only about 200 tons to be treated by oil, or a plant of four units, instead of one of ten units, if all the ore had been treated by oil.

In conclusion, it can be stated that, contrary to belief, the process is cleanly and the costs very small. These costs have not been compiled by the writer, but the total of crushing and concentrating should not exceed 75 cents per ton.

Tonopah District, Nev.*

Written by S. A. KNAPP.

The Tonopah mining district is situated partly in Nye county and partly in Esmeralda county, in the State of Nevada, and on the western slope of the southern portion of the San Antonio range of mountains, this range here being broken up into isolated buttes and rolling hills with a gradual easy slope to the San Antonio desert, the contour in some places being very rugged, and in others having small plateaus and wide ravines or washes.

Until the year 1900 the whole area was comparatively unknown, except to a few cattle and range men, and very little of its mineral possibilities were realized. In May, 1900, J. L. Butler, while prospecting, came across the outcrop of a series of ledges and took samples with him. The quartz was unpromising in appearance, but the veins were large and the outcrop prominent. He took some of the ore with him to Klondyke, a camp 10 miles south of the present town of Tonopah, where he left a piece with an assayer to be tested, who thought so little of it that, when Butler left for Belmont, threw it out of the window without testing it. Mr. Butler on his return to Belmont told T. L. Oddie he had found large ledges of this material in the southern desert, but had not had it tested. Arrangements were made between them and the ore sent to Austin to be assayed, and it was found to contain high values in gold and silver (about $600 to the ton). The returns were delayed in reaching him, and Mr. Butler returned to the locality and proceeded to locate the claims covering this outcrop, this being done in the latter part of August, 1900. During September, October and November, he, with T. L. Oddie and W. Brougher, completed their locations, and in November the news got abroad that good ore had been found, and a number of miners from Silver Peak, about 40 miles distant, came in and were given leases by Mr. Butler and his associates on portions of the ground. Leases of 100 feet in length along the outcrop, with the right to follow the veins down, were the rule. By the middle of December, 1900, five leases were in operation. Butler and his associates started a small shaft on what is now known as the Mizpah ledge and were down about 25 feet.

At that time others had commenced to come in. An examination of the property was made by S. A. Knapp and a report sent to J. R. Delamar, who acquired a bond on the property to permit examination and sampling for $200,000. In January the examination was made, and the man sent to examine the property concluded that there was at least $750,000 worth of ore available that could be counted upon from the surface or by development which had been made at that time, but as fuel and water were not known in any quantity the conclusion on his part was that the outlay necessary to commence operations would be very heavy, and without further development he would not be warranted in paying that price. During these negotiations other parties had come in and other leases were given, and the output and shipment of ores had commenced.

Up to March, 1901, the leases had all been given with the proviso that in the event of a sale the leases would be abrogated. This prevented systematic exploration and development on the part of any of the leasers, and necessitated their gouging out their ore day by day, thus leaving the property in bad shape. Realizing this, Mr. Butler notified all the leasers that, sale or no sale, they would be given until January 1, 1902, to operate their leases, they paying to himself and associates 25% of the amount extracted. By this means, having something definite to go on, the leasers commenced systematic development and opening of the ground allotted to them, with the result that by January 1, 1902, they had, it is reported, extracted ores of the value of about $3,000,000. The high grade of the ore attracted widespread attention, and in April the property was bonded by Price & Brent. Owing to a disagreement between themselves and Mr. Butler and his associates, the bond was thrown up.

About June 1st, O. A. Turner of Grass Valley, attracted by an article descriptive of the property which appeared in the MINING AND SCIENTIFIC PRESS in May, came up and made an examination of it, and was convinced of its great value and secured a bond on the property for $336,000, and agreed to pay $50,000 down on July 1st. He telegraphed his principals; a hurried examination was made by experts and parties connected with the matter from Philadelphia. The first payment was made in accordance with the contract, and in due course of time the property was paid for and passed into the hands of what is now known as the Tonopah M. Co. The royalties from ores extracted by the leasers up to January 1, 1902, more than covered the amount paid by this company for the entire property. The leasers crowded all the men they could into their ground with a result that some of them penetrated to a depth of 200 feet, showing the ledges to be large, strong and carrying high values; the average of the entire mass of ledges ranging from 5 to 10 feet in width, the ore running about $100 per ton, of which about 25% was gold and the remainder silver.

The property was taken over by the Tonopah Company on January 1, 1902, and its systematic development undertaken. One shaft, known as the Siebert shaft, was started, being a three-compartment shaft, well timbered, and has reached the depth of 950 feet. Another shaft, known as the Valley View, was also commenced, and has reached a depth of 740 feet. What was known as the Brougher shaft, which was sunk by the leasers originally, was extended to the 700-foot level. From these shafts a series of levels have been driven on the 300, 400, 500 and 700 on the Mizpah ledge, and connections made with the Valley View, upon which a level of 1000 feet in length has been driven. The 300 level on the Mizpah ledge is 2600 feet long; the 400 level is 412 feet in length; the 500 level is 1776 feet in length, and on the 700 level a long crosscut has been driven to a connection with the Valley View shaft. The Mizpah ledge and the Valley View ledge run east-west and dip to the north—the Mizpah at an angle of 60° and the Valley View at an angle of 45°. Between these two ledges are the Burro No. 1 and the Burro No. 2 veins, which show upon the surface and have been cut on the 300 and 700-foot levels. This system of work shows that the Mizpah ledge ranges from 5 to 11 feet in width down to the 700-foot level. The Valley View ledge, which on the surface consists of a number of parallel ledges, at the 300 level is 68 feet wide, and shows a ledge on the hanging wall of very high-grade ore, ranging from 6 to 10 feet wide, the remainder of the ledge being a lower grade of ore, and consisting of porphyry with streaks and stringers of quartz through it.

Up to the present time only the highest grades of ore have been extracted and have been shipped to the various smelting points for reduction. This has entailed a heavy cost for team freight, railroad freight, smelting charges and percentages deducted by the smelters, and, as the ores which have been shipped have averaged about $150 per ton net, the cost of shipment, reduction and percentage deducted is approximately $50 per ton on this class of ore. Realizing that it would not be policy to continue this loss, the Tonopah Company has been looking about for means of reducing the ore on the ground or in the vicinity, and by this means reducing this expense. In order to obtain the fuel, water, salt and chemicals necessary, and to transport supplies at a lower rate, they are now building a railroad from Rhodes Marsh, a station on the Carson & Colorado Railroad, to Tonopah, a distance of 60 miles. It is expected that this road will be completed the present month.

The geological features of the Tonopah mining district are complex. The country is made up of eruptive rocks, which have apparently been erupted at different periods. The underlying formation, so far as known, which is locally called the lode porphyry, is andesite, and this has been fractured and fissured, which has permitted the formation of the ledges. So far as developments go, the principal ore bearing ledges are confined to this underlying formation, which was only exposed and known upon the surface in the ground now owned by the Tonopah M. Co. Although apparently extensive, it was covered by subsequent flows of different characters of porphyry, volcanic mud and showers of volcanic ash.

An early examination convinced other parties that this porphyry containing these ledges extended under these surface flows, and work to determine this was commenced. The first absolute proof of the correctness of this theory was made by the Tonopah Fraction M. Co., which, in sinking their shaft, encountered the lode porphyry and ore at 280 feet. A number of companies are engaged in this development work, and gradually the area of this underlying formation containing veins is being widened. Wherever encountered thus far, the veins and ledges are of a similar character, and the ores are of a generally similar nature, the ores which have been unoxidized being a silver sulphide combined with an iron sulphide, and intimately associated with quartz. Where the surface waters have penetrated and oxidizing influences have obtained, these ores have changed in part to sulphates, oxides, carbonates and chlorides.

*Abstract from the Resources of Nevada.

The Small Sawmill in Mine Development.

Written for the MINING AND SCIENTIFIC PRESS by DENNIS STOVALL.

The small sawmill is gaining an important place in the development of placer and quartz mines. Well it should, as it is proving a great money and labor saver. Many of the quartz and placer mines of Oregon and California own their own mills, especially in those districts where there is an abundance of timber. Properties that are located in remote districts cannot purchase and haul in lumber for less than $30 a thousand. The small sawmill can cut it for less than $6 a thousand.

The mill shown in the accompanying illustration is installed at a hydraulic mine, and "can be loaded on a pack pony," as the old sawyer expresses it, yet it cuts from 5000 to 7000 feet of lumber a day. Power is supplied by a Pelton wheel, and the water is derived from the pipe line feeding the giants. It requires but three or four men to operate the mill, and about that number in the timber, felling trees and sawing logs. A mill of this kind can be torn up and made ready for transportation in a short time, and can be readily set up again.

Quartz mines are also making use of the small sawmill for sawing mine timbers, lagging and lumber, and the placer miners use them for cutting lumber for flumes.

Small Sawmill at Mine, in Oregon.

Remarks of "Dry Washer Bill."

TO THE EDITOR:—The Oakland ferry had just come in, and to one not a dweller in San Francisco it was interesting to see the fast-moving, clean-appearing throng swarming out like bees from a hive. Suddenly my hand was grasped by a broad, athletic figure with a grip like a rock crusher, and while a suspicious flash of bunco man crossed my mental vision, it was dispelled in an instant by a recognition of the genial face of "Dry Washer Bill," one of the best mining scouts and prospectors on the coast, one for whom extremes of space and variation of climate are no hiudrance—no mountain too steep to climb, no desert too forbidding to cross, and no work nor hardship too great to endure; often without sufficient food and, perhaps, worst of all, no tobacco; one season digging away the moss and sinking in the frozen muck of Alaska; then, out of luck and disgusted, to the other extreme of wandering, parched of tongue, over the hot sands of the Mojave. A thorough quartz miner and judge of ores, expert and honest, he could be steadily employed at good salary, but he prefers to "play a lone hand," never doubting his ability to "strike it richer than ever," for he has discovered and sold out for a song mines that are worth millions.

Successful work near Goler with a dry washing machine during the first rush to those limited but rich-in-spots diggings fastened on Bill the handle of "Dry Washer;" and so he is known, whether in Butte or Bisbee.

"Well, well, but I am glad to see you," said Bill. "It's good for sore eyes to see somebody who isn't a permanent resident—not that I'm particularly dowu on that class of inhabitant, but I can't do any business with 'em, and it sort o' hurts my feelings. While I don't owe this town a cent, I can't keep away from "Frisco" when I've got the price. There's nothing doing here, though, for me. I must say it's the hardest place in which to work up a good, square mining deal I was ever in. Oh, yes, there's plenty of money—oodles of it—but precious little of it can be had to work a prospecting mine. Everybody in the mine business hereabouts wants a developed mine—and they want it cheap. Why, if I had such a mine as nearly all you Californians are asking for, I wouldn't sell it for any price. Developing a mine means to sink shafts, run drifts and block out ore. This means that somebody has first to spend money and take a chance of losing it in searching for the ore, which must be found before it is blocked out. And yet, so many talk about 'legitimate mining'—'legitimate mining.' It makes me tired to hear the words.

"Never has a quartz mine been opened up, in any part of the world, which did uot require a chance to be taken that the openings made would be in ore and contiuue to be pay rock in sinking, driving and raising. The men or companies who work their properties, make no false reports and pay their bills, are doing legitimate mining, whether they have ore in sight or not. Legitimate mining implies the taking of legitimate mining risks as well, and yet people talk as though it meant 'sure thing' in money making, which is not good sense, for you can't apply that term to any kind of ordinary business. Mining records fewer failures, though, when once established.

"Anybody, even a correspondence school graduate, can pass on the value of and, after a fashion, work a developed mine, with ore bodies all blocked out, and get some pay from it. But somebody had to pay for the explorative work, and if a risk had not been run, unless someone had courage to back his judgment the developed mine would not be there, ready to turn out its visible wealth.

"Men so timid that they must be coaxed into investing their money by the assurance that they can not lose are not the ones to help along the mining industry. No; they're not the same in other States. Colorado people will jump at a chance that some of you Californians couldn't be dragged into with a yoke of bulls.

"If it wasn't so I wouldn't be here now with a wad of greeubacks in my inside pocket. Sold a claim there, up above timber line—10,500 feet elevation; had to pack my ore on burros down a narrow trail 4 miles to a flat car; then hundreds of miles by railroad haul to a smelter; snow up to your necktie eight months in the year. Why, some of you California mother lode miners couldn't be coaxed into looking at it—not even with first-class passage in an air ship. If Colorado miners and capitalists had California's advautages of known but undeveloped mines, its accessibility and climate, enabling them to do work the year round in the open air, as can be done in most situations where you are now mining, the gold and silver production of California would be a hundred millions per year in a short time. Why don't they come here and show us the trick? They're too busy—attending to their own business and developing their own State, as Californians might be doing. That's one reason.

"Yes, California miuing propositions are occasionally presented to Colorado men, but it seems so dead easy a thing to them that they can't help thinking there must be a catch in it. They have read about the courage and the progressive spirit of the California pioneer, and it is not easy to believe that such chances really exist.

"No, don't mistake me. I'm not saying a word against California miners; there are some of the best in the world in this State, even if they are, as a rule, a trifle too easy-going, and lack ginger, when compared with residents of colder climates and higher altitudes. Colorado much injured by the strikes? Yes, very much. It's hard to do anything in the way of getting a new property started until affairs are more settled. Who is to blame for this condition? Well, as I see it, both sides. When two men, each with a chip on his shoulder, butt up together, there is always a show for a scrap. Sometimes the bull-headed manager is as much to blame as the bullet-headed walking delegate. Many superintendents are working their mines and running right along without trouble. Perhaps 'Cousin Jack' is right when he says 'there are places for men, and men for places.'

"I believe in the right of men organizing to establish a uniform scale of wages. I believe, also, that a man should have the right to hire and discharge whom he pleases and manage his own business in his own way. Do I mean I should recognize the union? Most certainly. Why not—if the union recoguizes us first? Let no man outdo you in politeness."

At this I looked up into the face of "Dry Washer Bill," but couldn't make out whether he was joking or in earnest. But since my talk with him I have been thinking. CHAS. L. LANG.

Sonora, Cal., May 16.

The Ridgway Two-Belt Conveyor System.

The use of belt conveyors for handling material in bulk or package within the scope of this type of machinery is an established fact. Mechanical, mining, civil and consulting engineers appreciate it as a simple, cheap and economic labor-saving device where large quantities of material are to be conveyed, or elevated and conveyed. Plans are made and specifications drawn calling for belt conveyors, and it is now no longer a question of creating a demand, but of supplying it.

In the two-belt system an interior troughing and supporting belt runs over its individual head and tail pulleys, having separate take-ups, and is independent of the conveying belt proper. The conveying belt is threaded over its head and tail pulleys in the usual manner and has its separate take-up, so that the two belts, although moving together in the same direction at the same speed, are separate and distinct, to enable the conveying belt to be lifted off the supporting belt, out of the troughing blocks and passed through either a stationary dumper or a movable tripper.

The conveying belt has no work put upon it other than what is required to drive the lower carriers and its own head and tail pulleys, the carriers on the upper line being revolved by the inner supporting belt, the strains being thus divided.

The interior belt is driven by a compensating drive (roller or block chaiu sprocket drive) from the main driving shaft, and with the two belts in tension, just sufficient to prevent slip on their driving pulleys; both belts move at the same speed in the same direction. At the points where the conveying belt meets the interior supporting belt, a pair of concentrating rolls lifts the edge of the belt and drops it into the troughing blocks. This same method is used where the conveying belt leaves the troughing blocks at the opposite end.

Fig. 1 represents the carriers used in the two-belt system, straight rollers fastened to steel shafts revolving in babbitted boxes. The interior belt, by a compensating drive, is driven at the same speed as the upper carrying belt, and the two move together through their entire travel on both the upper and lower sides.

The inner or troughing belt carries the outer or conveying belt through the upper line of working travel and the outer belt carries the inner belt on its return and through its travel in the lower line.

Fig. 2 shows the assembled parts, the conveying belt proper resting on the blocks of the inner belt and producing a trough which conforms to the segment of a circle. This system is furnished by the Ridgway Belt Conveyor Co., 29 Broadway, New York, N. Y.

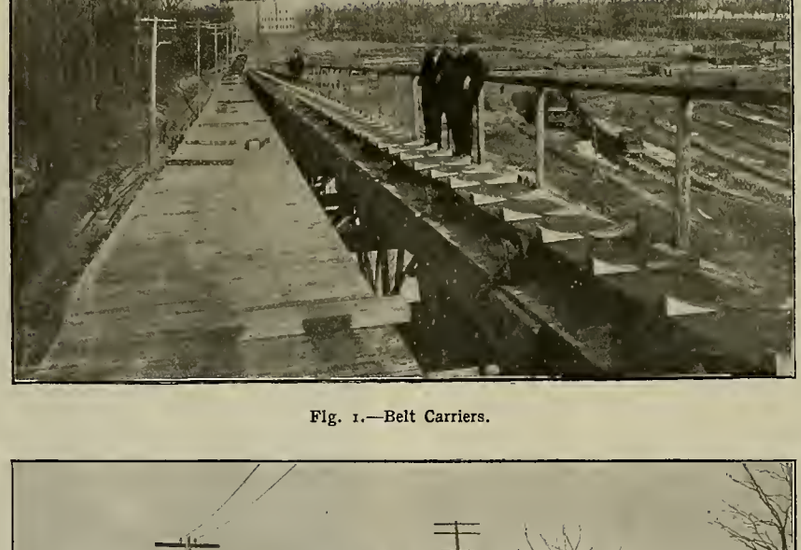


Fig. 1.—Belt Carriers.

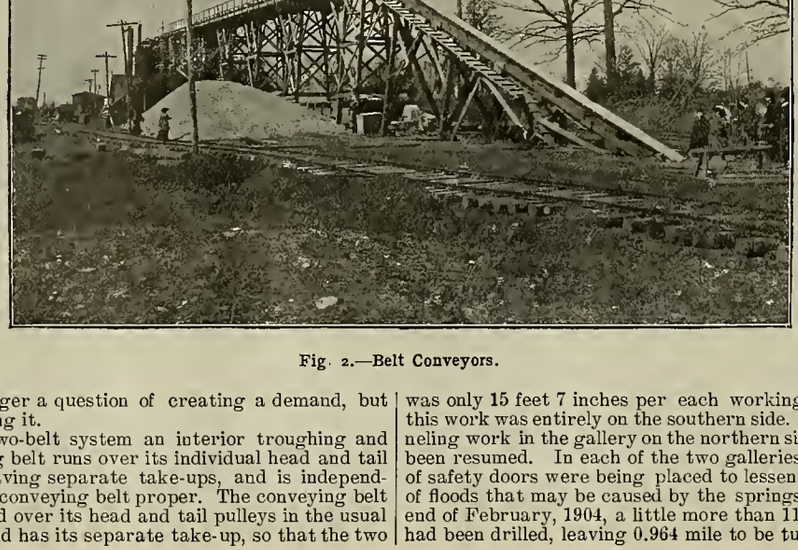


Fig. 2.—Belt Conveyors.

The Simplon Tunnel.

The Tribune of Geneva states that during the month of February the advance in the Simplon tunnel was only 15 feet 7 inches per each working day, and this work was entirely on the southern side. The tunneling work in the gallery on the northern side had not been resumed. In each of the two galleries a system of safety doors were being placed to lessen the effect of floods that may be caused by the springs. At the end of February, 1904, a little more than 11.295 miles had been drilled, leaving 0.964 mile to be tunneled.

Acid Making From Pyrrhotite.*

By E. A. Sjostedt.

Attempts at using pyrrhotite (monosulphide of iron, $Fe_n S_7$) instead of brimstone or pyrite (bisulphide of iron, $Fe S_2$) for acid making have often been made, but the same having repeatedly ended in financial failure, they came to be considered as foolhardy undertakings, and some engineers and professional men have even gone so far as to publicly pronounce it an impossibility, as will be seen from the following quotation:

"One of the most serious errors ever perpetrated in the manufacture of acid from pyrites is the attempted employment of pyrrhotite for pyrite. Aside from the greatly lessened proportion of sulphur—36% as against 53%—the pyrrhotite will not even yield freely what sulphur it contains, but crusts with oxide of iron, turns black, and is soon extinguished when treated in an ordinary pyrite kiln."

When, therefore, a few years ago the problem was presented to us of treating the Sudbury pyrrhotite so as to recover not only the nickel, cobalt and copper present, but to utilize its sulphur and iron contents as well, no sympathetic co-operation was to be expected, and open criticism was heard from many quarters. We are now able to announce that the question of economically using the sulphur from said ore has been solved, and herewith present such information and data as will prove to the engineering fraternity the value of the work done and the importance of the results obtained.

The Problem.—The Sudbury pyrrhotite as shipped for smelting purposes averages about 15% to 20% sulphur, 1% to 3% nickel and .5% to 2% copper, the balance being made up of a corresponding percentage of iron and gangue. Realizing the impracticability of using such low-grade ore for the purposes set forth, the first step taken was in the direction of concentrating it. The pyrrhotite being easily distinguished by its pale color from the deep yellow chalcopyrite, the separation of the same from the copper ore and the gangue was readily accomplished in the rock house, at the crusher and on the sorting table; and in this separation we obtained two workable grades of ore, one high in copper and gangue and low in sulphur, designed for the ordinary matte smeltiug process, and the other, low in copper and gangue but high in sulphur and nickel, intended for the acid plant. This latter grade usually averages about 28% sulphur, 3% nickel, .5% copper and 50% iron.

The plan proposed for utilizing the sulphur in this ore was to roast the pyrrhotite in a closed furnace, with the recovery of the resulting sulphur dioxide, which, after having been cleaned and cooled, was to be used for the following purposes:

1. In the manufacture of a "bisulphite liquor," of a character suitable for, and to be used in, the sulphite pulp industry.

2. In the manufacture of liquid sulphurous anhydride, intended as a reserve supply for the sulphite mill in case of any stoppage or interruption at the roasting plant, or when the pulp mill would call for more or a stronger gas than that furnished by the roasters in operation; also intended as a separate commercial product to be disposed of for the purpose of refrigeration, ice making, sugar refining, bleaching, disinfecting, etc.

3. In the manufacture of sulphuric acid—50°B, 66°B and 98%—for the great market open to such an industry, covering an extensive field from fertilizers to gold miuiug, and including manufacturers of fertilizers and soda water, oil refiuers, dyers, furriers, cotton bleachers, brewers and galvanizers, and also for the rubber and hat trade, the woolen and wire mill, the nitro-glycerine and dynamite manufacturers.

The Roasting Plant.—The question of greatest importance at this stage, consequently, was to find a method or roasting system by means of which a clean and sufficiently strong gas could be obtained at smallest cost. Roasting experiments were carried out in a systematic manner in shaft and reverberatory furnaces, and the first conclusion reached was that the ore, in order to be successfully treated, must be crushed to a powder. At this time a roaster for treating pyrite fines was brought to public attention, and, receiving some encouragement from the designer as to the feasibility of this furnace accomplishing the desired aim (a dead roasting of the ore without any auxiliary heat), one of these roasters was erected at this place for trial purposes. In spite of every effort, and after a long series of tests, however, we found that this roaster, as constructed, would not answer our purpose—the roasting heat not being maintained by the combustiou of the sulphur in the ore, and the gas produced being too diluted. The many excellent points embodied in this type of roaster being fully appreciated, attempts were at first made simply to improve on the weak points as applied to our special problem, but gradually a somewhat different type was evolved, containing important changes, by which the problem was eventually solved. These modifications consist of (1) a minimizing of the heat of radiation, (2) the application to best advantage of the roasting heat geuerated, (3) the exclusion as far as possible of an excess of air over and above that required for the oxidation of the sulphur in the ore, and (4) the applicatiou of an auxiliary source of heat, iu case of need. The special features embodied in the new roaster are the following:

1. The combination of four single furnaces in one battery, disposed equidistant from a commou center.

2. A minimum distance between the floor and roof of arches of the roasting chambers, made possible by the construction of the arm aud the manner in which it is secured to the center shaft, it being secured in position by a horizontal motion and a quarter turn.

3. A round rabble arm, with a perfectly secure locking device having both ends closed so as to prevent any inflow of air from the center shaft to roastiug chamber, the air of combustion being admitted through special pipes, provided with valves for a perfect control of the same.

4. Separate muffle chambers for the applicatiou of an auxiliary heat, aud having no connection with the roasting cbambers, the one under the bottom hearth being a combustion chamber, and those under the second and top hearths being heating chambers, through which the combustibles of the extraneous fuel pass from the combustion chamber, and thus utillzed to advantage in heating the corresponding roasting floors.

5. A screw device for feeding the ore from the hopper to the roaster, the same being propelled by means of an eudless chain from the main driving shaft.

(To be continued.)

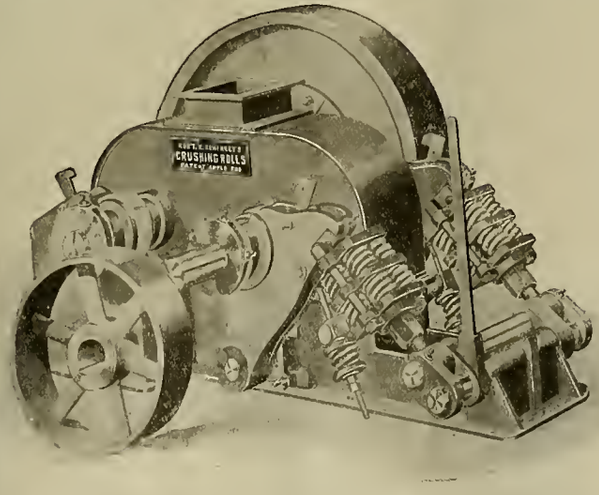
*Abstract Trans. Can. Min. Inst.

Temperature in Steam Pipes.

The measurement of temperature in steam pipes by a mercury steel pyrometer was described in a recent paper by R. K. Morcom, read before the Institution of Electrical Engineers, at Birmingham, England. The temperature is indicated by a pointer on a dial face, which has the appearance of a pressure gauge. The pointer is saturated by the expansion of mercury in a steel tube reacting on a spring. The instrument may be fixed in any position iu the engine room and connected by a fine steel tube containing any convenient medium to transmit the pressure to the spring. It is troublesome to calibrate, and requires frequent correction. A platinum wire pyrometer, he asserts, has frequently been broken by the rush of steam, and is too delicate for the testing plant of an engine works. The present arrangement comprises a thin, steel tube, screwed well into the steam pipe through a stuffing box, so that an asbestos packing may insulate it from the steam pipe. Oil is used in the tube instead of mercury, as it is found slightly more accurate. The author also referred to the method of inserting a thermometer into a cup screwed into the pipe, the end of the thermometer being immersed in a bath of mercury.

Crushing Rolls.

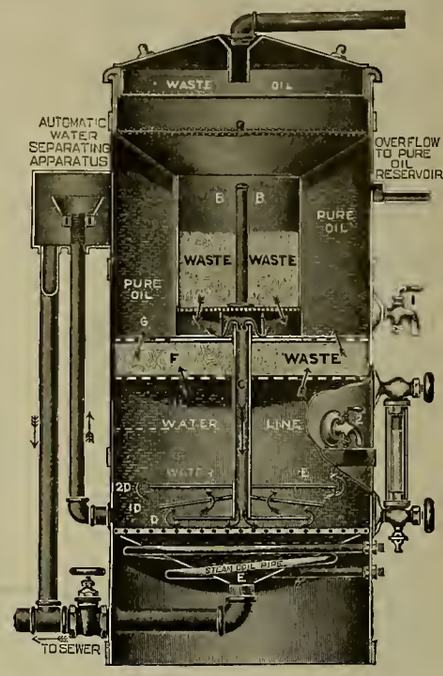
The accompanying illustration gives a good idea of the priucipal features of these rolls. There



are means for keeping the rolls in proper alignment, a lever to separate the rolls quickly in event of the machine becoming clogged, and straps and keys to hold the bearing caps. The caps are held in place on the main shaft by large yokes locked with steel keys, like battery keys, that the vibration of the machine may cause them to tighten instead of coming loose. The Colorado Iron Works Co., Denver, Colo., are manufacturing these rolls for Robert K. Humphrey of 1025 South Gaylord street, Denver, who is the inventor.

Saving Cylinder Oil.

The Burt Manufacturing Co. of Akron, O., make what they call their "Style B Oil Filter." As illustrated, the oil and water are poured in the top of the filter and then passes iuto chamber B, through the



layer of waste, to collect all the heavier impurities of the oil; from thence through the perforated bottom of chamber B, down in the direction shown by the arrows into tube C, thence to filter plate D, where the increased weight of the water has a tendency to keep the oil back in tube C. The pressure of oil in chamber B forces it down to spread over plate D, in a thin film, growing thinner as it travels from the center to the circumference of plate D, to expose the waste oil to the action of the water. It then flows upon plate D′ and D″, going through the same process in each case. Wheu the oil leaves the filter plate D″ it is in a finely divided state of separation, and mixed with water, whieh washes it out and from which it separates by gravity the impurities, which settle in chamber E to be removed by opening the gate valve at bottom of filter, which drains off the water and dirt. From plate D″ the oil again filters through the stratum of filtering material F, from there rises to the pure oil chamber and thence flows to the oil reservoir. The water is automatically separated after it passes down the tube C and reaches the bottom plate. The oil being lighter than water, as it reaches the bottom of the filter, it rises the surplus water passing into the tube which leads to the automatic water separating device.

The Production of Zinc.

The production of zinc ore in the Joplin district during the first quarter of 1904 was 65,500 tons, or at the rate of 262,000 tons per annum, which is a large increase over 1903. The production in the first quarter of 1903 was only 58,581 tons. The average price reported for the output in 1904 is $33.30, which is decidedly high, the average price of spelter at St. Louis having been only 4.673 cents in January, 4.717 cents in February and 4.841 cents in March.

The price for spelter has lately risen as was forecasted it would be likely to do, and, ore having failed to rise in the same proportion, the smelters gained a somewhat more comfortable margin, which, indeed, they were in need of. The increasing supply of ore, combined with an improved demand for the metal, has put them in this more satisfactory position. The miners are receiving so high a price for their product that they have no ground for complaint. An unusual feature at preseut in the Joplin ore market is the wide range in basis prices, ore being quoted at $34 to $37 ou 60% base, which means that inferior grades are purchased in proportion to $34 for ore containing 60% zinc; and superior grades in proportion to $37, this being due to very active competition for the fancy ore by certain smelters, who prefer that kind.

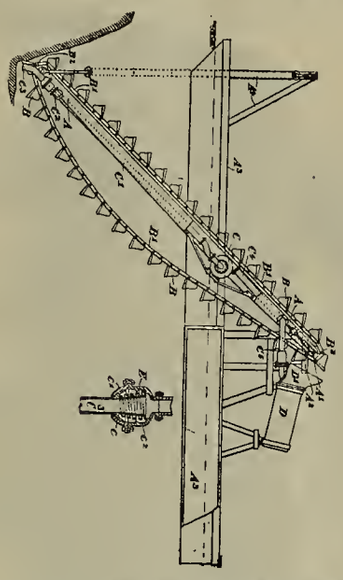
Should the Mountain Copper Co. determine to close down their works, the people of that vicinity would probably not be long in finding that there are worse things than sulphurous gas. This was illustrated last year at the time of the strike, when the works were closed for several weeks.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 17, 1904.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

COMBINED BUCKET AND SUCTION DREDGE.—No. 758,608; R. Andrew, Melbourne, Victoria, Australia.

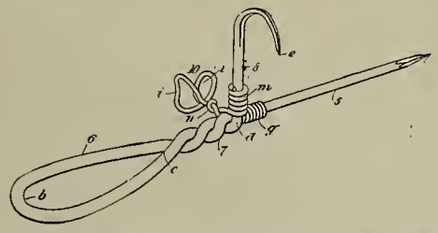


In combined bucket and suction dredge pump arranged between cheeks of ladder and having suction pipe which terminates in breeches pipe, ends of which lie at each end of and immediately behind lips of bucket.

FISHING TOOL FOR SUCKER RODS OR THE LIKE.—No. 759,454; O. A. Mann and W. J. Evans, Oil Center, Cal.

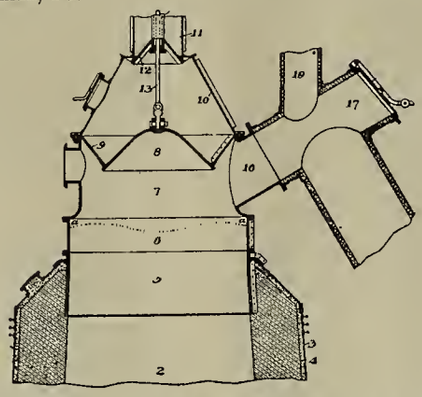
Device of class described comprisiug suitable body having central opening and hinged bifurcated clutch member normally resting on top of body and bridging central opening.

MINER'S CANDLESTICK.—No. 760,398; E. W. Packer, Mace, Idaho.



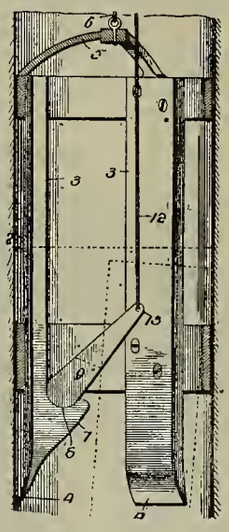
Candlestick formed of wire and comprising straight arm pointed at one end, wire being looped to form handle at opposite end, handle merging into twisted shank formed of same wire strand and from which extends hanger arm at right angle thereto and terminating at free end in hook, and clasp formed of bent wire so as to provide two curved loop members that are projected at one side of arm and looped handle, members having outer looped ends spaced apart and adapted to receive candle that is held at opposite side of straight arm and away from hanger arm and hook thereon.

BLAST FURNACE.—No. 759,991; G. K. Hamfeldt, Munhall, Pa.



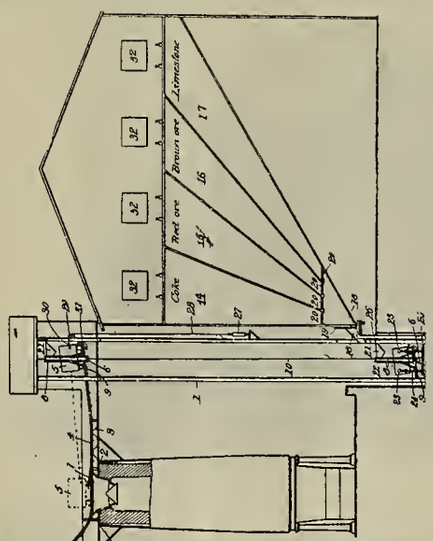
Blast furnace having annular metal shell with its lower portion within upper part of masonry stack, shell being extended above stack and having upper portion where dropping charge strikes it of smaller diameter than internal diameter of top of stack proper.

DEVICE FOR EXTRACTING RODS, ETC., FROM WELLS.—No. 760,219; J. Lisle, Sargent, Neb.



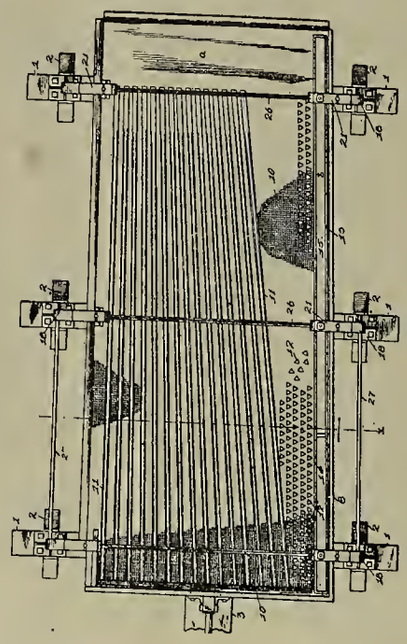
Device consisting of receptacle, catch pivotally supported therein, catch being thickest and narrowest at its pivoted end and broadest and thinnest at opposite edge, and having concave sharpened edge and projecting coruer and operating cord attached to corner.

PLANT FOR FEEDING METALLURGICAL FURNACES.—No. 760,189; A. P. Gaines, Bessemer, and E. R. Cox, Jr., Birmiugham. Ala.



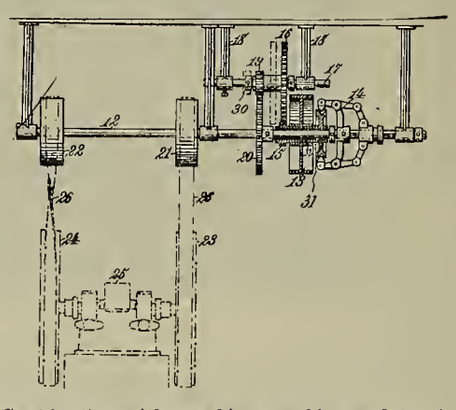
In plant for feeding materials to furnaces, combination with furnace, of vertical hoist, bridge connecting furnace with hoist, cage operating in hoist, car carried by cage and adapted to traverse bridge to furnace for discharging materials therein when cage is at upper landing, one or more bins provided with chutes arranged to deliver material into car while held stationary on cage at landing, and means for weighing loaded car at lower landing before hoisting.

COMBINED CONCENTRATING AND AMALGAMATING TABLE.—No. 760,213; J. Klein, Desloge, Mo.



Combined conceutrating aud amalgamating table, consisting of framework, flooring on same, covering for flooring, amalgamated wire gauze located on covering, series of ungraduated channels located on gauze, check blocks located on same, means for suspending table, means for giving table any degree of inclination and means for imparting motion to table.

APPARATUS FOR DRESSING CRUSHING ROLLS.—No. 759,931; T. L. Sturtevant, Quiucy, and T. J. Sturtevant, Wellesley, Mass.



Combination with crushing machine and turning tool device adapted for attachment to stationary part thereof iu position so that turning tool may engage crushing roll or tire, of power shaft from which crushing machine is driven, and which is so belted to pulleys of crushing rolls as to drive rolls in opposite directious with tops turning toward each other, and driving pulley loose on power shaft, clutch device by meaus of which pulley may be connected with shaft when crushing machine is to be run at crushing speed aud reducing gearing connectiug loose pulley with shaft when roll or tire is to be dressed by turning tool device.

STAMPING MILL.—No. 760,010; J. H. Montgomery, Denver, Colo.

In stamping mill annular mortar A, having wearing dies E, shaft H, journal boxes F, F, pulley G, and loose stamper J, having removable wearing shoes K, feed hole Y, and screen X.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

P. Early, H. H. Hunter and M. Kelly have put men to work to open their Washington & Alaska group, near Juneau.——J. B. Denny, of Juneau, is preparing to open up the Alaska-Reliance group at Sheep creek. Among the improvements planned is a crosscut tunnel.

H. C. Elliott of Chicago, Ill., president of the Hubbard-Elliott C. M. Dev. Co. of Valdez, Alaska, says he will resume operations on his company's copper mines in the Copper River country. He will take in men and an outfit, including two diamond drills, into the claims on Elliott creek.

ARIZONA.

Cochise County.

(Special Correspondence).—Paradise is a new copper camp being opened up. It is near the State line in Cochise county and 15 miles northwest of Rodeo, N. M., a station on the El Paso & Southwestern, 50 miles east of Douglas. The Chiricahua mountains surround the valley. Eight miles northwest of Rodeo the Paradise road enters the mountains by way of Cave creek and finally enters Turkey creek, on which the camp of Paradise is located. The country lies in parallel sections, including two mineralized zones. The Chiricahuas are mainly of granite and porphyry. Along this is a mineralized strip of lime and iron known as California district. At Paradise is the Galeyville silver mine. Galey built a small smelter and took out a pocket of silver, but the values changed to copper. The mine is being opened and the district is again being prospected. The most important developments at present are being made by the Chiricahua Dev. Co., whose property is 1½ mile northwest of Paradise. The company owns twenty-five claims and is composed of Michigan men. Superintendent J. H. Knowles says a 750-foot tunnel has been driven into the mountain, with a 100-foot winze and other exploratory work. Several buildings have been put up. Two 150 H. P. boilers are in place to supply power to a 150 H. P. and a 40 H. P. engine. A double drum hoist, 5 feet face, is on the ground, and a 20-drill compressor is at Rodeo. This machinery is expected to carry the three-compartment shaft, size 7x17, already down 75 feet, to depth of 2000 feet. It is proposed to sink 500 feet before starting crosscutting or other development work. Three sinking pumps, 300 gallons capacity each, and one station pump, 1000 gallons capacity from 1000 feet, will provide for handling water which may be struck. This machinery will be ready for operation by June 15th. Forty-five men are employed about the mine and fifteen more as woodchoppers. Water at present is pumped 1 mile from Jhu's canyon, over the divide, to a 15,000-gallon tank above the plant. The altitude is 6000 feet. There are two distinct ore zones on the property running at about right angles, and each averages 200 feet in width. The ore carries copper, with gold and silver values.

G. A. Walker and G. Myers own the Black Queen group of thirteen claims, near Paradise, on which there is a 50-foot shaft in copper ore. They also own the Leadville group of three claims, from which they have shipped twenty-nine carloads of ore averaging 40% lead and 10 ounces silver.

Six miles north of Paradise is Eagle City, in Chiricahua mining district, where three companies have holdings. Where Jhu's canyon and White Tail canyon intersect is the town of Copper City, which is near the proposed continuation of the railroad from Bowie to Rodeo. This townsite and surroundings to the extent of fifty-three claims have been sold to the Copper City Development Co. of Duluth, Minn. P. G. Carney of Copper City is part owner. They also own Horace mountain, east of the townsite, comprising sixteen claims.

——E. Sweeney and G. H. Crosby have bought seven claims south of the townsite, in the California district, for $75,000. Sweeney expects to begin development work next month.

Southeast of Eagle City, Morgan & Davis own twenty claims, with surface indications for copper ore. Over the divide, south of these claims, is Round valley, in which C. May has a group showing values in gold, silver and copper. Adjoining these is the property of the Savage G. & C. Co., in which J. A. Lewandowski of Douglas is interested.

In the same section H. Rowe and E. O. Gill own forty claims along Silver creek.

Paradise, May 21.

The Tombstone Con. C. Co. is keeping the usual number of men on the mines of the company and continuing development. The drainage of the lower levels is slowly being overcome. The pumping record maintains a daily average of 3,500,000 gallons. One proof that the water level of the district is being lowered is the fact that in the Emerald, 1½ miles from the pumping station, the men have sunk 65 feet below the original water level and are not bothered by the influx. A crosscut started at this depth in the Emerald last week is showing no water. The receding of the water has also been noticeable at the Silver Thread, a mile distant to the north from the central pumping station. At the 700-foot level in the main shaft the west drift is in 300 feet and the dike is being cut. The dike is 60 feet in width. The shipments of ore to El Paso, Tex., continue from the various levels of this shaft, the month of April showing an increase of five cars over the previous month. At the West Side preparations are being made to begin sinking and continue down as fast as drainage permits. The Silver Thread also furnishes its regular quota of ore, while in the Emerald men are crosscutting for the Emerald ledge. Shipments of 100 tons per day continue from the old dumps of the company.

Coconino County.

T. C. Woodworth of Denver, Colo., consulting engineer for the Anita C. Co., near Williams, says he will reopen the company's group and has put men to work removing the boilers, etc., from the old smelter building at Williams, same to be shipped to Anita and used in connection with the 6-drill compressor in sinking a double-compartment shaft.

Gila County.

J. F. Hechtman of Globe, president of the Globe M. Co., says plans for the hoisting plant and other machinery for the development of the company's Mineral Farm group are being considered.

The Tri-Bullion S. & D. Co., developing the Starlight group of mines, on the San Carlos strip, 8 miles from San Carlos, has driven the main working tunnel 900 feet and drifted 100 feet on an iron lead on which they are also sinking. Copper ore has been struck in a winze which is being sunk on another lead. The tunnel will have to be continued 375 feet farther, it is calculated, to cut the main lead, and at that point will gain vertical depth of 1200 feet. The shaft in this outcrop is 150 feet deep and the vein shows a width of 27 feet, says the Globe Silver Belt. Machinery is being put in, consisting of a boiler and air compressor, to operate drills. The Tri-Bullion is composed of Chicago, Ill., and Michigan men, with main office in Chicago, H. Pascal president. Development is under direction of J. C. Erman and forty-five men are on the payroll. This number will be increased.

Graham County.

The new Yavapai mine hoist, near Clifton, will lift double the capacity of the one displaced. This mine—a fraction—has for several years been sending up its average of eighty-five tons a day, the output of thirty men. Work on the 300-foot level calls for increased hoisting capacity. Yavapai ore is said to average 12% copper.

The Arizona G. M. Co. has been organized for taking over and developing eleven gold claims which have been under development by Clifton men. The claims are 6 miles above Clifton and near the Frisco river. The lodes carry gold and silver, which are being opened by tunnels driven in on the veins. On one of these claims a tunnel has been driven 200 feet showing the average width of the vein 2 feet. The ore averages $10 per ton. It is intended to drive the tunnel in 500 feet farther, when it will have a depth from surface of 450 feet. This work is being done on the Laura D lode. The company has a millsite on the river, but it is thought the plant will be placed at the mines, and the water pumped from the river, which would be cheaper than transporting the ore, besides which the tailings could be stored in the canyon. The officers of the company are E. M. Williams, W. Poland, J. R. Hampton, E. H. Franz, J. E. Holt, S. J. Forbes and A. G. Smith.

The Arizona C. Co. has started handling the tailings from its Longfellow plant, near Clifton. The tailings are stored in a series of bins and after they have become thoroughly dry they will be drawn from the bins and used for filling the stopes in the mines. This will relieve Chase creek from carrying the tailings from that plant. For some time the company has been disintegrating its slag by water, allowing it to find its way to the Frisco with the tailings from the plant. This system has been abandoned and the slag train again put into service. In addition to the slag the company is handling 400 tons of tailings daily by cars. The Shannon Co. also proposes to discontinue dumping tailings into the river. The tailings have been annoying to the farmers down the valley.

Maricopa County.

R. G. Williams of Denver, Colo., has bought the Ella mining claim in the San Domingo district, near the Ardath mine, said to contain deposits of vanadium ore. Assays show the ore to carry 4% of vanadium. There is a 100-foot shaft on the claim opening up a 4-foot lead of ore and about forty tons of selected ore are on the dump. The ore also carries values in wulfenite. Williams has also secured the Ramon Valencia copper mine in the Vulture section.

Mohave County.

E. B. Smith of Fremont, O., interested in the Swiss-American mines in San Francisco district, near the Leland and Vivian properties, near Acme, says the company will put in a gasoline hoist next month and start development work.

It is reported the Sun Cloud M. Co., operating south of Signal, has a bond on the gold mines of C. E. Price and will put men to work on them. The mines are below Signal. R. Wheeler is superintendent.

C. Baylor, of the Sorpresa M. Co., says he will begin construction of a mill at the mines of the company south of Kingman. Men will be put to work on the mines to get them in condition for outputting a large tonnage of ore. The mines of the company are north of the Bi-Metal, the Maguire vein, and are in the gold belt.

The Minnesota-Connor mill, near Acme, has been running for several weeks past on dump ores and making a good grade of concentrates, says the Kingman Miner. The inner part of the dump has been found too low grade to handle and hereafter the mill will be run entirely on ores from the mine. Another level will be opened up.

Pinal County.

(Special Correspondence).—The Lake Superior & Arizona Co. has put up an oil storage tank near the Florence depot.——Men are at work at the Fortuna mine, near Silver King. The tunnel is in 700 feet. As soon as the main ore body is reached the number will be increased.

H. Shaw and L. Citidini are putting in a crushing plant near the Ray mine. They will concentrate the ore not rich enough to ship as it comes from the mines.

G. Sarrick is working a copper claim near Kelvin.——Men are at work on the McSherry group, west of Kelvin.

Kelvin, May 16.

Yavapai County.

Men in the Lynx creek end of the Poland tunnel, near Poland, broke through the partition between them and the Poland end and a rush of air came through, showing the tunnel, 8071 feet long, completed. In addition to development of mineral veins, this tunnel will be an advantage to mining districts on the Lynx creek side of the divide in affording direct transportation facilities. A double-track electric railway will be operated through the tunnel to connect with the railroad on the Poland side. The work has been done by the Poland M. Co., of which F. M. Murphy is president and W. J. Martin superintendent.

W. A. Clark of Fool's Gulch, near Prescott, in charge of the Planet Saturn group of mines, says this property, which has been idle for several years, will be started up again.

Yuma County.

The Papago M. Co. has struck water at a depth of 232 feet in its well. It is the only water supply within several miles of the property. The group consists of ten mining claims in Agua Dulce mining district, 40 miles southeast of Texas Hill, a station on the S. P. railroad. The ore from these mines is largely free milling gold, and shows average assay of $100. Three shafts, with crosscuts and open cuts, have been sunk to the depths, respectively, of 60, 132 and 150 feet.

CALIFORNIA.

Amador County.

At the Argonaut mine, at Jackson, the old dump is being refilled with ore. The mill will not be started until development work has been carried to an extent that will insure its running indefinitely when once set in motion.——At the Madrone mine, near Volcano, ore is being taken out.

T. Mayon, who is working the Clark gravel claim, is arranging to run an 800-foot tunnel, near Oleta, to tap the gravel channel at a more convenient point.

Butte County.

A large number of men interested in dredger mining at Oroville met last week and formed an organization for the mutual protection of those interested in this industry and the discussion of matters of interest and benefit. Organization was effected by election of J. J. Hamlyn, superintendent of the Feather River Exploration Co., as president, A. E. Boynton secretary and H. E. Vail treasurer. The following executive committee was appointed: Hohl, Hamlyn, Mayhew, Junes Leggett, Brownell and Boynton. Col. Heuer of the U. S. Debris Commissioners and C. G. Yale of the U. S. Geological Survey were also present.

Calaveras County.

The Mayflower mine, near Murphys, will be unwatered by Carson and Klapp and development work resumed.——The Red Gold mine is shut down temporarily. Superintendent Stone expects work resumed next month.——W. F. Grider has taken charge of the Sugar Pine mine west of Carley's ranch and has put men to work. He expects to have the mill running next month.

Developments in the Chris Anderson mine, near San Andreas, operated by the San Andreas Gold Channel M. Co., continues. Though the east and west drifts from the bottom of the shaft have opened up 80 feet of gravel, neither rim has yet been found, says the Prospect. In the east drift the bedrock has pitched downward into a high-grade gravel. W. H. Miller, president of the company, is preparing to put in machinery for working the mine. A mill will probably be built for crushing the gravel and a permanent hoist put up. The shaft will be enlarged. Other property adjoining the Chris Anderson will be opened, one or more claims having been bonded.

Work has been started at the Duchess mine, near Vallecito, twelve men being on the payroll.

The T. M. Lane interest in the Alta mine, near Knights Ferry, southwest of Angels, has been sold to Manager Wright, who will continue to operate the mine as heretofore.

The Central Hill section, near San Andreas, will resume the output of placer gold. Two gravel mills are going up—five stamps on the Lloyd and ten on the Reed mine. The Spauolla mine, also in Central Hill district, has been bonded to W. T. Robinson and C. H. Clolp. Eight men are at work sinking a two-compartment shaft to cut the channel. The adjoining property on the north and the Cassinelli claim on the south have been shown to contain payable gravel.

C. W. Higgins, of Mokelumne Hill, has a bond on the Ready Bullion and Riverside mines, on the south fork of the Mokolumne river, 4 miles from Railroad Flat. Considerable development work has been done. There is a shaft down on the Riverside, 40 feet from which ore has been taken and worked by arrastra. At the Ready Bullion there is a shaft down 30 feet, which shows in the bottom a ledge 2 feet in width. The ore carries free gold, with sulphurets. Both of the properties are said to be favorably situated as regards power, timber facilities, etc.

Del Norte County.

Machinery is on the ground for the Monumental M. Co. mines, 40 miles from Crescent City, near Grant's Pass road. These mines are owned by T. W. M. Draper et al., and are said to carry gold in paying quantity. The company proposes to put in machinery for operating the mine, and will have 200 men at work by Aug. 1st.

Inyo County.

A new mining camp is being opened up at Cactus Flat, east of Haiwai. The Ella B., under bond to D. McLeod, measures 4 feet between walls, and is said to carry an average assay value of $14 in gold. The Forgot is an extension of the Ella B., and is owned by F. Elder, E. Walker and P. Giraud. The ledge shows from 1 foot to 4 feet in width, carrying $24 value. The principal interests in camp are owned by T. Boland, F. Elder and R. Lockett. This comprises nine claims and four mill sites. This group is bonded to D. McLeod. Work is being done on the White Star. There are forty claims owned by different persons. The facilities, with the exception of water, are reported good. Wood is plentiful and the ground easy to work. Water costs $1.50 a barrel, delivered at the mines from Haiwai Meadows. The main formations are granite and schist. The ledges run parallel, and nearly all pitch south at an angle of about 45°. The walls are sharply defined, and the ore free milling. The distance is 8 miles from Haiwai, to which point a natural roadway exists. From the camp to Olancha is 15 miles.

Kern County.

Bakersfield reports say a surveying party is at work between Sunset and the Pacific ocean laying out a route for a pipe line which will transport oil from the West Side districts to Port Harford or Ventura. H. W. McCray is at the head of the party. The company owns oil territory on the west side of Kern county, and heretofore there has been little or no transportation facilities. It has also been reported that A. Spreckels and the Crocker-Woolworth Bank people of San Francisco, who have large holdings in

that section, are planning a pipe line from Sunset to the coast. The distance from Midway to Port Harford is about 70 miles.

Mono County.

Superintendent Hoover of the Standard Con. M. Co. at Bodie says the company will make extensive improvements in its power plant at Green creek.——J. S. Cain has overhauled his custom mill at the South End. The ore from the Kennedy-Green lease at the Snowdrift mine will he put through.

Nevada County.

On Kentucky Ridge, near Grass Valley, Manager Kane of the Niagara mine, says he will resume operations next week. The surface plant is complete and he will drift on the vein in two directions and take out ore to test in the mill.

The "Elsie A" G. & S. M. Co. has been incorporated at Nevada City hy L. L. Myers, G. Bonney, B. S. Rector, A. Hongell, G. A. Hurst, H. Lane and J. M. Hadley, to open up and develop the Bonney & Hurst claim.

Plumas County.

The A. Cameron mine on the North Fork of Feather river, near Quincy, has been sold to W. D. Huntington, E. L. Dow and R. B. Mott of Oakland, who will start work next month. There is said to he timher on the property, also a water right.

San Bernardino County.

E. J. Delano of Los Angeles has a hond on the Bidwell group at Gold mountain in the Clark range, 25 miles north of Manvel. The property consists of the Colliseum No. 1 and 2. It is a low-grade proposition, said to average $4 per ton.

Shasta County.

The Clover Creek Quicksilver M. Co. has bought the quicksilver mines on Clover creek ahove Millville. H. S. Wilson, superintendent, says he is surveying a site for the plant, which will extract the quicksilver from the cinnabar. An experimental plant of fifteen tons capacity will be built first, and in the fall a plant which will handle 100 tons per day will he huilt. The mines are a mile from the Clover Creek falls and the reduction plant will be huilt on Clover creek helow the falls. A plant will be put in to generate electricity for power purposes in the mining and in the reduction plant.

Sierra County.

(Special Correspondence). — Several large nuggets have heen taken from the White Bear mine, near Downieville, this month, and the hest specimens will be sent to the St. Louis Exposition. One of the nuggets weighs thirty-three ounces. The mine is owned hy A. W. Lewis, W. J. Belcher and A. S. MacDonald.

Downieville, May 25.

A company has heen formed hy Downieville men for the building of an electric railroad from Marysville to Downieville. G. F. Taylor et al. are interested and have hegun the preliminary survey. The general course of the road will he along the North Yuha river from Downieville to near Bullard's Bar, thence out the main public highway, heading to Marysville. via Challenge Mills. This road will open up timber land, composed chiefly of sugar pine, also mineral land. The company has secured water rights which will furnish electric power for running the road, working mines, etc.

Siskiyou County.

J. Johnston of the Headwaters mine, Humbug creek, near Hawkinsville, is increasing work and will he ready for crushing ore in his mill next week. He will put in machinery for a sawmill, so that lumher for mining purposes can he made on the ground, where timher is abundant.

T. J. Nolton has hought the Pareira placer mine, ahove Hawkinsville, 2 miles north of Yreka, and also has an option on the Greenhorn ditch.

Trinity County.

Weaverville reports say J. Linderherg of Nome, Alaska, will prospect the gravel channel between Weaverville and Trinity Center. The channel is deep and is considered a good drifting proposition.

Tuolumne County.

The Calico M. & M. Co. has heen incorporated in Stockton hy A. Thompson of San Francisco, E. M. Crandall, J. J. Morris and R. A. Keller, to operate in Tuolumne county.

At the McAlpine mine, S. E. Rigg, superintendent, near Groveland, fifteen men are at work. Drifting is in progress and sinking will be resumed. The main shaft is down 300 feet. A heavier hoist will he put in.——W. Vincent is unwatering the Hull mine and operations will he resumed.

W. S. O'Brien says he has interested San Francisco men in his mining claims on the main Tuolumne river, near Groveland. Work has heen started on the Victor mine, one of the group, and a mill will he huilt. W. H. Scott is foreman and W. S. O'Brien, superintendent.

The Golden Harvest M. Co. of Los Angeles is starting up operations on a group of claims near Groveland, with J. C. Henderson as superintendent.

A drift is heing run east on the 400-foot level of the Golden West mine, near Sonora, to tap the hanging wall vein, says Superintendent McPherson. Operations heretofore have heen confined to work on vein matter lying in the slate on the footwall. The hanging wall vein follows the granite. The mill is being repaired and will he started up by June 25.

COLORADO.

Boulder County.

F. Mitchell, superintendent of the Nancy G. M. & T. Co., owning mines at Wallstreet, says on the Nancy development work is progressing. The 16-drill air compressor has been started up and the mill is ready. The mill has been converted from the chlorination to the cyanide process. It has a capacity of 100 tons daily. The crosscut tunnel is in 1600 feet. Five drills are running and more will he added. The mine and mill are lighted hy electricity. The mill is ahout 1300 feet from the tunnel and a tram will he huilt.

The Magnolia M. & R. Co. at Magnolia is overhauling its mill and will change to straight cyaniding. They are installing a cooling process, adding more tanks, and expect to treat 100 tons per day. W. H. Davis is superintendent.

Chaffee County.

(Special Corrospondence).—Mining operations in Monarch district of Chaffee county are increasing. Regular shipments are heing made from the Madonna, Lillie and Farrell mines. Others will resume as soon as the snow has sufficiently disappeared to admit of ore-hauling to the railroad.

Rock running well in gold and silver is being brought in from the mountains hetween Maysville and Cochetopa. This is a comparatively new country.——A body of gold ore has heen struck in the 400-foot level of the Gold Bug mine, in Turret district.

Manager Cavanaugh will resume development work on the Duke group, near Alder, on June 1st. A tunnel will be run to tap the hottom of the 179-foot shaft.

The Uncle Sam M. Co., of Peoria, Ill., is preparing for development on its mines in Larson hasin. —— Several companies will operate this season in the Chalk Creek district, near the Mary Murphy mine.

Salida, May 22.

F. Aude, superintendent of the Banker mine, 1½ mile above Winfield, in the Clear Creek mining district, says the Banker is a crosscut tunnel belonging to the Banker M. & T. Co. of Philadelphia, A. H. Stahler of Philadelphia being manager. The intention of the company is to drive a tunnel into the main range 4000 feet.

Clear Creek County.

The Stevens mill, near Silver Plume, which was closed down owing to scarcity of water, is again in motion. The new boiler is again in place. Manager F. Oliver says there is an ahundance of water to run the jigs and for other purposes.

The tramway huilt from the upper Mendota workings, near Silver Plume, to the railroad is in running order. Two ore huckets are used, each holding one ton, the loaded bucket in descending pulling up the empty one. Last week this company shipped two carloads each day, hut Superintendent M. Kester says 100 tons can be handled in a day (five carloads). The ores are heing shipped to the Idaho Springs mills for treatment.

Three carloads of high-grade ore were shipped from the Terrihle mine, near Silver Plume, last week, and four carloads of zinc ore. There is plenty of water in the stream to run the mill two shifts steadily. The number of men is heing increased and they have seven machine drills in operation, with more to he added. The work of retimhering and unwatering the main shaft will he started this week. Seventy men are on the payroll.

During month of April 1600 tons of milling and 140 tons of smelting ore were shipped from the Sun and Moon mine at Idaho Springs.

J. Morton of Chicago, Ill., principal owner of the Jo Reynolds group, up Silver creek, near Georgetown, has hought the Blue Ridge mill and millsite. It is the intention of the Jo Reynolds management to huild a tramway to the mill. The mill will be overhauled.

Gilpin County.

Work is heing resumed in the Lutz mine, near Russell Gulch, under management of G. K. Kimhall, Jr., of the Old Town mine. The Lutz is owned hy Dakota and Iowa parties and has heen idle for several years. Its ores are mostly pyritic. The main shaft is down 400 feet and the machinery and huildings, as well as the main shaft, will need overhauling before developments can be started.

It is reported Central City men will start up the Comstock mine on East Second High street. It is owned hy J. A. Thatcher, of Denver, and the shaft is reported to he 300 feet deep. It has heen idle for twenty-five years.

The Little Lallie M. Co. has heen incorporated, with W. E. Garver and C. A. Bell of Lawson, G. B. Wilkinson of Apex, and J. U. Garver, and P. C. Redfield of Chicago, Ill., as incorporators. The company will operate in Silver Creek district, near Central City, and in Lawson in Clear Creek county. They have a lease and bond on the Murray mine at Lawson. The property is equipped with a steam plant, to which will he added a sinking pump for handling the water. The main shaft is down 265 feet, and the company expects to get into payahle ore by drifting east. The company owns the General Funston group of three lode and one placer claims in Silver Creek district, on which they will start operations. W. E. Garver is manager.

The Gold Dirt mining property, hetween Perigo and Gilpin, which has heen worked under lease and hond hy Pittshurg, Pa., men, was sold last week for $120,000 to J. R. Anderson of Denver. No stoping operations have heen attempted, but in carrying on the dead work several hundred tons of good grade of milling and smelting ore havo heen extracted. This ore will be shipped to the smelters as soon as the Moffat road starts to receive ore for shipment. The owner proposes building a 50-ton reduction plant, which will later he increased to 100 tons. W. H. Knowles is manager.

Gunnison County.

C. T. Stills, owner of the Maple Leaf mine at Stillsville, says preparations are heing made to work the group. A plant of machinery, shaft houses and a 100-ton capacity mill will he part of the equipment.

G. Brant of Kansas City, Mo., manager of the Golden Islet mine at Pitkin, has hought the Chicago and Climax patented claims in the gold helt. They cover 3000 feet of the Islet vein on the north. Men have heen put to work on the ground crosscutting the vein and have struck ore. ——C. M. Carter of the Carter T. Co. has hought the Volunteer mine in the gold helt. The property has a producing record down to a vertical depth of 300 feet. Carter will unwater and re-timher the shaft, then sink on the vein. The Chloride and Volunteer are on the same vein.

Hinsdale County.

The Hidden Treasuro mine, near Lake City, operated hy L. Kafka, is shipping ore. Superintendent P. C. McCarthy has thirty men employed at the mine and mill.——W. F. Hood will develop his Lucrative group in Cinnamon hasin.——The Senator and Minnie Oppa are new locations, in Burrows Park, recorded hy G. H. Zacharias and J. W. Vickers.

Jefferson County.

It is reported J. Boyd et al. have secured control of the Carpenter smelter at Golden, agreements having heen fully ratified with the owners, and the smelter will start July 1.

Lake County.

The rehuilding of the Rex mine's shaft house, near Leadville, will he started next week hy the Keystone M. Co. of Pittshurg, Pa. The shaft houso was hurned last month. C. N. Priddy, one of the owners, states that the company will prepare to continue developing the mine. It is expected the work will be completed this autumn.

The Resurrection mill at Leadville has resumed. The mill will handle from 100 to 150 tons of ore a day. It is stated work will he continued in the Fortune mine this summer. The Fortune is northeast of the Resurrection and has heen operated hy J. McNeece, owner, and hy T. Raney, who had a lease on part of the workings. Raney's lease has expired and the entire mine will continue under control of the owner.

Las Animas County.

(Special Correspondence). — The military authorities in charge in the coal fields at Trinidad have issued an order that all striking miners must register and have their description written for future reference. Somo of the men refused to register and ahout eighty were deported. The men arrested and deported are mostly Italians.——The Western Federation has issued a statement regarding their view of the strike situation. This statement goes more into stating what should he done with the Governor and militia than as to the exact condition of affairs.

During the past week the property of the Denver, Lakewood & Gold Railroad was sold at Sheriff's sale. This road has heen operating between Golden and Denver. It is understood the new management will extond the system heyond Golden to Idaho Springs and other mining towns beyond and eventually make it a transcontinental line. S. Newhouse, of Salt Lake City, Utah, is interested.

During the past few weeks considerahle rain and snow have fallen in the mountains which has filled the streams and it is thought there will he plenty of water for all purposes during the summer.

Denver, May 23.

Mineral County.

(Special Correspondence).—The strike on at Creede over some slight disagreement is expected soon to be adjusted. Ahout the same amount of ore is coming out—one trainload every other day of standard-gauge cars.

Creede, May 22.

The ore production for Creede district during the month of April was 15,000 tons, 8000 of which were concentrated hy the Humphries and Solomon mills. The mines on the Bachelor vein continue to produce 90% of the production of the district, says the Times, the principal producers heing the New York and Del Monte, which are shipping 100 tons per day direct to the smelters.

Ouray County.

With the early melting of the snow, mines along Bear creek, near Ouray, are resuming. The Union, across the creek from the Grizzly Bear, has resumed. It is under bond and lease to T. J. York & Co., and a contract has heen let to drive a 50-foot extension of the lower tunnel to cut the vein. High-grade gold-silver has been produced by the Union.

Superintendent W. R. Kramer of the Governor mine on Mount Sneffels, near Ouray, says preparations are heing made to build a mill. A 10-stamp mill was originally contemplated. The mill site has been obtained a short distance down the gulch from the lower tunnel and in a secure place. Water for milling purposes will be piped from the main tunnel. The boiler and compressor that were put out of commission hy a snowslide will he placed in service and in such position as to make the plant safe against slides. The development work on the mine consists of two tunnels. Tho upper tunnel in the gold lead is in 600 feet. A crosscut on the upper working 50 feet from the gold vein cut the silver lead. The Governor mine is owned by Kramer & Heibler of Ouray and the Zangs of Denver.

Pueblo County.

The Ohio-Colorado S. & R. Co., owner of the smelter at Salida and of the Rocky Mountain smelter at Leadville, is planning to huild a plant at Pueblo, says the Colorado Chieftain. The management considered it would not he expedient to add to its other plants, as the problem of fuel and transportation of ores would not he solved hy centering the company operations at these points. Much of the husiness offered to the company could not be sent to Leadville or Salida and profitably handled. It is expected work on tho huildings will he started next month, and that the plant will he completed during the coming summer or autumn.

Sagnache County.

(Special Correspondence). — Bonanza camp is showing improvement on development and also in the mills. The Steele Creek Co. is going ahead with development.——Crestone camp is quiet. The 100-stamp mill is idle, hut the company is pushing development, hlocking out ore and doing considerahle dead work. Duncan camp is also quiet.

Ford creek, ahove Saguache, is showing high-grade gold and silver ore. Little development is heing done. The mine on Sierra Blanco, owned hy Winchel et al., situated at an altitude of 14,000 feet, is being worked steadily and ore shipments have hegun. Most of it is moved hy hurros, seventeen of them heing kept husy packing. A good part of the year there is considerahle snow there.

It is reported H. Barnsdale has hought the A. E. Reynolds interests at Summitville. The working force will he increased.

Saguache, May 22.

San Miguel County.

The Smuggler-Union M. Co. has put men to work on the Contention group, in Bear creek, 2 miles from Telluride and 1 mile from the Nellie and Ella mines. Before development was stopped on this group one year ago, it is reported, a hody of gold-hearing quartz was cut, and the men will develop this ore. A wire-rope tramway 2 miles in length was huilt from the group to the Smuggler mills at Pandora. The tram was later struck hy snowslides in two or three places and wrecked for a part of its length.

For several weeks past that portion of the Bear Creek mill, near Telluride, treating Nellie ore, has heen running only one shift, hut last week another crew was put on. Ten stamps are dropping, but with an increased output from the mine the milling capacity will he increased until forty are dropped. During the winter the Nellie and Ella mines have undergone

extonsive development. The ore is free milling.

Governor Peabody has declared martial law at Telluride at an end. While there is no change in the striko conditions as far as the members of the Western Federation of Miners is concerned, it is claimed by the operators that the mines of the district are working the same as when conditions were normal.

Teller County.

The Portland G. M. Co. at Cripple Creek has bought the Yule Tide, Pennant and Hatchet claims. The Portland property is producing 300 tons of ore daily and has on its payroll 550 men. President Burns of the Portland & Midget Co. says he will resume operations on the Midget claim Juno 1.

The Cripple Creek Times says last week nearly every mine in the camp was more or less affected from the surface seepage water caused by the heavy snow storm. In some of the mines the water rose 300 feet in the shafts, and the lower workings flooded. Some of the Bull, Ironclad and Tenderfoot hill mines had to shut down.——H. M. Gilbert has started work on the Hoosier mine on Tondorfoot. This property has been closed on account of the water.— Dugan & Bradley, working on the north end of the Gold Sovereign, have been hailing out water with a 200-gallon valve bucket.

A washing machine has been set up on the Abe Lincoln mine at Poverty gulch, near Cripple Creek, and the ore hoisted from the mine will be thoroughly washed before it goes to the sorter's table. The washing machine has a capacity of 200 tons of ore a day. The company is outputting between 1200 and 1500 tons of ore per month that will run 1½ ounce gold per ton.

The Homestake M. & M. Co., operating on Ironclad hill, Cripple Creek, which is arranging for a 1000-ton cyanide mill, is receiving its machinery. In the consignment under way are five rolls weighing 36,000 pounds each.

A contract has been made by the Stratton's Independence, Ltd., to Merryfield, Martin & Camphell, to treat and remove the dump of its Battle mountain mine. The lessees, who have been operating the dump for some time in a limited way, will contract to remove the pile of rock which is estimated to contain 1,000,000 tons, besides the amount which is dumped over the pile every day, making it another 500 tons daily. The lessees will put in a steam shovel, washing machines, sorting tables, etc., and after treating will dump the waste 200 yards away in the Midway lagoon, carrying it there by ore cars.

The Victor mine on Bull hill, Cripple Creek, owned by D. H. Moffat of Denver, will resume work on company account. The shaft will be sunk to additional depth, it being below the 1000-foot point.

Cripple Creek reports of the 22nd inst. say the drainage tunnel is lowering the water in the vicinity of the Elkton Co. at rate of 3 inches per day, and as the water is standing at a point 8 feet above the eighth level, it will take thirty-two days before it will be able to resume operations in that level without the use of a pump. The water standing in the shaft is extremely foul and the air is so bad that a man could not work in it. It is expected air from the compressor will be run down there. Even if the water were out of the level before the middle of June it is not expected work would be started in this level, as the company will not have completed reconstructing the ore house and installing the washing machine and sampling plant. With the sampling plant in operation the management will know each day the profit of the mine and how they stand. There is considerable ore broken in the eighth level. About 1000 tons of ore were broken there ready for hoisting when the heavy flow of water was struck.——D. Latimer of Victor has a lease on a block of the Rose Maud mine, and will operate through the Morning Glory shaft. The lessee will drive a crosscut and expects to cut the contact.

IDAHO.

Ada County.

The plant of the Highland Power Co. on the Boise river, 20 miles above Boise City, was washed away on the 23d inst. The loss is about $150,000. The river had been dammed with a crib and the power house built upon the river bank 60 feet below the dam. This plant was used for pumping water for placer mining.

Blaine County.

The Lava Creek M. Co. of Salt Lake City, Utah, has been incorporated with S. B. Smeltzer, W. A. Langford and L. W. Smeltzer as officers. The company's property is in the Lava creek mining district.

Five feet of ore has been opened in the properties of the Lipman M. & T. Co. at Hailey, says M. H. Lipman of Salt Lake City, Utah, manager. At depth of 100 feet in the shaft the find was made. He will not begin crosscutting until a level is established at 150 feet. Assays show thirty-six ounces silver and from $1 to $8 gold per ton, the metals occurring in a quartz gangue.——At the Red Elephant mine, operated under an option by Salt Lake City parties, Superintendent Page is taking out second-class ore from the 100 and 200-foot levels, while in the Crœsus 2 feet of galena, running high in silver, was cut at a depth of 700 feet in the shaft. Operations will be resumed at the Mayflower mine, owned by J. V. Farwell of Chicago, Ill., next month, while the mill at J. Q. Packard's Tipton will go into commission next week. The Minnie Moore continues to maintain its output, with 11 feet of galena showing underground.

Boise County.

A. M. Hager, superintendent of the Old Abe M. Co., has put men to work on the South Africa ledge, a mile north of Idaho City. There is a hoist on the ground.

Idaho County.

The Golden Crown mill at Newsome is in operation.——Mining and crushing ore at the Hogan mill at Oro Grande is in progress.——S. B. Baxter and L. Ewing are putting an arrastra on their Blind Pig claim on Relief creek, 8 miles from Elk City. It will have a capacity of one and one-half tons of ore daily. The motive power will be water and the wheel is so constructed that a second bed can be added later. The Blind Pig vein is opened up on two claims and much good ore is exposed. In the face of a 70-foot tunnel the ledge is 9 feet wide and is said to average $20 per ton. The tailings will be saved for future treatment.

Shoshone County.

Finch & Camphell, of Spokane, Wash., have bought the Granite mine, near Wallace, for $35,000. It is intended to increase the size of the plant and continue development work. Lessees have been working the property, and lead ores have been opened and shipped to the smelters.

Mining operations are reported improving on Nine Mile creek, near Wallace. Work is being resumed on the Granite mine under J. P. Keane, one of the principal owners. Formerly shipments were made by hauling the ore to the railroad at a point 1½ mile above Wallace in Canyon creek. Then it was loaded on the narrow gauge and shipped to the smelter by way of the lake. Later a concentrator was built at Granite station, near Gem, and the ore transported from the mine to the mill by a bucket tramway. The production of ore from the Granite was exclusively from the upper works, but meantime a tunnel was run at creek level to get under the ore body. This was accomplished when the shut down came about ten years ago. The mine is owned by J. P. Keane, J. Porteous, W. S. Norman and M. McAuley. The lower tunnel cut milling ore. As soon as air pipe is placed in the tunnel drifting on this ore will begin and a raise will be made to the upper works. This raise will be 418 feet in length. It is reported arrangements have been made to treat the Granite ore in the Sixteen-to-One mill.

Last month the California mine, on Nine Mile, shipped 230 tons of concentrates and is making a regular output of 200 tons a month. This property is operated under J. P. Keane. Twenty-five men are on the payroll.

O. Guay, part owner of the Hypotheek mine, near Kingston, says work is progressing. Bad air in the tunnel has made it necessary to put in a blower to be run by a small steam engine. The blower and engine are being set up.

KANSAS.

Cherokee County.

The Sunny Side mine at Baxter Springs has its crusher plant ready for work and will begin cleaning ore this week.——W. L. Carter and L. Ryan of Galena report mines south of Baxter improving.——Ford & Troupe at the Mission mine are running double shifts and are hoisting rich dirt to treat in the concentrating plant which is nearing completion.——D. B. Perkins of Joplin, Mo., says the shaft on his lease is 100 feet deep, and it is expected the ore penetrated by the drill will be opened up next week.

MICHIGAN.

Houghton County.

The annual report of the Isle Royale C. Co. for 1903, operating near Houghton, shows 3,134,601 pounds of refined copper produced. Receipts from copper sales averaged 13.12 cents per pound, or a total of $411,314. Expenses were:

		Cents Per Pound Copper Produced.
Mine expenses	$307,437	9.81
Smelting, freight, etc.	56,618	1.81
Exploration	7,259	0.23
Total	$371,314	11.85

Compared with 1902, the following figures are given by the report:

	1902.	1903.
Rock stamped, tons	203,672	199,493
Mineral saved, lb	5,219,305	4,408,615
Refined copper, lb	3,569,748	3,134,601
Fine copper in mineral, %	68.37	71.10
Fine copper per ton of rock stamped, lb	13 80	15 70
Cost of mining, per ton	$1 2556	$1.2516
Cost of stamping, per ton	0.2641	0.2884
Total costs	$1 5200	$1.5400

MISSOURI.

Jasper County.

At Webb City the Gussie K mine has its new shaft down into the ore and has begun mining the dirt. This is a different shoot of ore than the old workings and was driven over the line from the Stevison & Moore lease. R. and H. Gale et al. have leased the Mt. Ararat mine and are going into the old workings.——The Stevison & Moore mill, south of the Gussie K mine, started up last week and concentrates are ready for market. Stevison put down several drill holes near the mill and reports ore in all the holes. The company began sinking a shaft and moving the mill from its old location at same time. A second shaft is down into ore and shows 18 feet of pay dirt.——A lead prospect has been struck by a drill on the Center creek land.

The Stepp mill on the Guinn land, near Carterville, started up last week. This mine was formerly the Barrister.——The Oronogo mills have all been shut down on account of water flooding the ground from the heavy rains.——J. Wright & Co. have bought the Republic mill on the Plutocrat lease and will remove the mill to the Wright M. Co.'s six lots on the Missouri zinc fields ground where they have opened out a fine prospect.——A. M. Kennedy has started building a $10,000 mill on the Burgner land for a Cincinnati company.

At Galena, Gay & Co., on the Battlefield mine, made a turn-in of thirty-five tons of jack last week. A face of jack is being opened up at 110 feet. It is 40 feet wide and 100 feet long.——The Pittsburg M. Co. on the Windsor ground is preparing to mine on a larger scale, says Manager Matthews. The crusher is running and two shafts are producing. Two more shafts are being sunk. The pumps are handling the water. Three tramways will be built from the shafts to the crusher. The turn-in last week was seventeen tons of free ore and 10,000 pounds of lead.

MONTANA.

Beaverhead County.

By June 1 the Washoe copper smelter of the Amalgamated C. Co. at Anaconda will have an arsenic refinery in operation. The plant is said to be patterned after the German models, and is intended to save the arsenic, antimony and sulphur expelled through the stacks of the company's plants.

Fergus County.

There are four diamond drill outfits in Fergus county, three of which are being operated, says the Lewistown Argus. The Gold Reef Co. of Gilt Edge has two in operation and the Kendall at Kendall keeps one continually at work.

The Fergus M. C. has been incorporated at Great Falls by F. Longstaff, O. H. Perry, E. L. Williams, A. R. Mettler and O. F. Wadsworth of Great Falls and W. Ellis and J. E. Ferguson of Helena. The company has bought property on Sage creek, in the Belt mountains, and they are going to develop the claims during the summer.

Flathead County.

J. Ford of Libby, manager of the Illinois G. M. & M. Co., reports ore being opened up. The company has two claims, the Irish Boy and the Rambler, in West Fisher gold belt, on Lake creek, opposite the Illinois & Montana M. Co. mine. The vein is 2 feet wide and has a dip of 20°. The formation is slate. Cabinet is 3 miles from the mines. Since starting they have run 35 feet of tunnel, working three men.

NEVADA.

Churchill County.

As prospectors have located on tracts of land in Churchill county since the recent oil strike at Fallon, L. H. Taylor, district engineer in charge of the reclamation work being done by the Government in Nevada, has issued the following notice: "For the information of persons interested in prospecting for mineral oil in the Carson Sink valley, Churchill county, I desire to call attention to the fact that all of the public lands in this valley have been withdrawn from entry except under the homestead act, and are therefore not subject to location under the mineral land or mining laws of the United States.—Reno, May 24."

Esmeralda County.

D. Hudgens of Yerington, part owner of the Pine Grove mines at Pine Grove, says there are about 200,000 tons of tailings on the property and tests are being made to work them by cyaniding. Two-thirds of these were worked over some years ago, but it is thought that they may contain values sufficient to warrant working again. There are 60,000 tons of tailings lying mainly under the waste dumps, which have never been worked. Hudgens expects also to put men to work on the tunnel, this work to count as assessment work on the unpatented claims in the Pine Grove group.

The Jumbo & Vernal Extension M. Co. has been organized by K. Pittman and H. B. Lind for Martin, Jones & Higginson of Goldfield, H. B. Lind being secretary and manager. The mining claims owned by the company are the North Extension of the Jumbo mine, the North Extension of the St. Ives, a fraction of 137 feet which parallels the east side line of the Red Top mine; also a group of four claims, including Black Butte No. 1 and Three Friends, all at Goldfield.

Lincoln County.

At the Duplex mill, at Searchlight, the stamps will begin dropping again next week on ore from the Santa Fe group, says B. Macready of the Santa Fe M. Co. The present arrangement includes giving to the Santa Fe the use of the mill. It is thought that later, when the mine has been unwatered, the Duplex will resume operations. The Duplex has no use for the water until the lower workings are reached, and in the meantime the Santa Fe will be able to make tests of its ore. B. Macready is working the Santa Fe group under bond. He has also bought the adjoining Miess group of three claims and the Barney Reilly, an intervening fraction. Two shifts are sinking the main shaft to the 100-foot level. When reached, the vein will be drifted on both ways and east and west crosscuts run. Future operations will include opening up the lead by sinking two shafts, 200 feet apart, north of the present workings.

P. Thatcher has secured an option on the Dupont group at Camp Duncan, near Searchlight.——W. J. Kennedy and C. Crooks have relocated the W. Robbins claim as the Mohawk group. They have let a contract to sink 50 feet.

The system of settling tanks at the Quartette mine, at Searchlight, is reported successful. Ample water has been secured for all milling purposes and there is an overflow of waste. The management will put in two more hatteries this summer. The track is complete to the 700-foot level — twenty-five - pound rails were used and the gauge increased by 3 inches. Pumps have been received and will be set up. The vein is being drifted on the 700-foot level.

The sinking of the five independent shafts to depths averaging 50 feet each have shown the continuity of the ledge through the entire length of the Pioche-Nevada Con. Co. holdings at Pioche, says J. W. Burton of Salt Lake City, Utah, part owner, and the company will proceed with development. The central shaft, from which a recent shipment was made to the smelter and at the bottom of which 4 feet of high - grade ore are opened, will be sunk to the next level at 100 feet. The ore in the main shaft, says Burton, will average 50% lead, with at least an ounce of silver for each unit of lead, without reference to the gold and copper with which they are associated.

At Caliente, Superintendent Lloyd of the Chief group of mines, being developed by C. O. Whittemore et al. of Salt Lake City, Utah, says the ledge varies from 6 to 12 feet between walls. The ore, which averages $10 gold per ton, affords a cyaniding proposition. A mill will be provided.

C. Prisk has started work on the Pine Shade group of mines on east slope of Newberry mountain, near Searchlight.

Nye County.

J. M. Healy, of Tonopah, with Salt Lake City, Utah, men, has incorporated the Tonopah-Crown Point M. Co., which will operate the five claims of the Crown Point group on the Ray road, 6 miles north of Tonopah. These claims are said to show in an open cut a quartz ledge carrying values of $50 per ton in silver, lead and gold, the last-named metal averaging $25 per ton. The ore occurs in the northern lime belt. The claims are near the Cow Ranch wells, and within easy haul to the railroad.

F. Work, superintendent of the Hannapah M. Co. group, 18 miles east of Tonopah, says ruby silver has made its appearance in the face of the drift being advanced northeast to the dike.

NEW MEXICO.

Colfax County.

The Baldy Deep T. M. & M. Co. is increasing work on its group. A tunnel is being driven from the west side of Baldy

mountain to cut several ore bodies said to run through the mountain. The tunnel will gain depth of 2000 feet. The tunnel is in 1200 feet and when completed will be 3000 feet long.

Grant County.

F. Higgins has leased the plant of the Hanover M. & M. Co. at Hanover and is running it on ore from his mines as well as on custom ore.——President F. J. Herne, of the Colorado Fuel & Iron Co., after visiting and inspecting the iron properties of the company at Fierro, says operations will be resumed at Fierro by June 15.

Excavation work for the smelter owned by Johnson & Atkins, at Silver City, has been completed, the buildings are up and the machinery going in. The smelter will be blown in next week.

Superintendent Patterson, of the American Con. C. Co., near Lordsburg, is preparing to start work on the company's group. The American Con. C. Co. bas gold, silver and copper ore.

The Comanche M. & S. Co. intends to start work this week on a smelter on the site of the Silver City Reduction Works at Silver City. The plant will be larger than the one that burned down last July. It is intended not only to build a smelter but also to construct converters of sufficient size to handle its own matte and the matte of any other furnace.

Otero County.

Water has been struck in the Cuprite shaft on the Altamont C. Co.'s group at Jarilla and twelve barrels per day is capacity of the flow. This shaft is about 1 mile southeast of the Garnet group and near the placers. It is thought plenty of water can be obtained to work the placers.——The Excelsior M. Co. has men at work straightening up its shaft. The company is preparing to sink to depth of 500 feet. A vein of copper and silver ore has been opened in the Nashville No 1.

Prospecting is active around Tularosa. F. Clark has organized a company to work bis copper prospects.

San Miguel County.

The engine, boiler and pump have been set up on the Rising Sun mine on Copper mountain, near Rociada, and the workings unwatered. Development will be resumed.

Sierra County.

Preliminary work has been started on the Treasure mine near Hillsboro. A whim and other material are on the ground. —— Development work has been resumed on the Prosper mine. Drifting is being done on the 120-foot level.

J. Kasser has bought the Good Hope-Bonanza mines near Hillsboro. The working force on the Empire mine has been transferred to tbe Good Hope mines. A mill will be built. The mill will treat ore from both the Empire and tbe Good Hope mines. —— The Black Peak mines are producing ore.

Two companies in Hillsboro have plans for building milling and concentrating plants. They are the Sierra Con. G. M. Co., of which W. Miller is president, and the Good Hope & Bonanza G. M. Co., in which J. A. Holley and S. Stephenson of Charleston, W. Va., and J. Kasser are interested.

OREGON.

Baker County.

The '49 Jimmy mine, at Greenhorn, bas been sold to the Fortune M. & S. Co., of which R. M. Jackson of Spokane, Wash., is manager and P. A. Brady superintendent.

Manager Mueller of the Oregon S. & R. Co., with smelter at Sumpter, says ore buying will be resumed in Sumpter June 1st.

W. B. Dennis of Sumpter, principal owner and manager of the Black Butte quicksilver mine, Southern Oregon district, says he is preparing to put up reduction works. Development has been going on for three years. A drift has been made from the surface on the lode, and from it crosscuts driven to prove the entire lode, which is said to he 300 feet wide. Ore near the surface occurs in small lenses. The Black Butte will be equipped with a 300-ton plant.

At the Maxwell mine, in Rock Creek district, 18 miles northwest of Baker City, the 20-stamp mill which was wrecked by a snowslide in January will be rebuilt this summer. The snow is still deep at the mine, and it will be several weeks before construction can he started. Tbe new plant will he in a more protected spot. The bins were full of first-grade ore at the time of the accident, but remained in place.

Grant County.

(Special Correspondence).—The Badger M. Co., one of the Bunker Hill-Sullivan Co.'s properties, with offices at San Francisco, Cal., is working its mine and mill, near Susanville, to full capacity and has resumed the shipment of concentrates to the company's smelters.

Stevenson & Spaulding, who have a 30-ton mill to work over tailings of the Cooper claim, are making i provements in it to enable them to handle custom ore as well.——The owners of the Stockton mine, adjoining the Badger, have retimbered their shaft to a depth of 250 feet and expect to resume operations this summer.

The Blue Channel Gold Placer M. Co., which has bought 500 acres of placer ground on Big creek, is drifting at depth of 125 feet on an ancient river channel. Its gravel is dark blue in color. In addition to working by deep drifting, the management expect to put in a hydraulicking plant this summer, for which purpose they have 2000 feet of pipe and two giants on the ground.

Susanville, May 23.

A. A. Litsky of Boise, Idaho, is preparing to develop his quartz property, the Golden Eagle, near Prairie City. He has put men to work. Previous work at the Golden Eagle has shown a ledge 18 feet in width and carrying values in sylvanite.

Jackson County.

Foreman Garvin reports the Golden Spike tunnel of the Shorty-Hope M. & M. Co., near Ashland, is in 520 feet and the vein is carrying good ore. The management have ordered 400 feet of 8-inch galvanized steel pipe to run from the face of the drift back to the upraise to remove gases caused by the explosives. The dam at the ditch intake, injured by the high waters of Wagner creek, is being repaired.

Marion County.

J. J. Yackley of Portland, part owner, has put men to work on the Brightenbush mines, north of Quartzburg, in Marion county. He will develop tbe mine by tunnel and sbaft work. The property has smelting ore, and the ledges show an average of from 3 to 8 feet in width. A reduction plant will he put in on the mines.

SOUTH DAKOTA.

Custer County.

The Custer Chronicle says C. J. Sine and H. F. Ratte of Custer, and C. P. Doney aud C. B. Stevenson of Indianapolis, Ind., have bonded a group of six claims consisting of the Parish, Parish No. 2, Toledo, Springdale, Springdale No. 1, and another, in Camp Ivanhoe, 8 miles east from Custer, and joins the Ivanhoe M. Co.' property on the south and east. Development work has been done on some of the claims and ore has been taken from the surface workings.

Lawrence County.

The Penobscot M. Co., operating in Garden City district, near Deadwood, has been reorganized as the Alexander Maitland M. Co., A. Maitland of Negaunee, Mich., having taken over the interests of the company.

F. E. Little of Minneapolis, Minn., president and manager of the Minnesota M. Co., is arranging to start work on the company's property in the Garden City region, near Deadwood, adjoining the Penobscot mine. Little says he will start a two-compartment shaft, sinking to quartzite and exploring that horizon. The company has ore in both the horizontal and vertical systems. Attention for the present will be paid to the ore of the horizontal formations (the Cambrian).

The Gilt Edge-Maid M. Co. has excavated for its cyanide plant to be built on its mine near Galena. The company is owned by Minneapolis, Minn., men.

Operations are temporarily suspended at the Lucky Strike M. Co., near Deadwood, necessitated by installation of a steam hoist and other machinery. Delay has been encountered, the result of bad roads. An air compressor will also be set up at the workings and development work will be increased. The shaft has been sunk to depth of 175 feet and will be continued to 500 feet, when crosscutting will be started. The company expects to put up a mill, says Manager C. A. Allen.

The cyanide plants of the Black Hills are said to use yearly three and one-half carloads of cyanide of potassium, three and one-half carloads of zinc and about three carloads of sulphuric acid in the operation of tbe treatment of the gold and silver-bearing ore. Two-thirds of this amount is used by the Homstake company, and the balance by the dozen or more smaller cyanide plants operating throughout Lawrence county. The cyanide of potassium costs about 22½ cents a pound, the zinc about $8 per 100 pounds and the sulphuric acid $2.90 per 100 pounds. The zinc is shipped in the form of discs 12 inches in diameter and nine to the inch. They are placed on a lathe and made into shavings, which are used in the precipitation of the gold and silver from the cyanide solution. The sulphuric acid is shipped in iron tanks, weight 1600 pounds each.

UTAH.

Beaver County.

The Horn Silver mine at Frisco is preparing to increase output. Shipments during month of April reached 2800 tons. During the year 1903 the average monthly production of ore was 1450 tons, and the total receipts therefrom during the twelve months $126,000. The ores coming from the mine run well in copper and lead, while the silver values are low.

Box Elder County.

At Park Valley the Iona mine, of wbich P. W. Madsen of Salt Lake City is manager, will have a milling plant built this summer. The vein is 20 feet in width and is an extension of the Century vein. Madsen has put on more men.——At the Century the mill is handling fifty tons daily and is running on ore which will average $8 per ton. Superintendent Hardy is putting in a full set of new copper plates. The old ones are to be replated and placed in use again later.

Millard County.

Ore brought from the mines in Drum district, near Oasis, of the Oasis G. & C. Co., is said to show $40 in gold, silver and copper to the ton. Development work is being carried on under J. Clive.

Piute County.

The Copper Butte group of five claims in Gold Mountain district, near Marysvale, has been leased and bonded to W. Johnston of Richfield, who will begin development operations next week. The Copper Butte is near the B. W. & H. and the Butler Beck mines.

The Gold Dev. Co., P. A. H. Franklin president, operating near Marysvale, has made application to the State to appropriate the waters of Bullion canyon, amounting to 20 second-feet. It is intended to convert the water below the Dalton mill and apply same in operation of an electric power and lighting plant. The site selected for the proposed plant is above the Webster mill in same canyon. The water will be conveyed through a pipe 10,000 feet in length.

Salt Lake County.

With another set of rolls the Ohio C. Co. mill at Bingham is again in operation. The plant is reducing an average of 125 tons of ore daily, while 120 tons of ore, maintaining an average of 20% copper, has been forwarded to the valley smelters the present month, says Manager H. Caitro.

Summit County.

Work at the Mazeppa shaft at the Daly mine at Park City was discontinued last week, the reason given being that surface water has forced them to temporarily abandon the sbaft. It is thought development work will hereafter be carried on through the Federal tunnel. Manager Rood says it would take three months to connect with the Mazeppa ledge. If large ore bodies were opened up the product could easily be hauled through the tunnel and it would not be necessary to put a hoisting plant at the Mazeppa shaft.

Superintendent Moffat of the Ontario mill, near Park City, bas men at work sluicing dirt, taken from beneath the old mill, for its quicksilver values. Last spring and summer, before the mill was built, this process was worked with success, almost enough money to pay for the erection of the mill having been realized from it. When the mill was put up, a tunnel was run from the outside to the point under the old building that the product was taken from.

The new ore house at the Daly-West mine, at Park City, collapsed last week. The building was 130 feet long and fell in completely, entailing a loss of $10,000. The building was erected on an old dump, and it is thought the settling or moving of a large rock in the dump caused the disaster. The building contained sixteen bins, each of 100 tons capacity, there being about 1200 tons in the bins at the time of the accident. No lives were lost. Men were put to work clearing away the wreckage and building a temporary trestle, over which the ore will be hauled from the mine to the mill. The ore house will be rebuilt, but will be placed on piling to prevent its settling. The conveyor belt and electric motor were put out of commission by the accident.

Weber County.

Shipping of ore from the Southern Pacific mine in Sierra Madre district, north of Ogden, will start next month, says Manager Burnham, of Salt Lake City. He has put on more men. To get the ores down from the mine, Manager Burnham will build a road around the ridge of the mountain near the mine for ¾ mile. He has completed arrangements with the smelters and has the matter of freight rates up for consideration with the railroad companies.

Interests in whose favor a $60,000 option on the Castro group at Ogden having failed to comply with its terms, the property has reverted to its owner, N. Castro, who will resume work on the group the present season and extend the lower tunnel to the main ore bodies, while tbe placer will be operated under a lease.

WASHINGTON.

Ferry County.

(Special Correspondence). — Developments on the Belcher exceed one-half mile of tunnel and crosscuts. There is a body of ore 80 feet in width which has been followed 400 feet. The mine is to be equipped with a machine drilling plant.

The Copper Key, on the south slope of Belcher mountain, southeast of the Belcher mine, has been bonded to Spokane men. R. Angus is in charge.

The Oversight is to resume and the Old Hawkeye property is to start up. Work is also to be resumed on the Midnight, 6 miles east of Belcher mountain. It is reported that the Columbia mine will resume. It is a milling ratber than a smelting proposition.

Republic, May 21.

Lincoln County.

Preparations are being made to start work on a smelter at Crystal City and contracts will be let for the furnace, says Manager J. Gray of the Crystal mine in Cedar canyon, near Davenport. It will be of the type which has a method of consuming the fumes that ordinarily kill vegetation around a smelter. The furnace will be of 100 tons capacity and will make a base bullion containing copper, lead, gold and silver.

Thurston County.

H. G. Lougee of Spokane, president and manager of the Great Western Coal Dev. & M. Co. at Tenino, says the new washing plant, with a capacity of 400 tons per day, has been put in operation. The principal work is cleaning up some coal and sending it over a 3-inch screen. All the lump will go to the cars direct, while the rest will be washed and separated into pea, nut and egg coal. He says tbis product will return about 75% salable coal. They are putting in a new baulage system, which will facilitate handling the coal and do away with the mules. A 500-ton bunker will be added and a dynamo placed in the power house. The dynamo will be used to light the power house, the washer and other buildings. The company has 300 acres of land near Tenino, and has sunk a shaft and opened four veins. The first vein is the one being worked. Tbe next vein lies 35 feet under No. 1, and is 4½ feet thick. No. 3 is 70 feet below No. 1, and is 7 feet thick. No. 4, 240 feet under No. 1, is 11 feet tbick.

WYOMING.

Fremont County.

(Special Correspondence).—The Carisa M. Co., T. Ewing manager, is getting bids on a 500-ton stamp mill and cyanide plant which it expects to build during the summer.

South Pass City, May 22.

(Special Correspondence).—The Garfield M. Co. is making preparations to increase development work and to build a stamp mill during the summer.

Atlantic City, May 22.

Uinta County.

The American Con. Oil Co. reports a strike of oil in the Spring Valley field, east of Evanston. The second drill of the company, which was started near the first well a month ago, struck a heavy flow of oil at a depth of 800 feet. After penetrating the oil sand to a depth of 60 feet the drill was withdrawn and the well tested. The result is said to have shown a 200-barrel well.

FOREIGN.

AFRICA.

West Africa.

At Seckondi, on the west coast of Africa, J. H. S. Cox, of Denver, Colo., reports the mining industry developing. Ho says the negroes, who work under white foremen in the mines, are a difficult class to handle because of their natural love of outdoor life. While they are not lazy, yet it is difficult for them to devote their energies to one particular object.

AUSTRALIA.

South Australia.

The Northern Territories M. & S. Co., under date of May 5, reports the water-jacket smelter had been worked for twenty days satisfactorily. During that time a total quantity of 1160 tons of ore was treated, of average assay value of: Copper, 3½%; gold, 4 dwts. 7 grs.; silver, 10 ozs.; the total production being 120 tons of matte, containing: Copper, 40 tons; gold, 250 ozs.; silver, 12,200 ozs.; valued at £4570. Over one-third of the tonnage smelted consisted of slags from the reverberatory furnaces, which contained a small percentage of copper, gold, and silver, valued about 15s per ton. Tbe slag was useful in facilitating starting the water-jacket

smelter. Will start reverberatory furnaces roasting matte on the 8th inst.——At the Mount Ellison mine, 120-foot level was driven during month of April on lode 40 feet, total 252 feet; the level timbered throughout, and tramline laid. Grey ore is again making in face of lode, 4 feet wide; assaying 6% copper. They raised during the month 150 tons, of average value of 15% copper.——At the Iron Blow mine, the main shaft, 100-foot level, crosscut was driven 20 feet, total 72 feet; lode 20 feet wide; assay value copper, gold and silver, £6 5s per ton. Raised 960 tons of ore during the month. Sinking of main shaft has been resumed. On the tramways, earthworks have been completed for 7 miles 2 furlongs. Rails are laid for 6 miles 6 furlongs.

Queensland.

The gold returns of Queensland for month of April are reported as follows:

	Tons Crushed.	Yield in Ounces.
Charters Towers	24,500	25,500
Croydon	6,400	3,600
Gympie	16,900	9,100
Mount Morgan	18,500	10,400
Ravenswood	2,100	2,600
Other Fields	2,700	2,100
Alluvial	.....	800
Total yield		54,100

Western Australia.

Diamond drill boring is being carried on from the 1100-foot level of the Chaffer's mine, at Kalgoorlie.

The Great Boolder mine at Kalgoorlie is having two ball mills added to the sulphide plant, which will bring the treatment capacity of the crushing section up to that of the roasting section; also increase the tonnage handled by about 500 tons monthly.——At the Associated, two additional roasting furnaces have been put in, making fourteen in all. The completion of the 20-head mill, in course of erection for treatment of low-grade ore, was delayed pending delivery of concentrating tables.

BRITISH COLUMBIA.

Boundary District.

During the month of April 383 feet of development work was done at the Granby mines at Phœnix.

Work was resumed on the Trilby mine, near Greenwood, last week. The property is under bond to L. A. Smith and Gaunce & Wickwire. It is near the E. P. U.——Development on the Defiance has been resumed by W. Fowler. The steam plant of the Marguerite mine, in Deadwood camp, has been bought, including hoist, pump, drills, etc., and is being set up at the Defiance.——Superintendent Longley is starting development on the Carmi mine, up the West Fork. All repairs necessitated by a year's shut down have been made and drifting on the 150-foot level of the Carmi is starting.

East Kootenay District.

The number of men at work at the St. Eugene mine at Moyie has been increased. The concentrator is crushing steadily. The mill is being fed by ore from the Lake Shore workings. The aerial tram which connects with the upper workings is running. Ore is being shipped to the smelters.

Rossland District.

Next week it is expected operations will begin at the Rossland Power Co. concentrator, near Rossland. Each section will be started up and the machinery adjusted. The last consignment of cyanide machinery is being set up, also the electrical transformers for the West Kootenay P. & L. Co.'s transformer house at the works. The capacity of the plant is 200 tons daily.

Rossland reports say efforts are being made here through the Rossland Board of Trade to have the Canada Geological Survey make a structural map in detail of the camp, similar to the work done by the United States Geological Survey at Cripple Creek, Leadville and other points. E. B. Kirby, manager of the War Eagle-Center Star mines, says a structural survey would do much to stimulate mining.——In anticipation of the production of milling ores at Rossland on a large scale, further efforts will be made to secure the amendment of the 2% tax on the output of British Columbian mines. It is said to have been shown that on low-grade ores extracted for concentrating the tax takes from 12% to 22% of the profits, and remedial legislation is sought whereby the tax will bear less heavily on this class of product.

Vancouver Island.

President Atkinson of the Cascade M. Co. is preparing to start developing the company's property on Uchuchlesett harbor, near Alberni. The Southern Star mine on Uchuchlesett harbor continues to improve. The company is filling the hunkers ready for another shipment. The mining outlook for the district generally is reported good.

West Kootenay District.

In the Lardeau it is reported that the Great Northern Mines, Ltd., will put in ten more stamps in the Oyster mill, near Camborne. The fifth monthly cleanup of the Oyster mill was made last week, with satisfactory results.

It is stated that the Imperial Development Syndicate will take over the Eva mine, near Ferguson, from the Calumet & British Columbia Gold Mines, Ltd., on account of the latter company failing to make a third payment.

Yale District.

The plant of the Nickel Plate mine at Hedley is divided into three departments—the amalgamating, cyaniding and concentrating rooms—each operated independently of the other. The power used is water, taken from Twenty Mile creek. The overflow from this power is utilized to generate electricity, and the electricity, besides being used for lighting the mill, is held as a reserve power that may be used to run the mill in case of necessity. The tram from the mine to the mill was at first 4 miles long, but, because of the difficulty of working this length of cable, it has been cut into two sections, which facilitates handling the ore from mine to mill.

CANADA.

Ontario.

U. S. Consul H. S. Culver of London, Ontario, transmits the following statement, issued by the bureau of mines, showing the mineral production of the Province of Ontario during the year 1903. The total value of metallic minerals was $5,165,000 and non-metallic $7,632,644. The number of men engaged in production was: Metallic, 2936, earning in wages $1,583,361; non-metallic, 7652, earning $2,617,012. Following is the summary of metallic production:

Article.	Quantity.	Value.
Gold, ounces	10,383	$ 18,036
Silver, ounces	16,868	8,942
Copper, tons	4,731	641,726
Nickel, tons	6,998	2,499,068
Iron ore, tons	208,154	450 000
Pig iron, tons	87,004	1,491,696
Steel, tons	15,229	304,586
Zinc ore, tons	1,150	17,000

Total value, $5,601,154, less value Ontario ore smelted into pig iron and pig iron converted into steel, $436,154. Total value of metallic production, $5,165,000. Following is the summary of non-metallic production:

Article.	Quantity.	Value.
Asbestos, tons	550	$ 1,650
Arsenic, tons	257	20,046
Building and crushed stone	.....	845,000
Carbide of calcium, tons	2,509	144,000
Cement, barrels	784,808	1,282,118
Corundum, tons	1,119	87,600
Feldspar, tons	15,296	20,046
Graphite, tons	4,400	20,636
Gypsum, tons	4,520	7,910
Iron pyrites, tons	7,469	21,693
Lime, bushels	3,400,000	520,000
Mica, tons	948	102,205
Natural gas	.....	196,535
Peat, tons	1,100	3,300
Petroleum, imperial gallons	16,640,338	.....
Oil, refined, imperial gallons	9,710,386	.....
Benzine and naphtha, imperial gallons	832,153	.....
Gas and fuel oils and tar, imperial gallons	1,968,172	.....
Salt, tons	58 274	388,097
Talc, tons	920	2,625

Total non-metallic production, value, $7,632,644; add metallic production, $5,165,000. Total value, $12,797,644.

The commissioner of Crown lands reports the production of nickel in Ontario last year exceeded that of any previous year, the total being 6998 tons, valued at $2,499,698, writes J. E. Hamilton, United States Commercial Agent at Cornwall.

Yukon Territory.

A shipment of railroad rolling stock, to be used in the development of the Anderson concession on Hunker creek of Klondike district, near Dawson, is being taken in. The consignment consists of four 6-ton engines and twenty cars. The Detroit-Yukon G. M. Co. owns the concession. They are to be used on a railroad, about 3 miles in length, extending from the mines to water. The gravel will be loaded into the cars and from them dumped into the sluice boxes. The company's concession comprises a number of benches on Hunker creek.

MEXICO.

Chihuahua.

The United States M. Co., at Parral (formerly the Terrenates Con. M. Co.), is increasing development work on its mines and at same time is shipping a car of ore a day. Its steam-turbine, electric power plant is in satisfactory operation and three heavy pumps are on the ground to be set up, says Manager J. W. Marshall.

The Hidalgo Placer M. & M. Co. has been organized under Delaware laws by J. V. Dignowity et al to operate in the Colorado mountains, near the Conchos river, 65 miles from Parral. The officers are: M. C. Butler, T. S. Morehead, C. Hedges, Morehead being manager. The general officers are in Washington, D. C., with branch office in Parral. The company is said to own the Delfina, of eighteen pertenencias, the Florentina, of fifteen, and the Body, of ten perteuencias.

J. F. Johnson, B. Peterson and C. Crowell, of the latest bonanza at Santa Barbara, are striking ore in their Rayo mine, near the Adela mine, and they have contracted for the mill of the latter. The vein is said to be 16 feet in width, the ore carrying 150 grams gold per ton. The mine has been producing ore carrying 600 grams silver and some gold.

Durango.

The A. Payne and C. von Brandis mining interests at Velardena have been sold to the American & Mexico M. & Dev. Co. of Chicago, Ill. The properties transferred were the Roca Negra, the Alicia and Margarita, in one group. There were two other mines at Canelas, the properties in the El Torro group, which were sold to A. J. Scott of Chicago, Ill.

The San Lois Mining Co., L. Ross managing director, operating mines 30 miles from Durango, is putting in a pumping plant, boilers, hoists, etc., at the mines. The company is shipping 1000 tons of ore monthly and is treating 100 tons per day by the lixiviation process at the mine. It is building a 6-mile railroad to connect two of its mines with the mill. On the San Lucas mine a $25,000 pumping plant is being installed. The company has four mines in operation out of forty-three properties. The ores are silver, lead and copper.

The Arizona M., M. & Dev. Co. of Oklahoma City, O. Ty., is building a 20-stamp mill at its mine in the Canelas district, near Goanacevi. They report having a quantity of $15 milling ore.

Guanajuato.

H. Hine and L. E. Cortis, of Colorado Springs, Colo., with Eastern men have formed the Guanajuato R. & M. Co. to operate the Rul estate and other mines in Guanajuato. It is stated $2,500,000 is to be spent on the Rul mines and a 500-ton daily capacity mill is to be built.

Jalisco.

L. E. Oldham, E. Fitzpatrick and W. W. Dodd, of San Antonio de los Moran, have filed on a group of mineral holdings near the Falda mine and will begin development work.

Near Chapala, F. B. Martinez says he is preparing to develop a gold and silver group.——I. P. Martin will develop his mines near Hostotipaquillo.——Development work will be started at Tamazula by M. K. Taylor of Guadalajara.

Lower California.

C. W. French of San Diego, Cal., of the Pacific Steel Co., reports the company has taken over the W. E. Webb iron mines in Lower California, near San Quentin. Eight mines have been transferred, leaving twenty-one others to be transferred later.

Oaxaca.

It is reported La Purisima mine, at Penoles, had been bonded to J. Z. Mason, of Cleveland, O., for $1,000,000 Mexican money.

Puebla.

The Compania Minera de Mexico, Ltd., has bought a group of gold and silver mines, at Tetela de Ocampo, for $125,000 after an option, during which the company did development work. F. Brennan is manager. It is stated the company proposes acquiring electric power at Nexcaca, 65 miles distant for operation of its mines.

Sonora.

M. B. Romero at Mulatos reports shipping last week $35,000 in gold from the Rey del Oro Co.'s group, the result of three months' run of six Bryan mills. The Mulatos district is three and one-half days ride from Minaca, Chihuahua, and about six hours ride west of the Chihuahua line. Other properties in the Mulatos section being opened up are the Calera and Santa Eduviges mines, being developed by F. W. Garretson. These are silver and gold. The Trinidad silver mine is having extensive workings made by the owners who compose La Bufa Co. Richardson Bros. have charge of operations.——Near Mulatos the Cieneguita C. Co., of Nogales, Ariz., is operating its copper group. Development continues and it is stated the company is preparing to build a smelter at or near the mines. G. Beebe is manager.

The El Tigre copper mine, owned by B. F. Graham et al. of Bisbee, Ariz., is preparing for a reduction plant, says O. Hoffman, consulting engineer. C. Meyers of Albino, Durango, will be superintendent of the company's smelter.

Zacatecas.

Near Zacatecas, at the Magistral mine, D. H. Norris of New York City will put in additional machinery.

The Calera M. & M. Co., composed of Philadelphia, Pa., men, is arranging to build a 20-stamp mill at its mines, 12 miles east of Calera.

Personal.

C. K. COLVIN of Denver, Colo., has returned there from Idaho.

W. O. MANSON, a mine owner of Denver, Colo., is in San Francisco, Cal.

W. L. CARD of the Card concentrator, Denver, Colo., is visiting California.

J. H. NEALE, a mine owner and operator of Sonora, Cal., is in San Francisco, Cal.

L. HUMPHREY, Central City, Colo., is in Arizona for the Guggenheim Exploration Co.

W. E. GARVER is manager of the Little Lallie M. Co., operating near Central City, Colo.

W. H. HAMPTON goes from Grant's Pass, Or., as manager Jualpa Co., at Juneau, Alaska.

J. J. CHAMBERS of Rodding, Cal., a Shasta county mine owner, is in San Francisco, Cal.

B. PITTMAN, interested in Tonopah, Nev., mines, is in San Francisco, Cal., from Tonopah.

HOMER WILSON, a mine operator of San Francisco, Cal., has returned there from New York.

WM. SHARWOOD of Soulsbyville, Cal., interested in Tuolomne county mines, is in San Francisco, Cal.

T. DOUGLAS, operating mines at Bayoreca, Alamos district, Sonora, Mexico, is visiting in Wisconsin.

JOHN ROSS JR. of Sotter Creek, Cal., is in San Francisco, Cal., from mine oxaminations in Oregon.

A. H. PHELPS of Denver, Colo., manager of the Bonnie Girl mine, La Plata, Colo., is at the property.

O. A. HONNOLD, electrician of the Utah Power Co., has returned to Salt Lake City from a California visit.

W. H. BRAY of Nevada City, Cal., interested in Nevada county mines, is in San Francisco, Cal., on business.

G. F. DITZLER of Biggs, Cal., interested in Butte county mines, is in San Francisco, Cal., on business.

W. H. FORD, superintendent of the Francisco mine at Llano, Sonora, Mexico, is visiting in Morristown, N. J.

C. W. CLARK of Butte, Mont., manager of the United Verde C. Co. of Jerome, Ariz., is in San Francisco, Cal.

A. GURR of the Alder M. Co., near Virginia City, Mont., has resigned his position and gone to South Africa.

F. V. BODFISH is local manager at Cripple Creek, Colo., for the Moffat interests, including the Victor mine.

C. M. FUELLER, Denver, Colo., has returned there from a professional trip to the San Juan country, Colorado.

NORMAN MCGEE has been appointed to the chair of civil engineering of Colorado College, Colorado Springs, Colo.

C. A. ROSS, president of the Standard copper mines, near Clifton, Ariz., is in Boston, Mass., on a business trip.

A. E. SAYLES, representing the Mine & Smelter Supply Co., Denver, Colo., has returned thence from Sumpter, Or.

W. CONDRON, interested in mines in Mexico, with headquarters at Douglas, Ariz., is visiting in Spokane, Wash.

W. F. SNYDER of Salt Lake City, Utah, of the Western Exploration Co., is in San Francisco, Cal., on mining business.

W. E. THORNE has returned to Denver, Colo., from making mine examinations at Del Norte, Rio Grande county, Colo.

R. G. WILLIAMS of Denver, Colo., is in London, England, on business connected with his mining interests in Arizona.

F. M. DOWNER has been appointed superintendent and A. R. Hodges assayer at the United States Mint in Denver, Colo.

J. M. BIDWELL has been appointed assistant manager of the American S. & R. Co. in Utah, with offices at Salt Lake City, Utah.

M. L. REQUA, president of the Pacific Steel & Wire Co., and A. C. Lawson, professor of geology at the University of California, have gone to White Pine county, Nevada, to examine mines owned by the former.

J. H. LE NOIR of Chihuahua, Mexico, has gone to Victorino, Chihuahua, Mexico, to take charge of the Senorita mine of the Mines Corporation, Ltd., and the

San Vicente mine of the San Vicente & New England Co.

A. HARVEY has returned to Denver, Colo., from Santa Barbara, Chihuahua, Mexico, where he was on professional business.

H. M. DIFFENBACH of Chihuahua, Mexico, until recently with the American S. & R. Co., is manager of the Compania de Minerales y Metales.

E. D. PETERS has been appointed professor of metallurgy in Harvard University, Department of Mining and Metallurgy, at Cambridge, Mass.

M. H. LIPMAN, manager of the Lipman M. & T. Co., operating at Hailey, Blaine county, Idaho, is in Salt Lake City, Utah, from the company's mines.

J. A. BAYLOR of Clifton, Ariz., is manager of the International Development Co., operating a group of claims east of Hermosillo, Sonora, Mexico.

F. G. BAUM succeeds L. M. Hancock as general superintendent of the California Gas & Electric Corporation, with headquarters at San Francisco, Cal.

S. F. WILES of Los Angeles, Cal., superintendent and manager of the Mexico M., R. & E. Co., operating in Sonora, Mexico, has returned from a trip to the mines.

G. K. FISCHER of Salt Lake City, Utah, mechanical engineer for the United States smelter, near Bingham, Utah, has returned to Salt Lake City from San Francisco, Cal.

J. HENDERSON, president and manager of the El Porvenir de Sonora mines at Mina del Oro, 14 miles east of Poza station, Sonora, Mexico, has returned there from an Arizona trip.

F. P. RODDY, secretary of the Poker Flat M. Co. and the Lassiat M. Co., has returned to Downieville, Cal., from a three months' trip East on business connected with the Lassiat mine.

G. McM. ROSS, superintendent of the Andes and Mexican mines at Virginia City, Nev., has returned from a business trip to Boston, Mass., and New York, N. Y., and is in San Francisco, Cal.

F. FLETCHER of Parral, Chihuahua, Mexico, has been engaged as consulting engineer by the Avino Mines, Ltd., to put in a 400 H. P. gas system at that company's mines at Avino, Durango, Mexico.

MR. J. C. MCQUISTON, until recently secretary, has been appointed superintendent of the Westinghouse Co.'s publishing department, having charge of matters relating to the publicity of the products of the various Westinghouse interests in the United States and Canada.

G. A. ROBINSON of Salt Lake City, Utah, will go to British Columbia to take charge of the Britannia mines at Howe sound, Vancouver island. While retaining the management of the Tintic M. & D. Co.'s affairs of Eureka, Utah, he has resigned the management of the Yampa Smelting Co. of Bingham, Utah, in which he is succeeded by Walter Kelly of San Francisco, Cal.

Commercial Paragraphs.

THE Pioneer Roll Paper Co. of Los Angeles, Cal., manufacturers of Ready Rock roofing, report the sale to the Western Railroad of 1,170,000 square feet of their roofing.

FAIRBANKS, MORSE & CO. of Denver, Colo., report having closed an order with the Two Republics M. Co., Tejamen, Mexico, for a 100-ton concentrating mill, including two Elspass mills.

THE Lunkenheimer Co. have an exhibit in Machinery Hall, location 5-G, block 26, Louisiana Purchase Exposition, St. Louis, Mo., displaying the line of engineering specialties which they manufacture.

THE Colorado Iron Works Co., Denver, Colo., has recently shipped one 42x160-inch lead furnace, eight slag trucks and other material to Missouri. This is the largest furnace ever constructed by this company.

ALLIS-CHALMERS CO., through their Denver, Colo., office, have an order from the Atlantic M. & R. Co. for a 20-stamp wet crushing cyanide plant to be shipped to Atlantic City, Wyo., 90 miles north of Rock Springs.

C. M. FUELLER, 1752 California street, Denver, Colo., has recently placed orders for four plants of machinery for milling purposes. He recently drew plans for the Dexter Mining Co. of South Pass, Wyo., for a 100-ton mill. In addition to his regular work of making mill tests and designing mills for parties, he expects to take up special survey work.

FRANCIS SMITH & CO., 83 Fremont street, San Francisco, Cal., are installing an electric power plant for the Rock Creek Power & Transmission Co., near Baker City, Or. Power is to be furnished to mines in Sumpter district.

THE Pneumatic Engineering Co. of New York has an order for an air compressor to be used in connection with the water works of Sberman, Texas. The machine is a special Rand-Corliss compressor, with tangye frame, having air cylinders 20 & 12x20, steam cylinders 9 & 17x20, designed for 200 pounds per square inch air pressure.

A. M. ROCKWELL of the Kimplin Crusher & Pulverizer Co., Chicago, has just returned there from a successful trip through the West. On this trip Mr. Rockwell closed a contract for a plant equipped with Kimplin machinery near Phœnix, Ariz. Considerable interest was manifested in the crusher manufactured by this concern, and Mr. Rockwell was enabled to show the practical workings of the machine by means of a working model which he had with him.

JAMES W. LYONS, who has been for many years associated with the Allis-Chalmers Co. in the capacity of engine salesman, has been appointed manager of the newly created power department of the Allis-Chalmers Co., with headquarters in Chicago, the appointment taking effect Monday, May 16, 1904. This newly created power department will control the sales of: Reciprocating steam engines, steam turbines (entire unit including turbo-generators), condensers, gas engines, pumping engines, blowing engines, hoisting engines and air compressors. Mr. Lyons' well deserved promotion will gratify his many business friends throughout the country, for he is very well known, and it is an evidence that the management is determined to preserve the best traditions of the Allis-Chalmers Co.

Obituary.

N. JONES, a Gilpin county, Colo., mining man, died on the 19th inst. at Russell Gulch, after a protracted illness.

M. R. GLEESON, a mining man of Placer county, Cal., died in Sacramento, Cal., May 10th. Deceased was born at Wisconsin Hill, near Iowa Hill, Placer county, Cal., and was 42 years old.

C. J. BOGAN, foreman of the Dutch mine at Quartz, Tuolumne county, Cal., was killed on the 14th inst., being buried by falling rock in one of the stopes of the mine. Deceased was a native of Tuolumne county, aged 41 years.

H. R. CROCKER of Crocker's station, on the Big Oak Flat and Yosemite road, a Tuolumne county pioneer miner, died in Lodi, Cal., on the 22nd inst. Deceased was born at Waquoit, East Falmouth, Mass., March 20th, 1827.

P. H. SCOTT, a mining engineer of Denver, Colo., 70 years of age, died on the 24th inst. at Denver. Deceased was born in Canada. He was a pioneer on the Comstock, in Nevada, and was in business with J. W. Mackay and W. O'Brien. For fifteen years he was master mechanic of a Comstock mine.

Trade Treatises.

Bulletin No. 302 of the Holtzer-Cahot Electric Co., Boston (Brookline), Mass., gives detailed data of dynamotors and motor generators.

The Salt Lake Hardware Co., Salt Lake City, Utah, produce an illustrated catalogue and price list of the Keller assay balance, which they supply.

"Annealing, Tempering and Case Hardening" is the title of a booklet on the portable forge and tempering furnace from F. W. Braun & Co., Los Angeles, Cal., containing some helpful hints thereon.

"Pumping Machinery," from Fairbanks, Morse & Co., Chicago, San Francisco and Denver, edition C., No. 48, gives in its 88 pages some salient points of interest to pump users, and will be sent on request to any address.

"Compressed Air Haulage" is tersely treated in a brochure from the H. K. Porter Co., Pittsburg, Pa., builders of light locomotives, steam and compressed air. Of standard size—6x9 in.—the book is a fine example of a trade treatise and deserves a place in the engineer's library.

Latest Market Reports.

SAN FRANCISCO, May 27, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅜d (standard ounce, 925 fine); New York, bar silver, 55½c, refined (1000 fine); San Francisco, 55½c; Mexican dollars, 45½c San Francisco, 44½c New York.

COPPER. — New York: Standard, $13.12½; Lake, 1 to 3 casks, $13.00@13.12½; Electrolytic, 1 to 3 casks, $12.75; Casting, 1 to 3 casks, $12.50; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 7s 6d spot per ton.

Following are the figures of German consumption of foreign copper for the months January-March, 1904, compared with the same period of time in 1903-1902:

	1904.	1903.	1902.
Imports, tons.....	29,624	19,590	17,427
Exports, "	901	2,242	2,298
Consumption, tons..	28,723	16,648	15,129

Copper is slightly lower than last week, but there is a feeling of somewhat better prices in the near future, as consumers must soon stock up for the season.

LEAD. — New York, $4.50; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £11 13s 9d ₱ long ton.

SPELTER.—New York, $5.30; St. Louis, $5.00; London, £22 ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.00@27.75; San Francisco, ton lots, 29c; 500 lbs., 29½c; 200 lbs., 30c; less, 30½c; bar tin, ₱ lb., 32½@35c. London, £124 2s 6d spot.

PLATINUM. — San Francisco, crude, $18.50 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75@82c ₱ gram.

QUICKSILVER. — New York, $44.50@45.50, large lots; London, £8 2s 6d; San Francisco, local, $43@43.50 ₱ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.00c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 40@47c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.60@13.75; gray forge, $12.75; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In hhls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ hhl.

CEMENT.—Imported, $2.15@2.65 ₱ hhl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ₱ hhl. in sacks, 4 sacks to hhl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¾c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8¼c; 100-lb. lots, 10¼c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, hhls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, hhls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Antbracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, hhl., 49c; cs., 54c; raw, hhl., 47c; cs., 52c; Lucol oil boiled, hhl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., hhl., 75c; cs., 80c; Neats-foot Oil, pure, hhl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 52@57c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANCANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., 50c.

BISMUTH.—Subnitrate, ₱ lb., $2.10.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—Best, $2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 70c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittshurg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittshurg.

URANIUM.—Oxide, ₱ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

FISHING TOOLS FOR SUCKER RODS, OR THE LIKE.—No. 759,454. May 10, 1904. O. A. Mann and W. J. Evans, Oil Center, Cal. This invention relates to improvements in means for recovering and removing broken sucker rods or other and similar obstructions from oil wells. The object of the invention has been to design a simple, durable device which may be lowered into the well, slipped over the end of the broken rod, and engaged with a coupling or like protuberant part of the rod and the latter, with its bucket, drawn upward to the surface.

HOLDER FOR BOILING HAMS.—No. 759,451. May 10, 1904. H. A. Kurlinks, San Francisco, Cal. This invention relates to a device which is designed for holding hams during the process of boiling. It consists of a foraminous cylinder the meeting edges of which are free to move upon each other and within which cylinder the prepared ham is placed, a mechanism by which the cylinder may be contracted so as to compress the ham within it, and means for retaining the cylinder in its contracted position during the boiling of the ham. This device retains the juices of the ham and prevents its being unduly dried during the process of boiling.

PORTABLE BUILDING APPARATUS.—No. 760,178. May 17, 1904. H. Brand, Oakland, Cal. This invention relates to an apparatus which is designed for the purpose of preparing finished building material ready for immediate use from substantially rough lumber and in a means for placing the apparatus in close proximity with each building from which the lumber is to be used. It consists of a portable structure mounted upon wheels containing all the machines and apparatus necessary for the work permanently set up and maintained in line and in readiness for instant operation and a motor from which power is derived for the operation of the machines, wheels upon which the structure is mounted, and an independent connection between the motor and the wheels whereby the power of the motor may be directed to the transportation of the apparatus from point to point where necessary.

TOILET PAPER HOLDER.—No. 760,113. May 17, 1904. R. B. Friend, Oakland, Cal. This invention is designed to provide a means for conveniently holding and delivering toilet paper. It consists of a containing box or case, with means for securing or attaching it with the edges of the paper presented, so as to be extracted at will, and in other details of construction.

MINING AND SCIENTIFIC PRESS.

Whole No. 2289.—VOLUME LXXXVIII. Number 23. SAN FRANCISCO, CAL., SATURDAY, JUNE 4, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Proposed Copper Combine.

It is reported that a new movement is being made in New York and Boston with a view to forming a greater copper syndicate with larger capital and more far-reaching effect than that wielded by the Amalgamated Copper Company. This new consolidation of interests, it is said, contemplates the union of all the greater copper producers of the Lake Superior region (excepting Calumet & Hecla,) those of Arizona, California and Mexico, as well as those of the Butte, Mont., region not already in the control of the Amalgamated Company. The combined capital is stated to be $300,000,000. The plan, as outlined in the published reports of this proposed merger, is to buy the Heintze interests in Butte for $16,000,000; the Lake Superior properties for $50,000,000, and the Southwestern mines for $40,000,000. This latter item is supposed to include the Clark, Phelps-Dodge and Green interests in Arizona and Mexico, beside such others as may be considered necessary or desirable. It is then the intention of the Amalgamated Company, so it is reported, to increase its capital to $300,000,000 and to absorb the several subsidiary companies.

The scheme of controlling the copper output has been attempted before, but up to the present time has not met with unalloyed success Any move on the part of the large operators to raise the price of copper is at once followed with increased output by mines great and small not directly connected with the large interests. Increased price stimulates production, and it also has the effect of opening and equipping new mines all over the mining regions. Should copper go to 16 cents and remain there a year, the copper output would probably be increased at least 20%, and this largely by mines unable to produce copper profitably below 14 to 15 cents, and there are mines of this class in great number, while those more fortunate would at once take advantage of higher price to increase their reduction capacity and to output a greater amount of the metal to take advantage of the opportunities afforded by a high selling price.

It is unlikely that the several amounts mentioned above would buy the mines referred to, though it might possibly go a long way toward securing control of them. That the copper mines embracing the United Verde, Equator, Copper Queen, Shannon, and the others of Clifton, Globe and Morenci, together with the Cananea group of Mexico, are not held at more than $40,000,000, no one familiar with them believes. As to what may be accomplished in Butte or in the Lake Superior region with $56,000,000, as suggested, is a matter difficult of determination. When the Amalgamated consolidation was first talked of in 1899, about five years ago, the reported capital was $75,000,000, and it was then pointed out that the amount was insufficient to accomplish the purpose. The necessary sum was placed at $450,000,000 at that time, and it will probably require more than that amount now to secure control. When looking to such gigantic combinations of industrial interests, it is necessary that all actual competitors, or those likely to become such, must be included in the scheme of consolidation, or the plan may fail. In addition to the noted mines above mentioned, there are many others of present or future great value ; beside which there are indications that in China, in Alaska, and even in the heart of Central Africa, and in numerous other places are copper deposits of great prospective value which only require the stimulating effect of high price, whether created by increased demand for copper or by control of the market by a powerful syndicate, to spring into active life and become large producers and competitors. The proposition has not come to a realization as yet, but the syndicate formed to control, which does not actually control, soon becomes a burden in the hands of those creating it.

Head Frame of Globe and Phœnix Mine, Rhodesia, S. A.

A New Style Head Frame.– (See Page 380.)

Mining in Rhodesia.

Although Rhodesia is one of the most recently developed gold fields of the world, the mining equipment and methods there are for most part after modern ideas and practice. The Globe and Phœnix mine, near Bulawayo, is said to be one of the good properties of that section. It has been opened by a shaft on the dip of the vein to a depth of 1000 feet, and is said to make a favorable showing in the bottom. The accompanying illustration is that of the steel head frame at this shaft—a structure designed on modern lines, and especially to suit the conditions of the surroundings, in which topography is important. The shaft is sunk on a hill sloping toward the foot wall, which makes construction of a head frame somewhat more complicated than when situated on level ground. In Rhodesia timber is scarce and the imported timber is expensive, and in view of this steel frames are not generally more expensive than similar structures made of wood which would meet the requirements of the situation. In such places steel head frames are preferable to wood frames, because of their freedom from the danger of fire. Where steel frames have been introduced they have been found satisfactory and they are growing in popularity. In many instances a less elaborate frame is permissible. An instance is shown in the larger engraving on this page.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1164 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, JUNE 4, 1904.

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Latest Problem on the Rand.

The importation of Chinese laborers from China to South Africa has actually begun and the result of their introduction into the mines of the Rand will be watched with much interest by the mining world. A recent press dispatch states that a mutiny among the Coolies, which occurred iu the pen in which they were confined before shipping, had to be quelled by troops. This indicates that the Coolies are not going voluntarily to their period of serfdom in the gold mines, and also that careful organization and prompt measures to suppress rioting or uprising of any kind will be necessary. If these men were going voluntarily there might be less to fear of insubordinatiou, but a mutiny and rioting before they leave their native land makes it appear that some difficulties might be anticipated in their control when they actually reach the mines. If they are dissatisfied with the conditions under which they enter the service it would probably be the part of wisdom to select only those who are willing to accept the conditions voluntarily. In past years thousands of native Africans have been successfully haudled in the mines of South Africa, both on the Raud and in the diamond mines, and it has only been rarely that harsh measures were necessary. These natives were fed and lodged in compounds—large enclosures from which there was no escape—and the terms of their service were not uulike those under which the Chinese are engaged, and no serious difficulty arose, but it may be that the native Kaffirs are more tractable than the Chiuese Coolies. In auy event the present condition of the gold mining iudustry on the Rand demands a large number of cheap laborers, and the Chinese have come to be cousidered as the only material available to meet the requirements. It will be a largc problem to hold these men in check while getting valuable work out of them, but the mine managers of the Rand are accustomed to difficult problems, and doubtless, with the aid of the Government, will find a solution to this their latest difficulty.

Where Knowledge Is Power.

There is something required of the mining engineer in many instances when making an examination of a mine, beside the mere takiug of samples, measuring the width of the vein, etc. These are simply mechanical operations which may be performed by any miuer after a short course of instruction by an energetic and painstaking instructor. The blocks of ore may be measured and carefully sampled, and by a strictly mathematical process the averages may be found and the value of the mine determined as to ore in sight. In a well developed mine the mechanical labors of the mining engineer are multiplied — the greater the area of ore exposed the larger the number of samples that must be taken, but, on the other hand, this condition robs the proposition of much of the risk involved, and if the work of sampling, measuring and plotting be carefully and thoroughly done, the actual value of the mine is readily ascertained. But there is another element in the determination of the value of a mine, and this is the conclusions based on the observed facts. It is not always the good fortune of the engineer to find a carefully developed mine. Often he finds a very badly developed one. Sometimes the rich ore has been stoped and the low grade rock left standing with only the owner's statement as to the value removed—a factor which experience has taught to be regarded with much caution. The backs of the stopes may be inaccessible, requiring the construction of scaffolding to reach the ore. Uuder such conditions "instances have been reported" where the backs claimed to be rich were worthless. Caved workings, strange appearing aud apparently unnecessary bulkheads are sometimes found which require investigation. An instauce was recently related to the writer of a reported 30 feet of valuable ore opened iu a crosscut from the main line drift. This proved on investigation to be a mere "scab of ore" left along a branching fissure, which a few shots stripped completely, showing barren rock just back of it. This crosscut was left as a "show place," evidently in the hope that it would be mistaken for a solid face of ore. This supposition is strengthened by the fact that iu the face of the crosscut a bulkhcad had been erected which, upon being removed, showed that the crosscut had been turned to the right and backward, and all in barreu rock, proving that the former operators knew that the 30 feet of good ore was only "skin" deep. In another mine examined not long since two drifts were found running ou either side of an ore body 40 feet wide, a stope connecting the two drifts—one of the drifts on the foot wall, the other on the hanging. No ore appeared in the crosscut from which these drifts were run, except a stringer 12 inches wide, though 30 feet south of the crosscut the ore body was actually 40 feet wide. The back was 30 feet above the floor, several hundred tons having been removed and no timbers put in the stope. At the face of the foot wall drift was found probably twenty tons of ore broken down lying on the floor of the drift and filling the space entirely up to the back of the drift. The other drift on the hanging wall was still in ore. The broken rock was cleaned up in the foot wall drift, and a short distance beyond the pile of broken rock and partly covered by it was an east crosscut toward the hanging wall, altogether in barren rock, and not 15 feet south of the 40-foot stope, where the face was all in ore. The mining engiueer demands proof that men are honest. He dares not assume it. If he does it may result in his undoing. He must be a judge not only of mines, but of men. In miue examination a knowledge of geology — particularly of that branch known as mining geology—is imperative as a means of self-protection and an end to the success of himself aud that of his clients, and he who lacks this knowledge is as unsuited to pass upon the value of a mine beyond what can be absolutely seen and determined as the novice at the business.

An Important Decision.

The United States Circuit Court of Appeals for the uinth circuit has rendered an important decision in the case of the Last Chance Mining Co., appellants, vs. the Bunker Hill & Sullivan Mining & Concentrating Co., appellee. These properties are in the Cœur d'Alene district of Shoshone county, Idaho, and the mines concerned cover one of the most important lead-silver deposits in the world. In its decision the court has determined for the first time some points in law, which heretofore have been merely presumed to exist, and has affirmed others. The case was tried before Judges Gilbert, Ross and Morrow, and the opinion was written by Judge Ross, being concurred in by the other members of the bench unanimously. In the Circuit Court below the appellee was plaintiff and the appellants defendants. The complainant claimed to own the Bunker Hill claim, and that the apex of the vein claimed is within the boundaries of the claim. This apex on its course crosses the claim diagonally, making what was originally intended to be the side lines, in fact, the end lines, aud the extralateral right is therefore in the direction of the actual end lines. In its opinion the court states that the locator must consider the outcrop or apex of the vein to indicate its direction. The prospector is not presumed to be an engiueer, who can make a trigonometrical calculation of the true strike along a hillside.

"The extralateral right to a vein or lode outcropping at the surface, where it exists," said the court, "is fixed by the course of the vein or lode at the surface, and not by its course on the level. We do not mean to say that a vein must necessarily crop out upon the surface, in order that locations may be properly laid upon it." Said the Supreme Court, in Mining Co. v. Tarbet: "If it lies entirely beneath the surface, and the course of its apex can be learned by sinking shafts at different points, such shafts may be adopted as indicating the course of the vein, and locations may properly be made on the surface above it, so as to secure a right to the veiu beneath. But where the vein does crop out along the surface, or is so slightly covered by foreign matter that its course can be ascertained by ordinary surface exploration, we think that the Act of Congress requires that this course should be substantially followed by laying claims and locations upon it. * * * * The most practicable rule is to regard the course of the vein as that which is indicated by surface outcrop, or surface explorations and workings. It is on this line that claims will naturally be laid, whatever be the character of the surface, whether level or inclined."

Another important point made by the court is as follows: "The mining right is an integral one. It is secured by a single location. The title to it is conveyed by one patent. It is a separate and distinct thing from every other claim. The fact that one individual, company, or corporation locates or acquires many such claims is wholly unimportant. Congress has never yet seen fit to put a limit on the number of such claims that one individual, company or corporation may locate or acquire. Whether, in view of its well-known policy to encourage the development of the mineral wealth of the country it shall ever deem it wise to do so, rests with Congress, and it is a matter with which the courts have nothing to do. The rights which a valid location of such a claim secures to such a locator and his grantees and successors are clearly defined by law, and are wholly unaffected by any subsequent conflicting location. Iu all such matters the first in time is the first in right."

Another point was made in the fact that although the Bunker Hill claim was located prior to the Last Chance, one of the claims in conflict, the location of the former was not recorded within fifteen days, as required by the Idaho State law, while the latter was recorded seven days after location, but as the State law fixed no penalty for failure to comply with the law it was of no force and in no matter affected the title of the Bunker Hill claim.

The opinion is of interest throughout, and decides a number of important points in mining law which have heretofore been somewhat in doubt by reason of lack of high judicial decision, which is considered essential in all legal points wherein the laws are at all ambiguous or silent entirely in the matter.

CONCENTRATES.

THE relative cost of water gas and fuel oil depends almost wholly on the situation and cost of raw materials at the point where the gas or oil is to be used.

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THE forward tilting of screens in the stamp battery facilitates the discharge of the crushed pulp, and consequently has a tendency to reduce sliming of the ore.

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IT is only rarely that concentration of ores yields the mineral sought directly. The concentration of metallic copper from the Lake Superior ores is a notable exception.

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GYPSUM is used for the manufacture of plaster of Paris, and also to a great extent as a fertilizer. It is worth from $2 to $2.50 per ton where mined. The supply is abundant.

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BY employing a greater volume of water in the battery, or adding it to the pulp coming from the mortar at the head of the amalgamating plate, the plate may be given a decreased grade.

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IT is probably owing to the fact that solutions of gold —the chlorides, iodides, bromides, etc., may vary more or less in their state of dilution that no specific gravity is assigned by text books to these solutions.

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ATACAMITE is a double chloride and hydrate of copper, first found at Atacama in northern Chile. Its color is green, of various shades, with apple-green streak; transparent to translucent. Hardness is 3 to 3.5; specific gravity 3.75; luster, adamantine to vitreous.

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THE coarser the rock to be crushed the larger should be the rolls employed to crush it. Rolls of small dimensions will not satisfactorily crush coarse rock. It may be stated as a general proposition that the wider the face of a set of rolls the greater their capacity.

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THERE is no limit placed by the law upon the number of claims an individual may acquire by location, but the law requires that not less than $100 worth of work shall be performed, or improvements made for each claim, annually, until patent is secured. The prior location is also first in right in case of conflicting interests.

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THE loss of quicksilver in mills varies greatly with the method of treatment, the character of the ore and to no small extent upon the millman. Pan mills generally lose much more quicksilver per ton of ore treated than plate amalgamation mills. This is partly due to the flouring of "quick" by grinding in the pans and failure to re-collect the finely divided quicksilver.

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A TIMBER-FRAMING machine at a mine will save much time and labor, and consequently money. It can be operated by any motive power, as water, steam, air or electricity. It frames accurately and quickly. It finds its greatest usefulness in framing timbers for square sets. The circular saw is also useful, as it may be used to work up lumber and waste into many things necessary for use about the mine.

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GENERALLY speaking, jigs are of two types—shaking screens, where the separation is affected by the rapid up-and-down motion of the screen in water, and the pulsation jig, where the concentration of mineral results from the reciprocal motion of a plunger in water in a compartment adjoining that in which the screen is situated, the pulsations of the plunger being communicated by means of the water to the screen.

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FOR the purpose of carrying running ropes, grooved wheels are in every way superior to cylinders. The latter almost invariably cut, and also injure the rope. Where the distance between the head frame sheave and the reel of the hoisting engine is so great as to seem to require a support, erect a light and substantially braced frame and place in it a grooved wheel on a running shaft, that the wheel may follow the cable in its side motion as the rope winds from one side of the drum to the other.

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USUALLY rusty gold ores in which the metallic gold is covered with a film of iron oxide silica, calcium carbonate, or some other substance which renders the gold impossible or difficult to amalgamate, may be successfully treated by crushing in grinding mills. The arrastra is considered one of the best gold-saving devices in use, for the reason that it brightens the particles of gold, making them readily subject to the action of quicksilver. The modern grinding mills are somewhat like the simple Mexican arrastra, in that they crush by grinding instead of stamping.

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SPECIFIC GRAVITY of a mineral is the ratio of its density—a comparison of its density as compared with some standard, usually the weight of the body divided by the weight of an equal volume of pure water. It is sometimes convenient in the determination of specific gravity, and also in separating fragments of mineral of different density, to employ a liquid of high gravity or density. For this purpose the Thoulot solution is used. This consists of a solution of mercuric iodide in potassium iodide, which has a maximum density of about 3.2, which may be diluted to any desired density.

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THERE is no way by which the trend of an ore shoot may be determined without exploration. In one part of the vein the trend may be to the right and in another portion to the left, and as often the shoot may descend normal to the strike. In most mines, however, the shoots generally trend with more or less persistence in a common direction. There is no law or rule by which to be guided. The theory that, "when standing and looking in the direction of the hanging wall, the shoot will dip to the right," is without foundation. There are many instances to support this idea, but there are as many disproving it.

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WHERE assessment work is done on one of a group of claims for the benefit of all the claims of the group, it is necessary that an amount of work be done equal to $100 for each claim of the group, and if the amount of work performed falls short of the necessary amount, it is likely that the courts would decide that the work performed should apply only on the claim upon which the work had actually been performed. "Concentrates" knows of no precedent to decide this case, but the evident intent and meaning of the law is plain, and clearly the performance of $1100 worth of work to represent fifteen claims is not strict compliance with the law.

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WHEN considering the likelihood of an ore to slime, it should be remembered that the amount of slimes which an ore will produce depends more upon the character of the ore itself than upon the method adopted to crush or pulverize it. Should an ore contain talc, clay, chlorite, lime or other soft minerals, or should the sulphides or other metallic contents be soft, like galena and tellurium, the disposition to slime is much greater than in the case of brittle and harder mineral. The finer the screens used the finer the crushing, and, consequently, the greater the amount of slimes. The proportion of slimes in wet crushing is generally greater than in dry crushing through a screen of the same mesh.

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THE lixiviation process for treating silver ores consists in roasting the ores with salt to convert the silver into chloride, if it is not already in that form, and subsequently dissolving the chloride of silver with a solution of hyposulphite of soda, and precipitating the silver from the solution in the form of sulphide by means of sodium sulphide or calcium sulphide. The precipitate is collected and smelted in a crucible. The process, though seemingly simple, often involves complicated chemical reactions, difficult to understand, and the results are often unsatisfactory with no apparent cause. The refining of the precipitates is also a matter often giving much trouble. When such processes are contemplated the services of an expert chemist, one having had practical experience with the process, should be engaged. It may save much unnecessary expense and trouble.

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SILVER is the most important substance of a foreign nature occurring in lead ores, although lead ores do not always contain silver in an amount to make the silver commercially valuable. Silver has a favorable effect on smelting operations, and most other foreign substances are detrimental to the process. Of these, zinc is the most injurious and unwelcome, as it renders the ore more difficult to fuse, and promotes the formation of slags containing sulphur and more or less of the precious metals. Arsenic and antimony are very volatile, and in most cases carry away precious metal values in the fumes. In lead smelting the presence of large percentages of either iron or copper sulphides is undesirable. In addition to these substances there are various earthy minerals present in the ore, such as silica, calcium carbonate, magnesium carbonate, aluminous minerals, etc. The presence or absence of these minerals determines the fluxes that must be added. The most commonly employed are limestone, oxide iron ores and silica.

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PANDERMITE is a variety of white, earthy calcium-borate, which occurs in nodules, the result of efflorescence, usually found on the floor of dry lakes in desert regions. It is doubtful if a borate mineral containing no more than 6% boric acid could successfully compete with mines producing colemanite which contains when pure about 50% boric acid. An ore running 20% might be made to yield a profit. The companies manufacturing borax and borax minerals have large and expensive plants, and small operators on low-grade ores could scarcely hope to successfully compete with them. The calcium-borate bearing mud of Calico, San Bernardino county, Cal., is being worked, it is said, successfully. This rock does not contain the characteristic colemanite, but is an indurated mud from a Tertiary lake bed, saturated, as it were, with calcium-borate. The percentage of boric acid in that ore is not known to "Concentrates." This mineral is reduced at large works at Daggett, 6 miles from the mines, by the employment of sulphurous acid.

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WHERE an ore is crushed in two separate batteries, one having a 600 screen and the other an 800 screen, all other conditions being equal, it is unlikely there would be no difference in the tailings after amalgamation with an ordinary gold ore. The only condition likely to produce such an unusual result would probably be found due to the fact that the gold in the ore was in an extremely fine state of division, and that it was disseminated throughout the mass with remarkable regularity. Instances of this kind have been observed. It is unlikely that the gold would be what is known as free milling. In some ores the values are largely in the fines, as in the case with some Cripple Creek, Colo., ores. In such cases the ores are washed and screened as they come from the mine, the fines only being milled, the coarse dumped out as waste. In other instances, the fines represent low-grade material, and these may be screened and rejected. A series of screening tests, followed by assays of the several grades, will usually show where the values are, and the result will suggest the proper method of treatment. There is usually found a point beyond which it is unnecessary to go for economic reasons, and that is the place to stop.

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IN the issue of the 14th ult., the statement was made in "Concentrates" that at Cripple Creek, Colo., ores containing not more than $10 per ton were not profitable. This statement has produced a number of inquiries from various parts of the country where gold ore containing $10 is valuable and produces a handsome profit. Cripple Creek ores are peculiar to that district, and are not as easily treated as free-milling ores, or as cheaply as telluride ores of the Black Hills of South Dakota. The charge for transportation and treatment of Cripple Creek ores, assaying one-half ounce gold, is $5.75. The cost of mining may vary from 75 cents to $3, according to the character and size of the vein. In many mines, while the mass of ore stoped from the vein may be placed in the ore bin at the surface for from $2 to $3 per ton (counting all costs), only a comparatively small amount —the fines—may contain the values. This raises the cost of mining the valuable ore very materially. The result of extraction will not average above 92%, which represents in $10 ore a loss of 80 cents per ton. Taking the average cost of mining at $3, the loss in treatment at 80 cents, and the smelter charge and transportation at $5.75, the total cost would be $9.55, leaving a margin of 45 cents for possible profit, and this the average miner does not view with favor, as the margin for success is small, and a small change in values to a point below $10 would mean loss.

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THE Coolgardie, West Australia, water scheme was taken up and built by the Government. A bill was introduced in the Parliament in July, 1896, and it finally passed the house in September, 1896. The work was completed on January 26, 1903, and cost £2,670,000, or only £170,000 more than the original estimate, which is a close result as public enterprises generally go. The scheme was designed to pump water from the Helena river, near Mundaring, to the summit of Mount Burges, near Coolgardie, a distance of 358 miles, the capacity to be 5,000,000 gallons each twenty-four hours. Those included in the so-called "trust" purchase water at a cost of 5 shillings per 1000 gallons. The particulars of the scheme are: Quantity of water to be pumped per day of twenty-four hours; length of pipe line from storage reservoir to Mount Burgos, 358 miles; diameter of steel pipes, 30 inches; velocity of water per second, 1.54 feet. The pipe line has a cubic capacity of about 70,000,000 gallons, so that water started from the reservoir does not reach Coolgardie until the fourteenth day; maximum lift from storage reservoir to main distributing reservoir, 1290 feet; weight of water pumped daily, 20,862 tons; net effective horse power required, 3129; horse power of engines in reserve, 2475. Total horse power, 6187. There are twenty stations and sixty-five pumping engines on the line. From the Mount Burges reservoir the water flows by gravity to the mines of the district.

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WHERE zinc shavings swell up and rise above the solution in the precipitation boxes, if a two-pound weight is insufficient to hold them down, try twenty pounds. If that is insufficient, add more weight. A good way to arrange this is by making a lattice screen of wooden laths and placing it on top of the zinc shavings, and upon the lattice place a boulder or rock of sufficient size and weight to hold the zinc in place—this to be determined by experiment. The foaming of solution in zinc boxes is due to excessive alkalinity of the solution, owing to the presence of too great an amount of lime or other alkali. If lime is being used, reduce the amount until foaming ceases. The zinc shavings should be shifted daily, according to F. L. Bosqui, and during this operation the solution should be turned off and the flow through the boxes stopped until the precipitate has had time to settle before turning the solution on again. Some operators prefer the downward flow of the solution through the zinc to the upward flow, the latter being the common practice. Those favoring the former method claim that by the downward flow the result of precipitation can be more carefully watched, and that the disposition of the fine zinc to sift through and clog up the bottom screen is reduced. It is said that dipping the zinc shavings in a solution of lead acetate before placing in the boxes facilitates precipitation. Also that zinc shavings containing a small percentage of lead effect a better precipitation than those made from pure zinc. When renewing zinc at the head boxes, it is considered good practice to take zinc from the lowest box of the series and add it to the head box, as it is known that zinc upon which a small amount of gold has been precipitated will act more effectively than new shavings.

Some of the Ore Deposits of Colorado.

Written for the MINING AND SCIENTIFIC PRESS by ARTHUR LAKES.

In Colorado are some very peculiar mines and ore deposits, some that can hardly be classed under any conventional type. These anomalous mines are mostly in highly volcanic regions, in fact, some of them occupy the vents or throats of ancient volcanoes. A district remarkable for its peculiar mines is that around Rosita and Silver Cliff, 30 miles south of Cripple Creek. It is a region of intense vulcanity of no very ancient date. The rocks covering the granite have all been poured or ejected from volcanic vents in the vicinity. Some of these eruptions were highly explosive, as indicated by the quantities of volcanic ash and fragments of rocks blowu from vents and now consolidated into stratified tuffs and breccias. Alternating with these explosive manifestations were quieter eruptions in which molten lavas welled up in the throats of volcauoes, or in fissures, and poured in lava flows over the country. Besides tbe different modes of eruption there were many different kinds of volcanic rocks erupted; among them rhyolites, trachytes and several varieties of andesite.

Three or four miles north of the Bassick mine, Custer Co., is a peculiar mine called the Bull Domingo. It also has its ore deposits in an oval well; the ore occurs in this in thin coatings of silver-bearing galena, enveloping and encrusting granite boulders. The dump on which these granite boulders and shells have been thrown reminds one of a battle field, with massive round shot of grauite lying here and there and pieces of broken bombshells of glittering galena instead of iron. One of the main differences between the ore occurrences of the Bull Domingo and the Bassick is that the boulders are all of country rock, granite or syenite, while those of the Bassick are of volcanic lavas, such as andesite. "The Bull Domingo ore channel," says Emmons, "was not so much that formed by a crater of explosion by the complicated intersection of a number of fracture planes producing a zone of country rock, in which the included fragments were rounded by attrition, but more by the action of percolating solutions. At the same time explosive eruptions of igneous rock were taking place in the adjoining regions, and, by force of such explosions, heated gases or waters may have been injected through the fissures of the surrounding country rocks, and passing through this broken zone rendered more complete—partly by attrition and partly by solvent action — the rounding of the rock fragments in this zone and may have ejected some of them from near, the then, existing surface." A narrow dike of red syenite cuts the granite close to the ore deposits. West of the Bull Domingo is Silver Cliff. This area is underlaid by beds of stratified tuff containing large round, bomb-like masses of pitchstone.

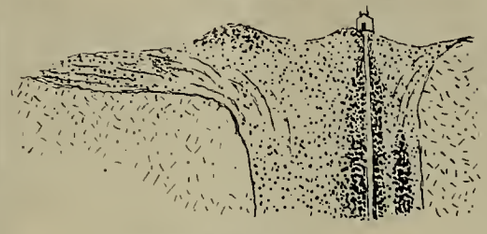
The Cliff, which gave rise to the name of the locality and was the first discovery, is a low, rusty bench of volcanic rhyolite breccia, seamed and stained; and in the seams, when first discovered, were quantities of horn silver. The deposit was worked by a large open quarry. Adjoining the Cliff is the Geyser mine. This mine has gone down over 2000 feet on a very uarrow, but rich vein, carrying galena, zincblende, copper pyrite, argentite, gray copper, ruby silver and polybasite. The shaft was driven down through the stratified tuff, in which it encountered fossil impressions of leaves and fragments of wood, showing that the comminuted material was hurled into the air from some neighboring explosive vent and fell into a lake on the site of Silver Cliff and was stratified by its waters.

Cripple Creek's mines, also situated in a highly volcanic area, are somewhat similar. The ore deposits may be grouped into ordinary fissure veins, ore deposits in shear zones and fractured zones, fissure veins following the lines of volcanic dikes, or at contact between dikes and breccia, or decomposed honey-combed granite, or dikes so impregnated with ore as to constitute veins. Seeing that these veins and ore deposits are located within the seat of a wide volcanic crater, we might naturally look about for peculiar volcanic manifestations such as fumaroles and the like. One of the most remarkable of these is at the Annie Lee mine. The ore deposit here is a body of cylindrical form, 12 to 15 feet diameter, dipping steeply and almost vertically from the surface to the bottom of the mine. The ore body occurs in the course of a dike 2 to 4 feet thick, which at the surface appears cutting right across the middle of the deposit. The deposit on either side of the dike consists of a friable puddingstone composed of small pebbles or pellets of phonolite and breccia surrounded on the edges by kaolin, which together with telluride ore constitutes the cement. The rock may run as much as 300 ouuces in gold, although no ore is visible to the naked eye. The ore body represents the neck of a hot spring or fumarole, such as abounded in the district after the subsidence of volcanic activity. Ascending hot water kaolinized the feldspathic constituents of the rock and deposited the other metallic minerals.

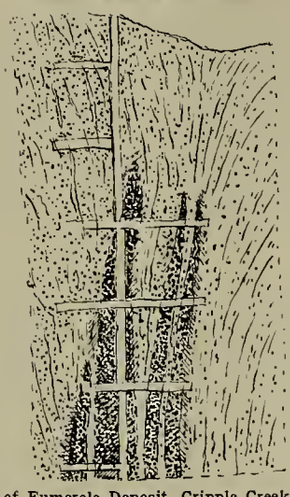
The difficulty of developing this oval, well-like ore body resulted in a fatal accident. The shaft, timbered by square sets, descended into the deposit through the center. The ore beiug very rich was robbed from around the shaft, leaviug it partially unsupported. A big rock fell in from the side and crushed the shaft like jack-straws, killing eleven men who were ascending in the cage.

At Leadville there is nothing very peculiar unless it be the fact that the horizon known as the "lead-silver belt" changed to a gold belt at the southern end of the camp, the change being probably due to a preponderance of siliceous and pyritic porphyry at that end. Another region of queer mines is that of the Sau Juan, composed of enormous accumulations of andesitic breccia and other volcanic rocks. Most of the veins are fissures.

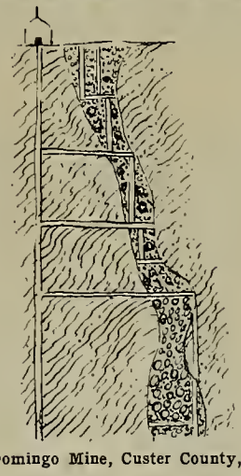
The mining town of Ouray is situated in a deep, pit-like depression, in the San Juan plateau, surrounded by steep cliffs of sedimentary rock capped by an enormous thickness of volcanic breccia. Hot springs abound, and the upper part of the town is located on the Travertine deposits of ancient extinct



Bassick Mine, Rosita, Colo.



Type of Fumerole Deposit, Cripple Creek, Colo.



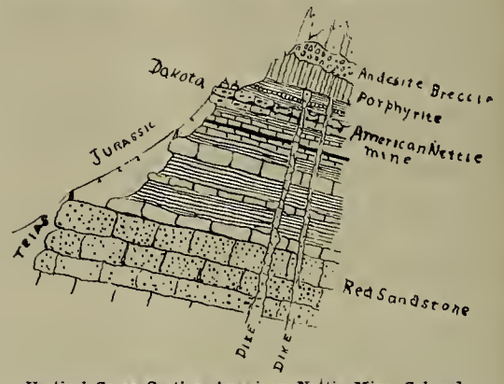
Bull-Domingo Mine, Custer County, Colo.

hot springs. The cliffs are riveu by dikes. The succession of strata from below up is, first, Carbouiferous limestone, then a great thickness of massive red Triassic sandstone, followed above by thinner beds of Jurassic shales, marls, limestones and sandstones, capped by a thick bed of quartzite belonging to the Dakota Cretaceous. It is this quartzite bed that contains the peculiar deposits of the American Nettie. Above the quartzite are beds of Cretaceous shale traversed by a sheet of porphyrite, and the top of the hill is capped by andesitic breccia worn by erosion into fantastic spires and pinnacles. Dikes of porphyrite and breccia cut all the formations from the base to the volcanic cap.

The ore deposits of the American Nettie were discovered in a zone of holes and caverns occupied principally by mountain rat's nests, so that it was said that at first they shipped mountain rat's nests and gravel rich in free gold. The cavities occur in the vertical jointing planes and at their crossiug of the bedding plaues of the quartzite. An adit tunnel enters the zone of cavities and follows down the gentle inward dip of the strata into the mouutain. There are upwards of 5 miles of intricate workings ramifying through these quartzite beds into the heart of the mountain.

On either side of the tunnel we observe cavities and vugh, or "bug" holes, as the miners call them, from a few inches in diameter to others large enough for a man to crawl into. The cavities are usually elliptical in shape. Some are smooth inside as if water worn, others are lined with quartz crystals or with a coating of gouge. Sometimes part of the cavity is filled with oxidized ore, in part with sulphides, and part with quartz crystals. Some cavities are completely lined with quartz crystals alone and are destitute of ore. In some the ore is brown oxide, in others solid sulphide. In most the ore is loose and friable and is carefully scooped out with a long scraper, the walls brushed clean and a light inserted to see if all the ore is taken out. Sometimes the ore occurs as veins along cracks. Narrow dikes of volcanic breccia at times make ore at contact with the quartzite, though themselves barren.

Above the quartzite lies the black impervious shale forming the roof. Ore rarely occurs at the contact except when there is a bulge or roll of the shale in the roof. When the quartzite is locally less metamorphosed or in the condition of an unaltered sandstone, ore is scarce, but increases when the rock becomes more quartzitic. Ore also is found at contact with a large porphyrite dike which cuts the quartzite.



Vertical Cross Section American Nettie Mine, Colorado.

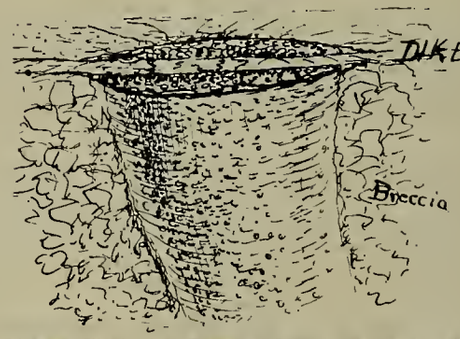


Diagram Illustrating Fumerole Deposit, Annie Lee Mine, Cripple Creek, Colo.

American Nettie Mine.

The ore zone, or gold belt, as it is locally called, is traceable for several miles, and numerous mines are located along it. Sometimes there is a mineralized seam connecting the cavities, again there may be no visible connection at all. Zones of crushed rock occur, due to local faulting, barren of ore.

The Nettie mine is remarkable for the great variety of ores found in it. There are copper pyrites, peacock copper, iron pyrites, silver-bearing galena, zincblende, gray copper, native copper and carbonate of copper. Tellurides also occur, together with bismuth. Green and blue sulphate of iron, or copperas, is common, resulting from secondary alteration of iron pyrites.

The ore may ruu from 2 ounces to 105 ounces gold. Pockets of moderate size have yielded $30,000 to $40,000. Part of the ore is concentrating, part smelting and part free milling.

The remote origiu of the ore deposits seems to be connected with the dikes and intrusions of eruptive rock. Heated waters or vapors ascending with the eruptiou of the dikes circulated among the joints and interstices of the sandstone, metamorphosing the rock into quartzite and eating out soft places, filled the cavity so formed with sulphide ores, which sub-

sequently became oxidized and broke up into friable matter, containing more or less free gold.

The cavities appear to have been first hollowed out and then filled with ore and vein matter, as there is often a lining of quartz crystals, and when the ore is removed the cavity shows a round, smooth face, with no gradual fading of the ore into the country rock, as there would have been had the ore been deposited by metasomatic replacement.

Crystallization of Copper Sulphate at the United States Mint.*

Written by HAROLD FRENCH.

In the United States Mint at San Francisco, Cal., the refining of gold bullion is almost exclusively confined to the sulphuric acid process. The crude gold, having been melted with 2½ parts by weight of fine silver, is poured into the form of thin, rectangular slabs, averaging in thickness ¼ of an inch. These slabs, which are commonly called "granulations," are then conveyed to the refining department, where two cast iron kettles are each charged with 600 pounds of the alloy.

PROCESS OF REFINING THE "GRANULATED" METAL.—Into each kettle the contents of a drum of concentrated sulphuric acid (66° B.) is siphoned and beneath each a coal fire is maintained for nearly twenty-four hours. At the expiration of this time, the silver is nearly all dissolved and the almost saturated solution of silver sulphate is siphoned from the kettles into a silver precipitation tank. The refined gold is then transferred to four smaller finishing kettles, where final boiling with concentrated H_2SO_4 reduces the gold to the fineness requisite for coining purposes. The silver sulphate solutions drawn down from each kettle contain nearly 900 pounds of the metal, which is reduced to fine silver by copper in the form of slabs placed along the sides and bottom of the tank. The precipitation of the silver is facilitated by diluting the solution down to 21° B, and keeping it at the boiling temperature by means of live steam forced through an open jet.

TREATMENT OF THE COPPER SULPHATE SOLUTIONS.—After about twenty-four hours the silver is entirely reduced, and, no trace of silver being detected upon the solution with salt brine, the copper sulphate solution is then siphoned down into the yard, situated in the interior of the mint. There it is received in one of two lead-lined boiling tanks, in which are coils of steam pipe which effect the necessary evaporation. The copper sulphate solution, as received, averages 26° B, and, according to the average of certain assays, is of the following composition:

	Pounds.	Per Cent.
Copper	300	3.16
H_2SO_4	3000	31.58
Water	6200	65.26
Totals	9500	100.00

The above proportions vary slightly with inconsequential percentages or traces of the sulphates of base metals derived from the boiling of the "granulations." The principal impurity is in the form of ferrous sulphate, the amount of iron dissolved in each tank averaging 3 pounds, or .000316 of the entire volume.

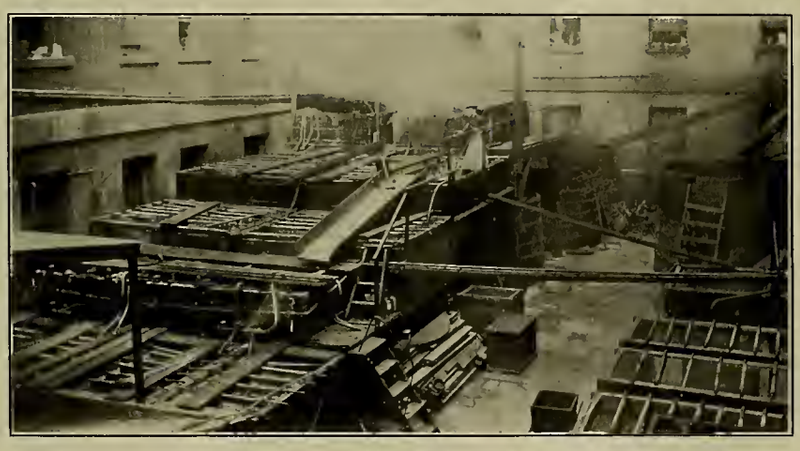
Each tank is boiled from six to seven hours when the solution is concentrated to 33° gravity—about 2700 pounds of coal being required to effect this much evaporation. The solution is then allowed to remain on the hot coils over night, when it is found to have gained from 5° to 6° in density, thereby saving fuel. It is then warmed, allowed to settle for an hour to eliminate any particles of metallic silver which may have been mechanically carried down by the siphon. At a specific gravity of from 38° to 40°, it is drawn down into one of the eight lead-lined crystallization tanks.

This density insures an abundant crop of crude crystals of "bluestone," but is not sufficiently concentrated to allow the formation of crystal sulphates to any noticeable extent. The boiling tanks are covered with a sloping roof, from 2 to 6 feet above the solutions, which prevents their dilution by the accumulation of rain water, while its height is sufficient to prevent condensation. The solutions are allowed to remain in the crystallization tanks from six to ten days, according to the speed with which refining operations are being conducted.

Five points are essential to good results in crystallization; namely, (1) the solution must be concentrated to nearly 40° gravity; (2) the density must remain constant during the first few days, crystallization being retarded by the addition of water or of fresh solution in any appreciable quantity, and the solution must be undisturbed; (3) the tanks must be clean, since dirt checks the molecular attraction through which the crystals form; (4) over 225 square feet of lead surface must gather the crystals which form on the sides, bottom and on the aprons of lead suspended from bars placed across the tank; (5) sufficient time must be given for the production of bluestone, all other factors being observed; this varies directly with the time allowed for crystallization.

Upon discharging the tanks the supernatant liquor is siphoned below into tanks where the remaining 60 or 70 pounds of copper still in solution are recovered by precipitation with scrap iron. The remaining crystals of crude copper sulphate, averaging 1000 pounds to a tank, are chopped from the surfaces to which they cling, with a tenacity increasing with their age. These crystals are shoveled into a dissolving tank where they are dissolved in hot water until a density of from 30° to 32° is reached. At this point the solution is drawn into one of seven final crystallization tanks, each having a capacity of 115 cubic feet. At this density only the pure sulphate of copper forms, all impurities from the crude crystals remaining in solution. In the second crystallization the solution stands from eight to ten days, and then the mother liquid is pumped back into the dissolving tank by means of a steam injector, and is used again to dissolve the crude crystals.

The pure "bluestone" is shoveled upon a drain board, where the crystals are washed carefully and the drainings, containing from 20 to 25 pounds of copper in solution, are saved in small tanks where the copper is precipitated with iron filings.



Copper Sulphate Plant, United States Mint, San Francisco, Cal.

The crystals are finally spread out in a drying house on a floor of sheet lead, under which steam pipes maintain a heat sufficient to dry the crystals thoroughly, care being taken to avoid the formation of the white, anhydrous copper sulphate by overheating. The bluestone is then barreled and sold to the wholesale dealers, this article being used by orchardists, wheat growers, electrical concerns, etc.

RECOVERY OF METALLIC COPPER.—The mother liquid solutions which are drawn into the cement-copper tanks beneath the series of crystallization vats contain from 60 to 70 pounds of copper. This metallic content is recovered by precipitating with scrap sheet iron and tin. Galvanized sheet iron is a splendid precipitant. The decomposition of the iron is hastened by warming the solution by means of a perforated steam pipe, the copper being thrown down in a spongy state comparatively free from iron. This copper is digested with warm acid solutions which free it of most of the remaining iron—leaving but a small percentage which can be readily slagged off by the melters. The copper is "sweetened" and dried previously to melting. By the use of a hammock-like sieve of copper wire, the scrap iron may be suspended in the solution, the fine copper falling through the meshes to the bottom of the tank, and, upon cleaning out the precipitation tank, the remaining pieces of iron are readily lifted out in one compact bundle.

The accompanying engraving illustrates the copper sulphate plant at the mint in San Francisco, Cal.

*Cal. Jour. Technology.

The Copper Deposits of the Kaibab Plateau, Arizona.*

Written by E. P. JENNINGS.

These copper deposits occur on the top of the Kaibab plateau in Coconino county, Arizona, and extend from the northern edge of the Grand Canyon of the Colorado river to near the Utah State line. The best developed deposits are near Jacobs lake, 30 miles south of the Utah line, where they are 16 feet thick, of unknown width, and are more or less continuous for 5 miles.†

From Jacobs lake to the edge of the Grand Canyon, a distance of 40 miles, outcrops of ore have been found, but no explorations have been made except those of wandering cowboys and hunters.

The Kaibab plateau, the highest of the Colorado river plateaus, is a great uplift, about 90 miles long from north to south, and from 10 to 20 miles wide from east to west. Its southern face is the Grand Canyon; its western boundary, a N.-S. fault plane, which separates it from the Kanab plateau, lying 1500 feet below. Its eastern edge is a monocline which brings the horizontal beds of the high plateau to the level of the plateau country of eastern Utah.

The elevation of the plateau near the Colorado river is over 8000 feet, and about 6000 feet at the Utah line. Its structure, as shown by the western fault, consists of about 500 feet of Aubrey limestones underlaid by 1000 feet of red sandstones. The limestone is the upper member of the Carboniferous, and is overlaid by the marls and shales of the Permian, 25 miles to the north on the Kanab plateau. At the town of Kanab, near the Utah line, the Permian strata pass under the magnificent red sandstone cliffs of the Triassic, that rise to heights of 1000 feet above the desert. The Grand Canyon exposes a section a mile deep at the southern end of the plateau, showing all the formations from the Archæan to the top of the Carboniferous.

The mountain mass, cut by two sections, the canyon and the western fault, shows no mineral veins or mineralization, above the Pre-Cambrian, near the bottom of the canyon. These ancient metamorphic strata contain a few copper-bearing dikes, with the usual contact impregnation of copper ore and copper-stained rock. All the Paleozoic strata are barren, both in the canyon and along the western fault, until the copper beds are reached at the top of the plateau.

I have described the formation of the plateau, for the purpose of showing that the possibilities of any connection between the copper veins and dikes of the Pre-Cambrian, and the horizontal copper beds of the Carboniferous limestones are, to say the least, very remote.

The ore beds are white chert, impregnated with malachite and azurite; small amounts of earthly cuprite, copper glance and chalcopyrite have been observed. Silver and gold are present in very minute quantities. The ores range from 2% to 40% in copper, and average 7%. They are too siliceous for smelting, but are good leaching ores.

Some leaching experiments have been made in a small way, but no copper has been produced commercially. The ore is covered by a few inches of soil and often outcrops. The upper portion of some of the beds have been leached, leaving a mass of honeycombed iron-stained rock. The beds are intersected by many small faults; the ore near these faults has been crushed and recemented by silica and copper, showing that the period of deposition was long. The quantity of ore cannot be accurately estimated from the small amount of development work done, but it is believed that 1,000,000 tons of 7% ore can be put in sight at the Jacobs lake beds alone.

I am not aware that any theory has been advanced to explain the occurrence of these ores. Evidently, they are replacements of the limestone by silica and copper. The ore-bearing solution was a descending carbonated alkaline water, which dissolved both silica and copper from the Permian and Mesozoic measures, that, in former time, covered the Carboniferous. This theory is rendered more probable from the fact that the Triassic sandstones to the north and east are copper bearing, and sufficiently so to be mined at a profit. There are no known eruptives that could furnish the copper, except the dikes of the Pre-Cambrian, a mile below the present copper horizon. I consider it a case of solution from a great mass of superimposed rock, and the precipitation by chemical means at one horizon, the Aubrey limestone being the precipitant.

The deposits can be considered as horizontal bedded veins, from which the hanging wall or roof, and also much of the ore, has been removed by erosion. The beds are similar in physical characteristics to the iron deposits of the Mesabi; the taconite or iron chert of the latter corresponding to the copper chert of the Kaibab. The chemistry of the formation of the two may be alike, but the Kaibab ores lack the subsequent enrichment the iron ores have received.

*Abstract Trans. Am. Inst. Min. Engs.

†Similar deposits occur on the south side of the Grand Canyon, presumably due to similar causes, and in all probability are older than the canyon, which has simply cut a drainage way through the strata, separating the two districts.—ED.

Acid Making From Pyrrhotite.*

NUMBER II—CONCLUDED.

By E. A. SJOSTEDT.

This roaster is shown in Figs. 1 and 2. Fig. 1 presents a battery of four furnaces in horizontal cross section on broken lines, 1——1, 1′——1′ and 2——2 on Fig. 2 showing the combustion chambers a^5, the lower and upper heatiug chambers a^4 and a^1, and the lower or discharging hearth A 5. Fig. 2 shows a sectional elevation of the battery on lines 3——3, on Fig. 1, through the ceutral columns of the furnaces, one side shown with the rabbles and one without. A1—A5 are five straight arched hearths, and a^1, a^4 and a^5 the combustion and heating chambers. The flow of the fuel gas and combustibles is indicated by arrows. The gas or oil, entering from main F3, through branch F3 and a suitable burner into the combustion chamber at F and F1, strikes the hot baffle walls and is readily ignited, passes through the chamber and reaches the flue D, which leads to the heating chamber a4 over the lower roasting hearth. This chamber also being provided with a baffle wall E, which extends to and surrounds center shaft 1, separating the gas inlet from its outlet; the combustibles are compelled to make a full turn here before passing out and up through the upper section of chimney flue D to heating chamber a1. Here it makes a similar circuit before finally passing out through the last section of D and flue D1, to stack K, which is in common to the whole battery of four

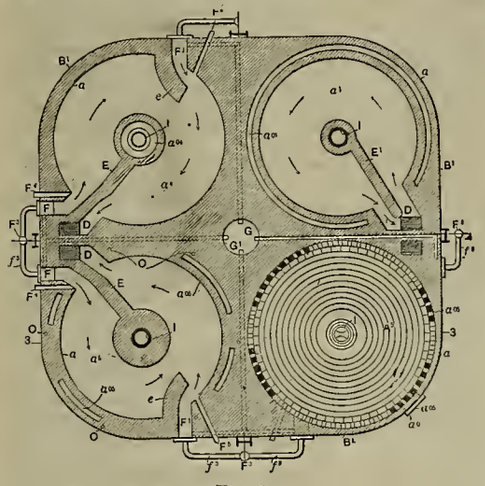


FIG. 1.

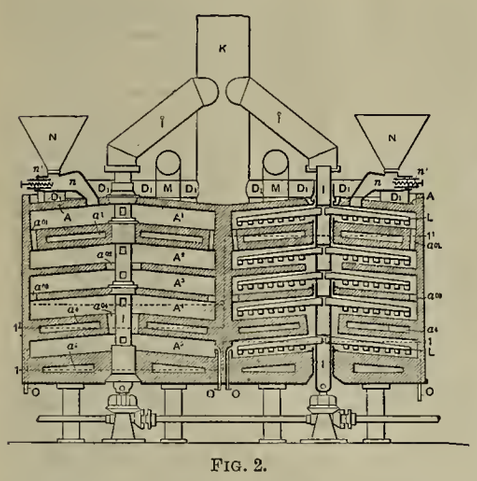


FIG. 2.

roasters. F4 and F5 are peep holes, for inspecting the heat and the combustion iu the heating chambers. G is an air receiver ("hot blast") in the center of the battery into which the air of combustiou is introduced under pressure and heated from the brick walls with which it is surrounded, and thence carried through blast pipes B2 to burner at F. The ore finely crushed is introduced through au opening in the top of roof A of the upper roasting chamber to the hearth A1, by feed tube n, provided with an automatic screw charging device n1. Owing to the bottom heat furnished by the heating chamber aL, the ore is soon dried and is moved towards the circumference by the teeth of arms L, fastened to the revolving center shaft I, and finally drops down on hearth A2 through rim discharges a o 1. The arms of this hearth, having their teeth placed in opposite directions to those in hearth a1, now cause the ore to move towards the center, and discharges it through center openings ao2 on hearth a3, and the ore is thereupon moved toward the circumference, drops through ao3, on the shelf a4, and is then moved towards the center and discharged on shelf a5, and finally through ao5 and spout ao6 in the ore conveyor. O are pipes admitting and controlling the air supply for the roasting of the ore, and M is a cast-iron pipe leading from the top of arch A of each roaster and through which the sulphurous gases pass out from the roaster to the main gas flue.

Four of these batteries of kilns—16 units—have been built with a total capacity of treating forty tons of ore per day; also a crushing plant has been installed, consisting of one 24x15-inch jaw crusher, two 36-inch rolls and two revolving screens of No. 16 mesh with a capacity of pulverizing about eighty tons of ore per shift of ten hours; also two water-gas generators, each having a capacity of producing 20,000 cubic feet of water gas per hour, or with a total capacity of about 800,000 cubic feet per day; also an electric installation of three 95 H. P. motors for supplying the required power.

THE ROASTING GAS.—At first water gas was used as an axiliary fuel, but by gradually improving the details of the roasters and gaining in experience we finally succeeded in doing without it, and since then have roasted our pyrrhotite without any extraneous fuel (even at times when the sulphur in the ore averaged but 20% to 25%, producing a gas of sufficient strength 6.10% SO_2), for making bisulphite liquor and liquid SO_2; also a fairly well roasted ore, running as low as 20% to 75% S when admitting a liberal amount of air and obtaining a weak gas, but generally from 1% to 3% S when producing a good gas.

A glance at the chemical reactions taking place in burning sulphur and in roasting iron sulphides will assist in forming an intelligent idea of the maximum strength of gas obtainable, as well as of the efficiency and significance of a 10% SO_2 gas from pyrrhotite.

When burning sulphur: $S + 2O = SO_2$, i. e., all the O combines with the S to form SO_2. When burning pyrite: $2FeS_2 + 11O = Fe_2O_3 + 4SO_2$, i. e., 8 parts of O out of 11 unite with S to form SO_2. When burning pyrrhotite: $Fe_6S_7 + 23O = 3Fe_2O_3 + 7SO_2$; i. e., 14 parts of O out of 23 unite with S to form SO_2. When burning pyrrhotite: $2FeS + 7O = Fe_2O_3 + 2SO_2$; i. e., 4 parts of O out of 7 unite with S to form SO_2. The roasting being accomplished by means of air instead of undiluted oxygen (containing 21% O, by volume), we readily find that the highest theoretical percentages of SO_2 obtainable are the following: When burning sulphur, S: $21 \times 2 \div 2 = 21\%$ SO_2 max. When burning pyrite, FeS_2: $21 \times 8 \div 11 = 15.27\%$ SO_2 max; when burning pyrrhotite, Fe_6S_7: $21 \times 14 \div 23 = 12.78\%$ SO_2 max; when burning pyrrhotite, FeS: $21 \times 4 \div 7 = 12\%$ SO_2 max.

The annexed tables from our daily records of two weeks run in February last, during which time we used pyrrhotite only (and that of an inferior grade), will furnish exact data of results obtained under such circumstances.

Composition of ore used, average sample taken from each 40-ton lot:

	a	b	c	d	e	Average.
Insol.	24.74	29.20	24.95	21.63	16.10	22.50
Sulphur	26.30	23.81	24.67	27.60	29.90	24.46

Roasting results (average of tests made each hour):

February.	11-12	13-14	15-16	17-18	19-20	21-22	23-24
Strength of gas, % SO_2	8.60	8.30	7.90	7.90	7.40	7.60	7.70
Roasted fines, % S.	1.66	1.86	2.04	2.54	1.78	0.95	1.86

During these two weeks we treated 210 tons of pyrrhotite, containing 111,112 pounds of sulphur, and recovered 191,917 pounds SO_2, thus obtaining an efficiency of 86%. The average working cost, exclusive of heating and lighting the building, amounted to $1.86 per ton of ore treated, distributed as follows:

Labor	$1 12	Crushing	50
Power	24	Roasting	75
Repairs and sundries	50	Sup. repairs and sundries	61
	$1 86		$1 86

If to this amount we add depreciation of plant (say, 14 cents per ton), the cost of the raw ore (say, $5 per ton) and the cost of briquetting the fines (say, 75 cents per ton), and then subtract the value of the briquetted ferro-nickel ore—which we will assume to be equal to that of the unroasted ore, or $5 per ton—we obtain a total of $2.75 as the cost of 914 pounds SO_2, equal to a rate of $6 per ton of SO_2 gas recovered, corresponding to $12 per net ton, or $13.44 per gross ton, sulphur.

It may be well to state here that at first no other raw material than pyrrhotite was used for the acid making; but some valuable deposits of pyrite having been discovered in close proximity to the company's iron mine, it was decided to use some of it at times when treating a low-grade pyrrhotite, or when an extra supply of gas would be required. During the last half year's run a few hundred tons of brimstone were also used, on account of shortage of both pyrrhotite and pyrites from the mines, caused by the company's financial condition at that time. Altogether 10,000 tons of pyrrhotite and 3000 tons of pyrite have been roasted in these kilns and 375 tons of brimstone used as raw material at our acid plant up to the present time.

*Abstract Trans. Can. Min. Inst.

Mica and Its Applications.

Mica is a substance that is now so very common, that to conjecture as to what would have been the influence on electrical industry had the substance not been a commercial article would be difficult; indeed, as regards electrical progress, mica has always beeu, as it were, ready at hand to aid any discovery or improvement, says a writer in the Electrical Engineer of London. On the discovery of the principles of the self-excited dynamo, which marked the advent of both a scientific and commercial evolution, it seems a most fortunate coincidence that such a material should have been to hand, and one that so successfully filled in, so to speak, the interstices of modern progress. Just before this time some practical use to which mica could be applied was being diligently sought after; now, however, what is required are new sources of supply to cope with the multifarious demands for the material. The substance has become now as essential to every branch of electrical engineering as electricity itself seems to be to human progress.

From a geological point, mica, slate and gneiss are the oldest stratified rocks that we are acquainted with. That it was known in past ages is evident from the many marks of ancient operations to be found in mines, and in so many places, for the material was employed for windows, mirrors and ornaments in the early days. In some form or other mica exists all over the earth; it may be found in granite and associated with quartz, tourmaline, feldspar, lepidolite, and many other minerals. It varies in color from white through green, yellowish and brownish shades to black, and its color is greatly influenced by the mineralogical peculiarities of the rock in which it occurs or has been associated, and its commercial value varies also with these circumstances.

One of the most important properties of mica, and one on which its value depends, is the remarkable property of lamination, its structure being so perfect that it is possible to divide it by cleavage into leaves $\frac{1}{250000}$ part of an inch. In consequence of its powerful insulating property, and also the very great advance made in electrical industries, the demand for mica at the present day in almost every country is so great that the supply is almost inadequate. It is not only the superior insulating property of the mineral that gives it such an advantage, but its characteristic and peculiar structure which makes it so adaptable as an insulator requiring very little machining or shaping; for instance, it is a substance which could not be well replaced as an insulator of commutator segments, for it is not only the best, but au efficient insulator under every condition. In the case of the commutator its hardness makes it invaluable, for it wears away under the friction of the brushes nearly at the same rate as the hard drawn copper of the commutator itself.

Further, the fact that heat has no injurious effect on either its physical structure or insulating property makes it almost indispensable in armature construction, safety appliances, and a multitude of industrial applications, such as lamp chimneys, smoke radiators or preventers, and all purposes where transparency, infusibility and toughness are required. As is the case with the incandescent burner chimneys, it is also taking the place of glass in many respects, especially on board ship, where its combined transparency and tenacity enable it to withstand the wear and tear and the concussion of heavy firing. The qualities of elasticity and toughness are properties in which it is not excelled by anything natural or artificial. These properties are taken advautage of in its employment as an absorbent of nitro-glycerine, and when so used explosions by percussion are rendered less liable, while at the same time nothing is taken from the nitro-glycerine; and for such purposes the pulmose mica is used, or that kind in which the scales are arranged in a feathery form.

The unalterable nature of the substance and its resistance to the corrosive action of acids, smoke and dust, make it also invaluable as a decorative material. The French silver mouldings are made with ground mica, which is accomplished by passing the prismatic or foliated material through a mill, which process increases the bulk forming a mass of translucent and beautiful bean-like scales. Mica is also being used extensively as a lubricant, and for such purposes it has no superior, except plumbago; it is likewise employed for boiler covering, as roofing material, and as fireproofing for safes, etc. As a reflector of light it has many applications, for it can be readily stamped into any desired shape. At the present time such reflectors are on the market in very many varieties, being admirably adapted to electric incandescent lamps.

Probably the most interesting and beautiful properties of mica are its optical, which, in connection with polarization of light, are both edifying and instructive. Mica under such conditions is what is called a biaxial crystal, which cleaves perpendicular to the bisector of the angle between the optic axis. Its properties in this respect are used for instructive demonstrations of the property of thin films.

There are so many ways of utilizing scrap and cut-

tings of this material in the manufacture of other insulating substances, such as micanite, etc., that it is almost impossible to find any real mica that may be pronounced useless.

The Park City Mining District, Utah.*

Written by J. M. Boutwell.

In August, 1902, the detailed study of the economic geology of the Park City, Utah, district was undertaken by J. D. Irving and the writer.

Sedimentary Rocks.—The sedimentary rocks of the Park City district include quartzites, sandstones, shales, and limestones. They constitute, according to their lithologic character and paleontologic contents, five distinct geologic formations. These are, from older to younger, (1) a massive quartzite, approximately 1500 to 2000 feet in thickness; (2) a calcareous series made up of normal limestones, considerable sandstone, and some shale, varying several hundred feet in thickness, from 600 feet upward; (3) a red shale with intercalated thin, argillaceous limestone and varicolored shales, ranging in thickness from 1000 to several hundred feet less; (4) a calcareous sandstone, normal sandstone, and varicolored shales, approximately 1200 feet in thickness, and (5) red shale with intercalated thin, fossiliferous limestones and calcareous sandstones, capped by coarse, conglomeritic, quartzitic sandstone, approximately 1000 feet in thickness. This group of five formations lies above a series of intercalated limestones, quartzites, and massive fossiliferous limestones of lower Carboniferous age several thousand feet in thickness and it lies below an immense thickness of red shale of Mesozoic (probably Triassic) age. Accordingly the geologic formations which outcrop within the Park City district are intermediate in age between lower Carboniferous and Triassic.

The geologic ages of individual formations in this Park City group are determined by means of distinctive faunas which characterize each of the two limestone formations. Thus the lower of these limestone formations, lying upon the massive quartzite and beneath the lower red shale, contain several members which carry faunas indicative of the upper Carboniferous. The underlying quartzite formation (known locally for many years as the "Outario quartzite," after the Outario silver mine in this formation) has thus far proved unfossiliferous. Its age may be closely limited, however, as it underlies the upper Carboniferous limestone, and carries intercalated in its basal portion fossiliferous limestones of lower Carboniferous (Mississippian) age. The upper of the two limestone formations bears a limited but distinctive fauna, which is unlike any described typical fauna. For the present it seems advisable to follow the usage instituted by the King survey, and to denominate these beds Permo-Carboniferous."

The lower red shale lying beneath this limestone formation and on the upper Carboniferous limestone has thus far yielded no remains of life and might be assigned to the age of either of the inclosing limestone formations. Inasmuch as its lithologic aspects are more characteristic of the overlying formations, however, it may reasonably be considered, for the present, to be "Permo-Carboniferous." The upper of these two red shale formations, although showing a dearth of organic life, presents a normal paleontologic and lithologic transition from the underlying "Permo-Carboniferous" (Paleozoic) limestone into the overlying Triassic (Mesozoic) sediments.

Igneous Rocks.—Although the field work of the last season has disclosed significant information regarding the igneous rocks of this area, it has failed to yield conclusive evidence on the relations between the three recognized types previously described as a fine-grained dioritic type, a coarser porphyritic type, and a poorly defined, variable, andesitic type. Facts observed both underground and on the surface tend to suggest, however, that these are three closely related facies. In case further study should show that they were derived from the same magma and were contemporaneous or approximately so, it is not improbable that the fine-grained, granular facies (dioritic type) may represent the present mass which, on breaking into the overlying sediments as restricted dikes, cooled in the porphyritic facies (porphyritic andesite), or breaking upward to the surface flowed out, blanketing the topography, and cooled as andesitic breccia (hornblende andesite). Final judgment in this case must be suspended until these rocks have been thoroughly studied microscopically and chemically. It now seems clear, however, that at least one, and probably two periods of intrusion preceded the above igneous activity. That an intimate relationship exists between these intrusions and the ore bodies which have been studied thus far seems indisputable. The determination of the nature of this relationship, however, is most difficult. Accordingly these problems assume immense practical significance, and their solution may reasonably be expected to throw light on the problems of the date, origin, and occurrence of the ore deposits.

Metamorphic Rocks.—The entire sedimentary section, embracing all of the clastic formations represented in this area, has been traversed by an extensive mass of the dioritic rock and penetrated by dikes of andesitic porphyry. Adjacent to the main intrusive body, and to some of the minor intrusions, the sediments have been intensely metamorphosed. Numerous contact-metamorphic minerals, such as garnet, epidote, magnetite, specularite, serpentine, spinel, secondary mica, and others have been developed, and the lithologic character of the sediments has been thoroughly changed. The determination of the precise nature of the metamorphism by tracing strata continuously from their unaltered phases through transitions into their altered representatives is attended with much uncertainty, owing to the obliteration of fossil remains by metamorphism and to the presence of complex and extensive faulting in the transition zone between the altered and unaltered sediments. The equivalency of certain marbles, quartzites, and argillites to certain limestones, sandstones, and shales has been recognized. Furthermore, metamorphosed sediments have been noted in localities which, though relatively remote from visible intrusive masses, are in the neighborhood of strong dynamic movement.

Geologic Structure. — The sedimentary formations of this region dip in general toward the northwest about 30° to 40°, and are traversed by many fissures, faults and intrusions. Normally the oldest formation therefore outcrops in the southeastern portion of the area, while younger formations outcrop successively toward the northwest. This general structure, however, suffers several important and many minor modifications through folding and faulting. In the vicinity of Park City proper, the general northwesterly dip of the formations gradually changes to a northerly and northeasterly dip, until, in the northeastern portion of the district, the dip is toward the east. In short, the general northwesterly dip gives way locally to a broad arch along a NNE. axis, which pitches northerly. The economic significance of this fact is that the two limestone formations, which in certain portions of this camp include valuable ore bodies, are thus preserved for some distance from burial beneath igneous intrusives to the north, and are brought into accessible positions immediately north and northeast of the city. This arch appears to have been faulted along a general NNE. zone of fracture at the east side of Deer Valley Meadow, with the net result that the eastern side has moved relatively a considerable distance to the south. To the south and within this general zone of deformation several hundred feet of sediments have been overriden and buried by strong overthrust faulting. McHenry canyon, the scene of some of the earliest mining of this region, follows for a considerable portion of its extent a great fault along which the displacement was not less than 2 miles.

The principal mineralized fissure zone, passing in a northeast-southwest direction through the center of the district, has been the seat of much faulting. On one of the fissures in this zone the northern side has dropped several hundred feet, and on another the south side has dropped considerably.

Pronounced faulting of direct importance to mining has occurred in the western portion of the district. In Empire canyon a fault truncates the "Permo-Carboniferous" limestones and throws their northern continuation westward for approximately a mile. A few hundred feet to the north of this fault in Empire canyon a northwest-southeast fault displaces the contact between the upper Carboniferous limestones and the Ontario quartzite, so that the north side is offset westward for several hundred feet.

Evidence, mainly of paleontological character, tends to show that the strata which form the ridges inclosing Thaynes canyon and White Pine canyon all belong to the "Permo-Carboniferous," and these ridges are duplications due to faulting along northeast-southwest planes. Other significant instances similar to those above described have been worked out, and many cases of folding and faulting have been observed.

In general there was fissuring in a northeast-southwest direction before the deposition of ore, and in northeast-southwest and northwest-southeast directions subsequent to both igneous intrusion and ore deposition.

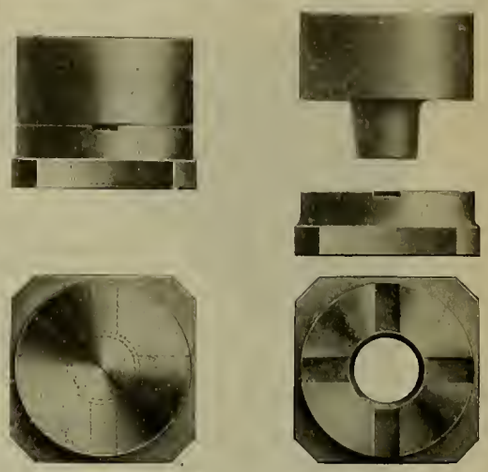
Glacial Features.—Evidences of local glaciation abound in the upper portions of the canyons which head on the higher divides and peaks. Although the exact succession of events during the period of ice invasion in this region cannot be stated here, the occurrence of typical features may be cited. These include characteristically polished and striated bedrock surfaces, rounded profiles of canyons, irregular kame-like deposits of mixed debris, erratics perched high on the sides of canyons, bowlder belts, lateral and terminal moraines, and other glacial features. Many of these are well developed in Lavigneur canyon, at the northwest fork of Snake creek, on Bonanza flat, in Empire canyon, Walker, Webster, and Woodside gulches, and Thaynes and White Pine canyons. About the head of Bonanza flat certain rock knobs and walls exhibit excellent polishing and striation. A limit of advance of each stream of ice appears to be indicated on the valley bottoms by heavy deposits of mixed unsorted soil and rock debris, which terminate abruptly downstream. The numerous bowlder belts typically displayed on Bonanza flat probably mark different positions occupied by the ice front. The Lady Morgan lakes, two small ponds just west of the Daly West shaft, are dammed back by a moraine. Collections of large, disordered masses of coarse rock debris simulating cirques at the extreme heads of valleys are best shown east of Clayton peak and Scott hill. Furthermore, glacial material composing the divide at the head of Woodside gulch; the flat-topped lobe between Walker and Webster gulches and Empire canyon; the narrow, attenuated spur between Woodside gulch and Empire canyon, and the straight, narrow, level ridge east of lower Thaynes canyon, indicate striking changes in topography and drainage produced by glaciation.

(to be continued).

* Abstract Bulletin No. 225 U. S. Geological Survey.

A Sectional Die.

One of the innovations in stamp mill forgings is in the sectional steel die made by the Chrome Steel Works of Chrome, N. J., and Brooklyn, N. Y. The die is illustrated by the accompanying engravings.



Sectional Die.

It consists of two portions—the base of cast chrome steel and the upper section or die of "adamantine" hydraulic-pressed chrome steel—which, it is claimed by the manufacturers, is the most economical material of which a die can be made, owing to its hardness and density. It is claimed that by the use of this die from 35% to 40% of the weight of the castings are saved, as the base is permanent and may be reused for years. When worn down, the remaining portion of the upper section is removed by driving a wedge in at the line joining the two sections at the point shown in the engraving. G. W. Myers, Hayward Bldg., San Francisco, Cal., is Pacific coast representative of the Chrome Steel Works.

New Style of Head Gear.*

To the Editor:—Some years ago the writer found it necessary to take the needed time to design a single-sheave wooden head gear that would give the maximum strength and durability with minimum timber and cost of construction. The result is the head frame shown in the engraving on the front page, which gives a clear idea of its construction.

The 32-foot head has 24 feet clear bucket way. The braces are made of ordinary iron pipe and can be placed lower or higher on any side so as to give any desired room for dumping the bucket. With 24-foot heads no braces are required. If it is desired to dump very high, it can be done by dumping over the brace.

The hoist is placed sufficiently near the head to allow the resultant line of force to come inside the feet. A Roebling sheave was used with ordinary horizontal boxes. It might be better to use a suitable angle box or cut the timbers to a square shoulder seat. However, several of these in use for several years have not given one particle of trouble.

By making the brace, which stays the rod and dumping chain, of the necessary length, and placing the frame brace at the proper elevation, the bucket can be dumped anywhere. The hoist man soon gets expert in dumping into cars or at a given place.

The advantages found in this sort of a head gear are its extreme simplicity and cheapness of construction. A 32-foot head, all complete, costs us here $145.05. Its great rigidity, strength and safety and its entire accessibility recommend it. There is nothing to interfere with general work around the shaft. It is practically working around a shaft without a head gear.

The iron caps at the upper ends of the legs are not necessary with good yellow pine, Oregon pine or similar wood. It is necessary with a head block

* See illustration on front page.

made of white pine, or a wood that would split easily, although not absolutely necessary with that.

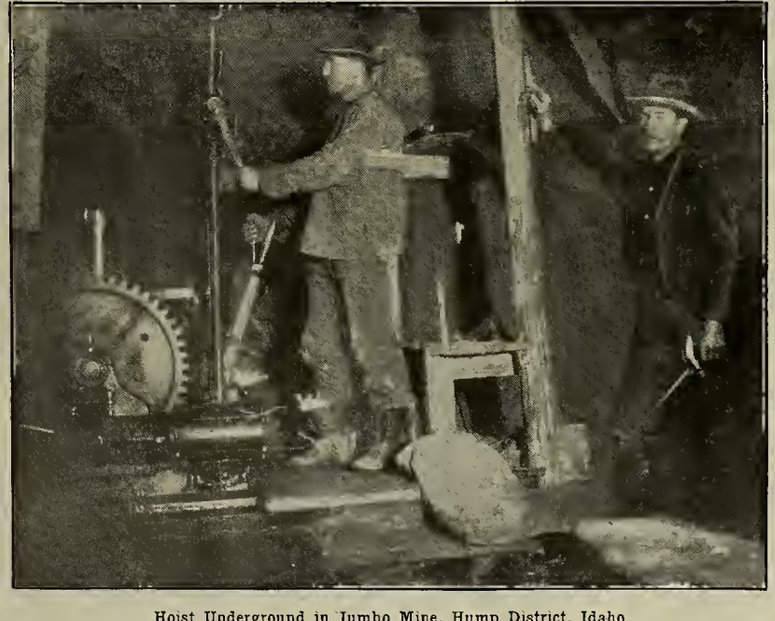
One of the heads of this description is on a working shaft over 600 feet deep. It has had incessant work for three years. It has not needed nor had a cent's worth of repairs and is as good as when erected. We expect to use it to at least 2000 feet depth. It is, of course, kept painted. The only things necessary are to keep the sheave greased and the bolts tight. The design is a departure from the ordinary, rather cumbersome, in-the-way sort, and experience indicates it to be an improvement over many in a practical way. F. L. STOCUM.

Concord, N. C., May 14.

Buffalo Hump District, Idaho.

One of the attractive sections of western Idaho is the new district known as the Buffalo Hump. It was discovered about four years ago, but owing to its inaccessibility, and the heavy snows of the winter, and the short seasons, the development of the region has been slow, attention having been directed to other districts more easy of access. The ore deposits are large, but of a grade which will insure satisfactory results when the region is made accessible by the construction of suitable roads, that the necessary machinery may be taken into the district to treat the ores. Up to the present time all supplies and machinery have been packed in. Among the latter is the Jumbo mill of twenty-four stamps, illustrated in the accompanying engraving, also the hoisting plant shown in another of the illustrations, which we are permitted to use through the courtesy of Alford Bros. & Stalutou of the Lewiston, Idaho, Tribune. The mines of the camp will be developed more extensively this year than in the past years, and it is hoped the State road, which has been building into the Hump section, will be completed this season. This will render the camp accessible and will also give an impetus to the development and equipment of the mines, which could not be possible without this necessary means of transportation. The mines are being systematically developed, however, and long tunnels are now being driven and others projected to reach the ore bodies in depth, the owners properly believing that this is the best way to advance their interests and to increase the value of their property, for, as they evidently think, with abundance of ore developed, railroads will build into the Hump camp to secure the assured business and to incidentally increase it—a result oft proven in mountain mining regions elsewhere. Other mines have ordered machinery, among them the Cracker Jack. Cyanide plants are among the latest additions to the metallurgical plants of the district.

Jumbo Mill, Hump District, Idaho.



Hoist Underground in Jumbo Mine, Hump District, Idaho.

Lake Superior Copper Mines.*

Written by HORACE J. STEVENS.

The old order changes, and a critical observer, well acquainted with the past history of Lake Superior copper mining, can note the great change that is now being made in the production of the district. With rare exceptions, the old mines are marking time, or going backwards, while the younger and more vigorous properties are gaining ground. That this should be so is not surprising, for the richest mine has its bottom, but it comes as something like a shock to the old residents, accustomed for a generation or more to consider the great mines as immortal. It should not be inferred, however, from the preceding statement that the old and large mines of the district are in danger of immediate extinction, or that their managements have grown senile. Such fine old mines as the Calumet & Hecla and Quincy will last for another generation at least, and discoveries of parallel cupriferous beds may prolong their life indefinitely. In the case of the Calumet & Hecla, such prolongation, due to the opening of new mines, is reasonably well assured, and the Quincy has several copper-bearing amygdaloids paralleling the great Pewabic lode, on which the mine is developed, although it was originally opened and worked for some years, in a small way and with indifferent results, on the Quincy amygdaloid. The improvement in methods and machinery has been marked during the past decade and every item of rock manipulation has been materially reduced. For this reason it is possible to mine and mill much lower grade rock than ever before, and some of the copper-bearing amygdaloid and conglomerate beds, pronounced worthless after exhaustive tests made many years ago, will eventually be worked at a profit. It is this possibility of developing parallel mines that gives hope for the remote future for the great old mines of the district.

The ore reserves of the Calumet & Hecla are variously estimated at ten to thirty years. The former figure is much too low, as the mine has ground opened ahead of the stoping parties for nearly that length of time, while the higher figure is based upon desires and hopes, rather than on tangible measurements and estimates. By virtue of lowered costs in mining and milling, the Calumet & Hecla can now work lower grade rock than ever before, and the limit has not yet been reached in this regard. The mine, however, has physical limitations, and while its territory west of the Tamarack undoubtedly carries the underlay of the Calumet conglomerate reef, the disappointingly low returns of copper given by all four of the deep vertical shafts sunk on the underlay of the conglomerate—three by the Tamarack and one by the Calumet & Hecla—renders it reasonably certain that at still greater depths the reef would prove still leaner, hence there is little likelihood that the Calumet & Hecla management will ever attempt to sink a 2-mile shaft to reach the conglomerate west of the Tamarack.

The objections to such a shaft, which has been given tentative consideration, are many and serious. As to time, not less than ten years would be required for sinking, and a longer period might be needed. The cost of sinking the shaft and equipping it with adequate hoisting machinery, compressors and rock houses would be not less than $5,000,000, and perhaps nearly twice as much. The heat of the mine openings at a depth of 2 miles would preclude work, except by the aid of artificial ventilation on a very extensive scale, and it might be necessary to reinforce this by artificial refrigeration. Last, but by no means least, the conglomerate might be found pinched to unworkable dimensions, or, possibly, cut out entirely, though the latter contingency is a possibility rather than a probability, and the copper contents of the rock would in all likelihood be very low.

The percentage of copper secured per ton of rock crushed is steadily decreasing at all of the old mines of the district. This is true of the Calumet & Hecla, Tamarack and Quincy, and the Atlantic is the only old property affording the proverbial exception needed to prove the rule. The Atlantic has always been of notoriously low grade, and its best stopes at the bottom of the mine show small change from those of the upper levels. It is evident, however, in the case of the Atlantic, as of the other extensively developed mines of the district, that the copper makes in courses or gigantic chutes that extend from surface to great depth, usually running somewhat diagonally to the dip of the copper-bearing bed.

Fortunately for the Lake copper district as a whole, mining and milling practice are as advanced here as in any part of the world, and the progress made enables the old mines to offset decreasing richness of rock at depth with greatly increased tonnages and greatly lowered costs per ton in every department of production. Among the important changes of the past decade have been the adoption of much heavier hoisting plants, high-pressure boilers, compounded engines, steam economizers, feed water heaters, automatic stokers, automatic hydraulic ash dischargers, electric underground haulage, improved crushers, heavier stamps, round mortars, hydraulic classifiers and discharges, coarse screens, improved jigs and slime tables and the introduction of several highly efficient forms of patented concentrating tables for the saving of fine copper formerly lost. In the smelters the reverberatory furnaces are several times as large as ten years ago. Water-tube boilers are heated by waste gases from the furnaces, dipping and casting are done with the aid of trolley lines, and one man does as much work as two did ten years ago about a smelter. All these improvements have united to greatly reduce cost, and have saved the day for the old mines of the district, but they have also set a new pace for the developing mines. Twenty-five years ago the experienced men of the district said that half a million dollars was needed to properly open and equip a new mine. Ten years ago the figure had been raised to a

* London Mining Journal.

million; but the experience of the new mines developed in the district during the past eight years show that this sum was an underestimate. At the present day an average of about $2,000,000 is needed to properly develop and equip an important new mine, allowing an average cost of $500,000 for the lands and promotion. In no other copper-bearing district of the world is the cost of making a mine so great as here; but there has been a proportionate increase in outlay required in all other districts. The principal reason why Lake mines are costliest to open and equip is found in the low grade of the rock, which necessitates miles of openings to feed the big mill that is needed to allow the mine to secure a considerable production and earn profits. The cost of opening the mines is usually less in other districts, as the ore is richer and the country rock less refractory as a rule. Timbering is frequently costlier. Power plants are usually much less extensive, and, consequently, far cheaper, as the Lake mines are the deepest in the world. The concentrators of the copper ore mines are far cheaper than the stamp mills of the Lake district. The cost of a Lake mill averages about $75,000 per stamp, and a modern 3-stamp or 4-stamp mill, which is the size commonly built for new mines, requires about eighteen months to build and costs a respectable fortune. In the item of smelting the Lake mines have a great advantage over any other district, as the raw charges fed to the furnace average 60% to 80% copper, and the gangue is merely adhering trap, conglomerate or amygdaloid rock; hence the only flux needed is a small charge of limestone. The big smelters and the intricate metallurgical processes common in many copper-bearing fields are unknown in the Lake Superior fields.

The sole disadvantage of the Lake district, as a whole, is the exceedingly low grade of its ore. This is a serious matter, and, were the district not so firmly entrenched, would prevent its development, with far richer ores abundant at a score of points on the world's surface. The advantages of the district are low labor and fuel costs, the best of rail and water transportation, ample capital, long experience and the best mining and milling equipment found in any mining field.

The Prospector.

During the past year a large number of mineral specimens (rocks, ores and minerals) have been received for determination, and the replies to this class of inquiry have heretofore been made in "Concentrates," but information of this character does not properly belong to that department of this publication, and it has been thought advisable to segregate the mineralogical and lithological features to a separate portion of this paper, and as the greater number of inquiries of this kiud come from prospectors, and miners engaged in actual mining, it seems proper to place this matter under the general and seemingly appropriate head of "The Prospector," where it will hereafter be found. It is not the intention to assay ores or to make analyses of any kiud, but to merely identify minerals, rocks and ores sent for that purpose that may be determined by simple means and by their physical appearance.

It is very necessary that an explanatory letter be sent with all specimens, either with the package or separately, at the same time, and it is also necessary that the sender place his name and address on each package, similar to that in the descriptive letter, as well as the location from which the specimens came. Following are the results of some recent investigations in this department:

The minerals from Manvel, Cal., are: 1. Limonite (pseudomorph after pyrite). 2. Same as No. 1. 3. Zinc blende in quartz. 4. Tourmaline in fine needles. The cassiterite at the Cajalco mine on the San Jacinto estate, Riverside county, Cal., occurs in a matrix of this black tourmaline. 5. Bismuth. 6. Pectolite. 7. Mica.

The specimens from Quartzsite, Ariz., are: 1. Orthoclase granite, in which the mica is much altered. 2. Aplite dike. 3. Metamorphic siliceous rock.

The specimens from Bishops, Cal., are: 1. Garnet, with a little copper carbonate. 2. Same as No. 1.

Specimens from Washington, presumably from Tacoma, are as follows: 2. Chalcopyrite in a gangue of dark siliceous rock. 2. Marcasite (white iron pyrite) and chalcopyrite (yellow copper sulphide) in quartz. 3. Chalcopyrite in quartz and altered greenstone.

Specimens from Winnemucca, Nev., are: 1. Clastic rock—fine-grained conglomerate. 2. Probably diorite (much decayed). 3. Diabase. 4. Granite.

The specimens from Rye Patch, Nev., having a metallic luster are pyrolusite (black oxide of manganese).

The rock from Battle Mountain, Nev., is hematite and is evidently of eruptive origin, being a much altered rock, in which hematite constitutes a large percentage

The two rock specimens from Shasta, Cal., are so much altered as to make their identification difficult. The minerals clearly seen are quartz and kaolinized feldspar. A dark-colored, dirty, greenish-brown mineral is evidently greatly altered hornblende. This is evidently diorite, or possibly grano-diorite. There is little difference between the two, one containing a little more quartz than the other, and is, in consequence, somewhat harder. Both rocks are stained with brown iron oxide.

The specimens from Canyon Creek, Mont., are: 1. Chalcopyrite in gangue. 2. Marcasite. 3. Altered country rock. 4. Diabase. 5. Malachite (green copper carbonate). 6. Altered greenstone.

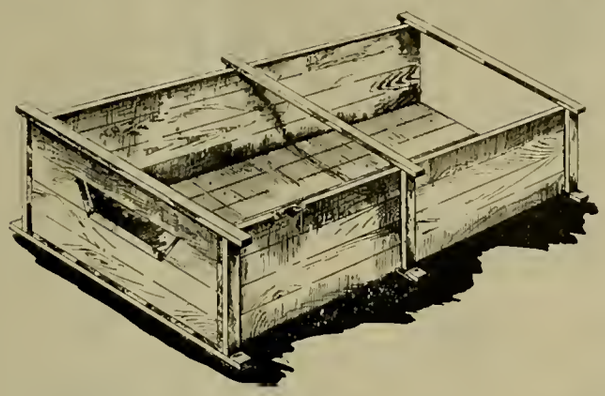
The rocks from Challis, Idaho, are: 1. Hornblende andesite. 2. Quartz diorite, much decayed. 3. Breccia. 4. Quartz, with antimony oxide.

The rocks from Bisbee, Ariz., are: 1. An eruptive rock, probably calcareous diorite, with abundant small crystals of magnetite, to which the dark color of the rock is largely due. The rock contains considerable disseminated copper sulphide, which might be concentrated to advantage. The values would probably be largely in the slimes. 2. Feldspathic rock containing much quartz and rhodonite (manganese silicate). 3. Greenstone (diorite).

A BILL has been introduced by Sir William Lyne in the Australian House of Representatives to provide bounties for the encouragement of the iron and steel industries in Australia. Should this bill pass and become law, as it probably will in a modified form, the imports of iron and steel from the United States will be largely affected. It provides a bounty of $2.48 per ton on iron and 10% on value of manufactures of iron and steel.

How to Measure Water.

One of the best and simplest devices for measuring water is the so-called Cipoletti weir. It consists of a rectangular box placed in the ditch, and through which the water flows. In the front of the box is a trapezoidal opening, over the base of which, known as the crest of the weir, the water flows. The accompanying sketch illustrates the weir.



Trapezoidal Weir.

Scale to be Secured to Side of Weir to Measure Volume of Water Passing Weir

Numerous tests have resulted in the construction of elaborate tables, by means of which, if the depth of the water flowing over the crest of the weir is known, the volume of water flowing through the ditch at any time may be determined.

Since tables are awkward to handle in the field, various devices have been made to allow those interested to determine, without measurement or table, the water flowing over the weir. The simplest of these devices is a scale, invented by T. P. Page of River ou, Utah, which may be screwed on the side of the weir. An illustration of this scale is also shown.

By the expenditure of a few dollars and a little labor, any one may construct such weirs as may be needed.

Dredge Buckets.

Herewith is illustrated a consignment of dredge bucket bottoms as they appeared in the shipping yard of the Taylor Iron & Steel Co., High Bridge, New Jersey. The sixty dredge buckets shown therein weigh 1700 pounds each. Part of them were for the new gold dredges being put in by Manager Hanford at Folsom, Cal.; the remainder are for the El Oro dredge, Oroville, Cal.

Dredge Bucket Bottoms.

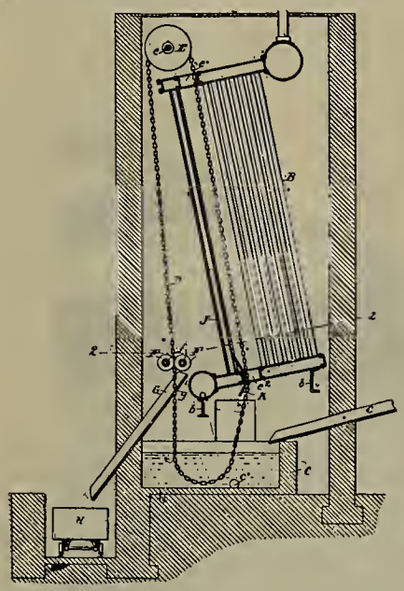
THE Mount Margaret gold fields of Western Australia, though only about six years have elapsed since their discovery, now ranks second in gold production in that region, according to the official reports. Originally a part of the North Coolgardie gold fields, it now comprises the three districts—Mount Malcolm, Mount Morgans and Mount Margaret.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 24, 1904.

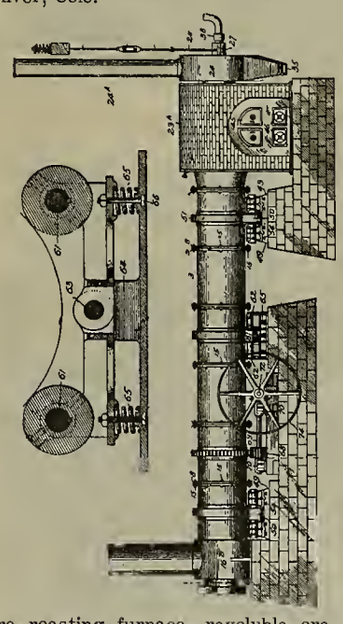
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SLAG FURNACE.—No. 760,172; R. Baggaley, Pittsburg, Pa., and O. S. Garretson, Buffalo, N. Y.



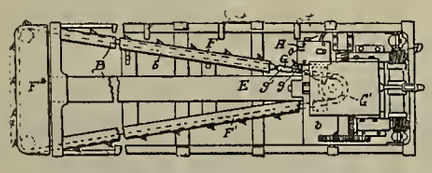
Combination of steam boiler, having upright heating passage, receptacle for molten slag arranged below heating passage, endless traveling slag carrier suspended in form of loop which dips with its lower portion into slag receptacle, elevating slag therefrom and passing with ascending portion, coated with molten slag, through heating passage for imparting heat to boiler, and mechanism acting upon carrier after it has passed through heating passage for detaching congealed slag from carrier.

ORE TREATING FURNACE.—No. 760,941; C. C. Wilson, Denver, Colo.



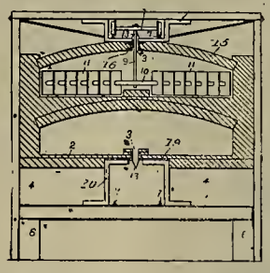
In ore roasting furnace, revoluble ore roasting chamber, and longitudinal shelves projecting from walls of chamber, shelves constructed to cause ore to drop from shelf to shelf and to move inwardly and outwardly on opposite sides of each shelf.

MINING MACHINE.—No. 760,575; F. L. Sessions and G. B. Norris, Columbus, Ohio.



In mining machine, combination with carriage, bed, and cutter carrying chain mounted upon carriage, of lubricant receptacle, valve, controlling flow of oil therefrom, means for guiding oil to chain, and automatically actuated tripping devices for intermittingly opening valve as carriage moves along bed to permit limited flow of oil.

ORE ROASTING FURNACE.—No. 761,049; W. H. Smyth, Berkeley, Cal.

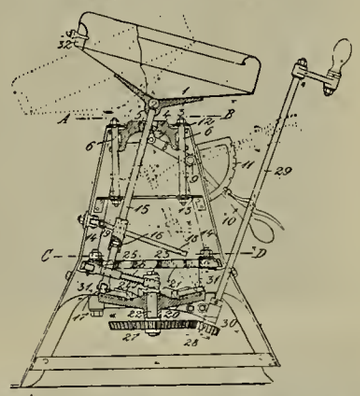


Slotted hearth furnace with rabble actuating devices projecting through slot, and laterally swinging plates or gates adapted to close slot, ends of which swing transversely across slot.

PROSPECTOR'S PAN.—No. 760,691; B. P. Herndon, Florence, Ariz.

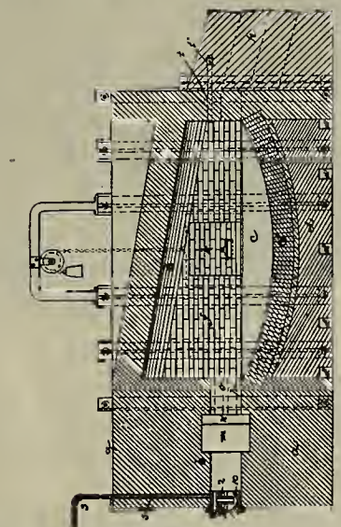
Portable prospector's pan having bottom and side walls, side walls being curved transversely or laterally in relation to bottom and pan being of substantial lune shape in general contour.

GOLD WASHING MACHINE.—No. 760,664; C. C. van der Valk, Voorburg, near The Hague, Netherlands.



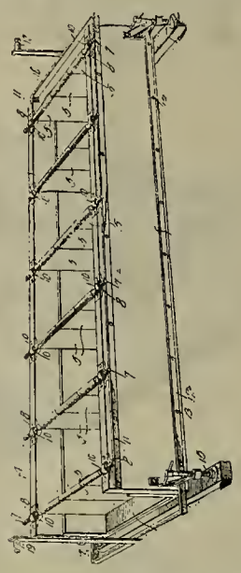
Gold washing machine comprising receptacle, bottom of which runs downwardly toward center, nonrotating support for receptacle, support being provided with recess, and receptacle having opening communicating with recess, means for simultaneously giving receptacle constantly changing inclination and up and down motion, whereby specifically heavier bodies contained in charge in receptacle are caused to advance toward recess.

FURNACE FOR MELTING METALS.—No. 760,495; J. Southern, Belleville, N. J.



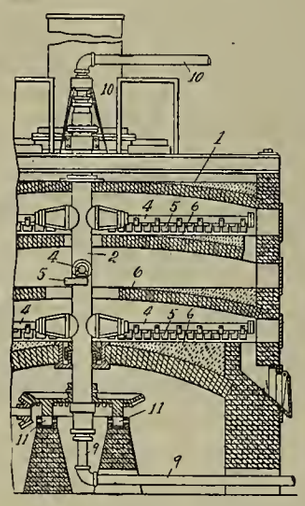
Melting furnace having wall a, melting chamber beyond wall, plurality of combustion chambers formed in wall and branching at ends next melting chamber to provide increased number of discharge openings to discharge heat into melting chamber, and means for supplying heat.

PROCESS OF RECOVERING METALS FROM ORES OR SANDS.—No. 760,539; W. J. Jory and J. H. Jory, San Francisco, Cal.



Process of extracting noble metals from ores, comprising simultaneous pulverization of ores and treatment with reagents adapted to combine with less valuable constituents of ores to form solvent for noble metals.

ROASTING FURNACE.—No: 760,510; L. T. Wright, Keswick, Cal.



In apparatus of character described, combination, with floor, of central hollow shaft, hollow arm communicating therewith and carried thereby over floor, pipe in hollow shaft, conduit connected with pipe and discharging into hollow arm, feed pipe leading up to, and connected with, bottom of inner pipe and discharge pipe connected with top of hollow shaft.

Gold Adhering to Retort.

TO THE EDITOR:—In the issue of the MINING AND SCIENTIFIC PRESS of April 16th last, under the head of "Concentrates", is given a method of recovering gold adhering to the bottom of an old iron retort. I would suggest that the following method might be used—it will require less chemical apparatus than the other: Melt the pieces of the retort with adhering gold in a graphite crucible, with excess of sulphur, at high temperature. The iron and sulphur will combine, forming a matte, and most of the gold will collect in a button in the bottom of the crucible. After the melt has been poured and has cooled, the matte may be crushed up fine, and panned with quicksilver, to amalgamate any gold that may be mechanically retained in the matte. A more complete recovery of gold held (mechanically or chemically) by the matte may be obtained by fluxing the crushed matte with litharge, silica (pulverized glass or quartz) and bicarbonate of soda in a fireclay crucible, and then cupel the resulting lead button.

WALTER W. BRADLEY.

San Francisco, Cal., May 31.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

The Davies mill and assay office at Juneau has been leased to T. D. Drew, who will keep the works open for custom work, with W. R. Bentley as assayer in charge. The 3-stamp mill has water power for its operation. There is a Blake crusher, from which the ore is hoisted to the automatic feeder, and to the stamp. Amalgamating plates save the free gold, and a Frue belt machine and a table concentrator separate the sulphides.

L. H. French and W. J. Scanlon of New York have gone to Nome with sixty head of horses, six cows and several hundred tons of mining machinery. They are engaged in mining operations, owning 14 miles of claims on both sides of Solomon river, near Nome City. Manager French says, employing 100 men at $5 a day and board, they will build a ditch to take water from Solomon river. They have heretofore tried steam shovels, conveyors and other devices.

ARIZONA.

Cochise County.

(Special Correspondence).—J. M. Burke of Boise, Idaho, has Riggs Bros. King of Lead claims under lease and bond. Brown, Murphy & Wright, lessees, have six cars of $70 ore out, which they are packing 1½ miles on burros, then by wagon freight to Rodeo station, N. M.—distance of 14 miles—$3 per ton wagon freight. The ores are silver-bearing galena. The concentrating ore is 20 feet wide; average $15 total value.——Four air compressors are being set up for the Knowles-Coles groups—Calumet & Arizona Co. The company has thirty-two claims. Two railroads are talked of, one from San Simon, 23 miles north on the S. P.; the other from Rodeo on the El P. & S. W. The telegraph line will be completed this week.

H. Summers has fifteen claims near the King of Lead, showing a 30-foot vein. It is 12 miles from Rodeo, New Mexico, station on the Bisbee R. R. in southeast Arizona. There is plenty of wood and water. Till lately this was only a wood and saw mill region for Bisbee and Tombstone. Paradise is on a line drawn from Cananea to Clifton, via Bisbee, and is in the same belt as Santa Rita and Carlisle. This is in the Chiricauhua forest reservation, altitude 4500 feet.

Paradise, May 30.

The Junction M. Co., near Bishee, has started its diamond drill on new ground on its claims adjoining the property of the Saginaw Dev. Co. The machine is set up several hundred feet to the left of the road leading to Naco and Don Luis. ——Work on the churn drill on the Junction property, near Bakerville, is completed and boring for water will be started this week. It is expected a large quantity of water will he secured through exploration to be done hy the churn drill, and the Calumet & Arizona C. Co. are building a concentration plant in which the water is to be used.

Gila County.

R. M. Foree of Santa Fe, N. M., manager of the Arizona-Colorado C. B. & G. M. & M. Co., says the company owns twenty-one claims in a body, embracing an area of 420 acres of mineral land 3 miles north of Globe, in the copper belt. The company has set up a 100 H. P. boiler, a double-geared steam hoist, has a shaft house and blacksmith shop and is sinking a double-compartment shaft.

Graham County.

(Special Correspondence).—The Home C. Co. is operating 2 miles southwest of Morenci. The Home is owned by Morenci men. Superintendent Molder has prospected the ground and reports the principal ore bodies are approachable from a tunnel site, giving 600 feet depth and starting on ore. The surface shows several ledges. The Home has a group of twenty-three copper claims, carrying large bodies of low-grade ore in porphyry dikes. Stringers of copper glance, carrying values in gold and silver, are also found in the ledges that have been opened. A mile north of its coppor claims the company holds twelve gold claims. Development work has shown the presence of bodies of free milling ore of low grade. High-grade ore taken from small stringers has been shipped from the property. The main ledge has been drifted on and crosscut a width of 75 feet.

Morenci, May 28.

Maricopa County.

(Special Correspondence).—W. Channell and R. F. Doll report finding gold-bearing ore in their group near the Phœnix mine, in Cave Creek district.

Phœnix, May 29.

Mohave County.

W. S. McCornick and O. P. Posey of the Gold Road M. & Ex. Co., operating near Acme, report the matter of betterments for the property have been taken up, and it is expected the mines and mill will he operated hy electric plants on the river or at Kingman. The mill will be converted into a wet crusher and its capacity will be increased to keep pace with dovelopments.

The Moss mine will be worked, having been taken over on bond by Manager Slocum of the Mossback mines. Contracts will be let for development work. The Moss mine is in San Francisco district, 6 miles west of the Gold Roads mines, near Acme, and within 7 miles of the Colorado river.

J. Denair of Needles, Cal., with A. Gosuell and P. Kleinfelter, are reported proparing to increase work on the Maguiro mines, south of Kingman. The mines have been under hond to A. J. Pickeril for two years past. The Bi Metal, one of the group, shows an outcrop of free-milling gold ore, and it is on this that the principal work has been done. It is expected a reduction plant will he built.

Pinal County.

(Special Correspondence).—The Copper Butte M. Co. is working sixteen men on its group, 7 miles from Kelvin.——A body of sulphide ore has been struck in the McSherry tunnel, heing oporated by an Omaha, Neb., company.

Dovelopment work is in progress at Troy. A road is heing huilt from the mouth of the Alice tunnel to the Gila river.

Kelvin, May 24.

(Special Correspondence). — The Lake Superior & Arizona M. Co. is developing its property with twonty men. The same company has let a contract for developing a load property 3 miles from its copper group.

A group of claims owned by the Ray M. Co. is heing worked hy lessees. High-grade copper ore is being taken out for shipment to the smelters.

J. L. Harn, operating the Fortuna mine, near Silver King, is taking out silver-lead ore. Soveral shipments have been made to the smelter.——J. Elder reports making a find of gold quartz on one of his claims near Kelvin.

Silver King, May 30.

Yavapai County.

The group of mines owned by the Burlington G. M. Co., 2½ miles from McCahe, is temporarily closed down pending putting in a hoist, compressor, etc. About July 1st they will again start up and will put in use several air drills.

The Rincon M. Co. is increasing work on its group near Martinez. Water tanks and pipe lines are heing put in and arrangements made for the 1-stamp test mill. There are twenty-five men at the camp.

CALIFORNIA.

Calaveras County.

Work will be started this week on the Zeigler mine, near Angels, which has been honded to the Etna King M. Co., who have also secured the Nellie group of mines. A shaft will be sunk on the Nellie mine to a depth of 1000 feet.

Work is again under way at the Oriole mine near Angels.——Machinery is heing put in at the Metropolitan mine.

El Dorado County.

Superintendent L. H. Wilkins of the Darling mine, near Georgetown, says men are at work grading for an electric plant, which will he put in at the mine this summer.——Work has heen resumed at the Eureka quartz mine at Georgetown by El Dorado C. M. Co. Superintendent Everson has men at work cleaning up about the shaft and cut preparatory to unwatering the shaft and making a survey of the underground works. A larger boiler will be put in at the hoisting works, after which development work will be increased.

L. H. Wilkins of Placerville, manager of The Darling mine, is preparing to put in an electrical plant at the mine. J. Toman is superintendent. The new three-compartment shaft is down 130 feet. It will be sunk to a depth of 1200 feet and will be equipped with heavy machinery. A dam, to he 250x300 feet, is in course of construction to impound water for supplying power to the dynamo.

At the Gopher-Boulder mine, near Kelsey, men are getting out rock from the Gopher ledge. The mill has been repaired. W. A. Bell is owner and J. Sipp superintendent.

Kern County.

The Amity M. & M. Co. expects to begin operations in the Slate range, northeast of Randsburg, next month. It has bought twenty claims from J. B. and A. Earley.

Mariposa County.

At the Virginia mine, near Coulterville, the mill is running steadily. The work is heing done under D. O'Toole and thirty-five men are on the payroll.

Nevada County.

At the Brunswick mine, near Grass Valley, the pumps are working satisfactorily and they have cleared tho mine of the water. There has been uncoverod at the 1250-foot level a hody of ore that shows payahle values.

Last week the Kenosha mine (Soven-Thirty), near Grass Valley, started up with electric power, says Manager Root. With the pump, hoist and compressor at work, sinking will be done.

Plumas County.

The Gold Run mino at Emigrant Hill, near Quincy, owned by the Gold Run M. Co., having received a permit to operate thoir hydraulic mine, hogan piping last week.

In Indian valley, at the Peter mine, near Genessee, dovelopment work continues steadily. A tunnel is heing run and it is expected to reach the vein in a distance of 400 feet. An air shaft will also he put down. The company has a mill on the property, hut it has not yet heon set up.

The mining camps of Granite Basin and Bucks ranch, near the Quincy and Oroville stage road, are being developed. The See & Jolly quartz property in Granite Basin, and the P. Malloy quartz mine on Buck creek, with the Huse quartz claim near the Malloy, have been bought by tho Idaho-Thunder Mountain G. M. Co. W. Vandenhoff is president and manager, W. W. Sweet is superintendent. At the See & Jolly ore is heing taken out in readiness for crushing when the mill starts next month. At the Malloy and Huse claims Superintendent Sweet has miners running tunnels on the ledges which aro said to he showing payahle ore. These properties are so situated with reference to each other that the ore from each can he conveyed through a common chute to a 10-stamp mill, to he built as soon as lumher may be ohtained for its erection.

San Bernardino County.

At the Fletcher camp, west of Needles, the development work is said to be showing bodies of payable copper ore. It is expected the smelter will he completed hy August 1. Fletcher has lead mines in Mohave county, Ariz., the ore of which he will ship to Needles for reduction.

Santa Clara County.

W. D. Holloway of Brookline, Mass., J. Joyce, J. R. Powders, E. Stone and M. Woodman are directors of the San Juan Quicksilver M. Co., which has heen incorporated to work a tract of mineral land near San Jose. They are taking out quicksilver ore.

Shasta County.

G. R. Du Bois of Battle Creek, Mich., secretary of the Huron Suhmarine G. M. Construction Co., says the company's gold dredger is in steady operation in the Sacramento river, near Redding. A second boat will he built.

Furnace No. 1 of the Mountain C. Co.'s Keswick smelter blew up on the 30th ult. making a complete wreck of the furnace, damaging the west end of the smelter building hadly, and fatally injuring five men, three of whom have died. The furnace had just been drawn off, so that repairs could be made to the pipe fittings of the water jackets. Left in the bottom of the furnace was a cake of matte. This is usually allowed to cool so that lahorers can get inside and pick and har it out. To hasten the cooling of the matte some one turned a hose on the mass. The water struck some of the molten metal that had not been drawn off, causing the explosion. The five men injured were hoth hurned hy the red-hot metal and struck hy iron fragments.

Sierra County.

P. H. Mason, superintendent and manager of the Golden Scepter M. Co., at Downieville, has begun operations at the mine.

Trinity County.

The Trinity Gold Dredging Co., operating near Lowden's Ranch, on the Trinity river, has begun operations. They have built a ferryboat and a cable footbridge and are clearing a place for the dredger. The company expects to have the plant in operation by Oct. 1.

F. C. Meckel, H. L. Knowles and W. B. Wilson have bonded the Schwartz group of mines on Rattlesnake creek, near Weaverville. They will begin development work this week. There are 100 tons of ore on the dump which will be crushed in the Bob's Farm Co.'s mill adjoining.

Tuolumne County.

(Special Correspondence).—The 50-ton cyanide plant at the Rawhide mine, near Jamestown, has resumed operations, treating the tailings impounded in the canyon from earlier operations of the mines. Heretofore the tailings were handled by scraping into bins and tramming to the vats. The tailings are now conveyed through 200 feet of V-shaped sluice to the leaching tanks. The tailings water from the mill is employed, after roughly separating the sand, in a spitzkasten. This water is run into the tailings dam and washes out the packed sand, carrying it to the sluice. The sluice enters the dam through a 12-foot tunnel in the rock wall. One Chinaman is employed to direct the water against the tailings hy means of short hoards set on edgo. This method does away with expense of six laborers and the scraping team formerly used. J. T. Terry, Jr., is in charge.

Jamestown, June 2.

At the Mohican mine, near Groveland, work continues and Superintendent Chappellett has thirty men employed. Sinking is going ahead, the shaft having reached a depth of 300 feet helow the station in the tunnel. Ore is being taken out and the mill is running.

W. Heath, manager of the Horseshoe Bend mino, near Columbia, with C. G. Grim, will operate the Mount Lily mine. He has also an option on the Littlo Queen group of mines in the Five Mile Creek section.

The interests of C. A. Holland et al. in the New Era group of mines (the Hunter group), near Carters, including tho water rights on Hunter creek, have heen sold to T. F. McAvoy of the Hard Tack G. M. Co.

Yuba County.

Near Hansonville, H. H. Wehb and C. Fife of Santa Monica, who have an option on a quartz mine on the Pauline land, have been doing development work on the lode and are putting in hoisting machinery to go deeper. It is named the Ora Leva mine and the lode is 4 feet in width. They will put the incline down at least 300 feet before starting work on a mill. —— In the Seahourg & Davis quartz mine, near Hansonville (now the Gold Bar mine), owned by J. M. Beck & Co. of Pasadena, Cal., the shaft is down 150 feet, and they have a ledge of quartz. They have put in a pumping plant. —— The Mexican mine, near Rackerby, is being worked by a company which has a tunnel in 300 feet, and when completed it will drain the lode. —— The King Bird quartz mino is on the C. F. Adam's land hought by J. M. Beck & Co. of Pasadena. The shaft is down 100 feet and well timbered.

COLORADO.

(Special Correspondence).—Reports received from several districts show placer mining is active. At Breckenridge, Summit county, all the placers are busy and work is being increased. Alma and Fairplay in Park county and Dillon in Summit county are also active. Near Telluride, in San Miguel county, considerable work is going on along this line.—— Lead mining seems to be improving. The strike situation is subsiding and in a short time it is expected everything will be running as hefore the strike. —— One of the State School of Mines building at Golden was damaged by fire on the 29th, doing ahout $8000 damages. The fire started in the basement of the main huilding, where the chemicals were stored.

Denver, May 30.

Boulder County.

(Special Correspondence).—The Boulder County M. Co. is cutting a tunnel through its property. This company has put in an 8-drill compressor. The tunnel is in 1200 feet. C. F. Lake, of Boulder, is superintendent.

Nedorlands, May 29.

(Special Correspondence).—Surveys are heing made through Eldora section for branch railroads, which will improve transportation facilities.

The Enterprise M. & R. Co. is operating its mine on Spencer mountain. It is stated the company will huild an aerial tramway from the mine to the mill. The mine is equipped with an 8x10 hoist and 60 H. P. hoiler. The shaft is 400 feet deep and from the 100-foot level they have drifted 280 feet east and 100 feet west. On the 200-foot level considerable work has been done—also at the 300-foot level. They are taking out fifteen tons of ore per day, but will double the amount. The 50-ton chlorination mill of the company has received added improvements.

They are roasting the ore by the use of oil burners instead of wood. Oil is brought from Boulder. A. M. Selfridge is superintendent of the mine and mill. He says they are making cyanide tests on the ore and, if satisfactory, will put in a cyanide plant.

It is expected the Mogul tunnel will start operations under direction of J. A. Gilfillan, manager, this week. The tunnel is 10x12 feet, with double track.

Eldora, May 30.

The Enterprise M. & R. Co., near Eldora, is increasing work at the mine and mill. Two shifts of twelve men each are employed at the mine and ore is being broken down. A 60 H. P. boiler has been set up at the mine and new cable put in

and the 35 H. P. boiler formerly at the mine has been put in the mill to furnish power for the oil blower. Two tanks, with a capacity of ten barrels each, have been put on trucks and are used in hauling oil from the Boulder refinery, which has the contract for furnishing the crude oil and residuum which is being used as fuel for the roaster. Two storage tanks for the oil used in the furnaces have been built outside the mill.

The Black Rose mine at the head of Gillespie gulch, near Jamestown, has been unwatered by Superintendent T. E. Irvine, and the work of sinking begun. A 3-inch seam is said to carry values in gold, with a large body of mill ore that runs $10 per ton. J. D. Mersereau of Pasadena, Cal., is owner of the property.

Chaffee County.

A plant of machinery is being put in for the Oklahoma mine at Harrington, 10 miles north of Salida, and development work will begin next week. President R. F. Grow, of the Oklahoma G. M. Co., of Lexington, Okla., is superintending operations. The shaft is down 80 feet, with small veins of ore reported in sight that run $12 in gold and a small per cent in copper. Owing to lack of sufficient water the company will use gasoline power until the water level is reached. The present plant is capable of sinking the shaft to a depth of 1000 feet. The Oklahoma mine is 1 mile from the Denver & Rio Grande railroad and 2 miles south of Turret.

The Granite G. M. & T. Co. has been incorporated by Colorado Springs and Eastern men, the object being similar to that of the deep drainage project of Cripple Creek. A 3000-foot tunnel will be started this month to drain the property of the Granite district at a depth of approximatcly 300 feet. G. Swan of Pittsburg, Kans., is president, with E. J. Eaton, J. T. Estill and C. L. Zobrist as directors. The Washington & California group will be the first drained.

Clear Creek County.

The McClellan Mountain G. & S. M. & M. Co. has been incorporated under Arizona laws to operate a group of claims in the Gold Belt district, upper Clear Creek county. The officers are: G. Albertson, president and manager; P. Garrettson, A. B. Kessler and E. W. Garrettson, with offices at Denver. The company owns the Double Header group on McClellan mountain, near Silver Plume.

The Republic Con. M. Co., near Georgetown, says F. H. Collins, manager, has been reorganized and all matters of difference settled. Development work in the crosscut tunnel, as well as opening up the claims on Douglas mountain, will be resumed.

Operations on the Clift group, on Democrat mountain, near Georgetown, are being carried on. says Manager D. W. Shepard. It is intended to drive the lower level to cut under the point where rich values were formerly obtained.

Work has started on the Ramsdale group of claims in Lincoln district, near Georgetown. A crosscut tunnel has been driven 150 feet and high-grade ore is exposed, some of which carries values in gold. A shaft has been sunk to a depth of 60 feet.

Custer County.

The Humboldt mine at Rosita is being reopened by a company of New York men. It is expected production will be increased. The silver ores carry also gold, copper and lead. —— The Bull-Domingo mine, in same district, will resume also. —— The Elematah mine has started up anew in charge of the Little Jim M. Co. and the shaft is down 400 feet, with ore bodies uncovered from the 100-foot level. Operations will be resumed by the Hessite G. M. Co. at the Eleventh Extension.——The Little Bernice mine reports opening up a body of ore, resembling the Bassick formations. The Toledo is increasing development work. The American Flag has opened a large vein of ore. A body of galena is reported in the Theresa mine.

Fremont County.

It is reported the tailings dumps of the National mill at Florence have been leased to L. R. Findley et al. The tailings will be worked over for the gold contents.

Gilpin County.

(Special Correspondence).—Everything in northern Gilpin county is waiting the advent of the Moffat road. This road, which has reached Rollinsville, will be receiving and discharging freight next week, when it is expected mining operations will be increased.

About 2½ miles northwest from Rollinsville is the Blue Grass M. Co. group in the Phœnix mining district. This company owns and controls ninety acres and has been operating and developing its property the past six years. On the Champion the shaft is down 265 feet, with 900 foet of drifts and crosscuts. The Decoration, which is 300 feet south of the Champion, has a large vein, but little development work has been done on it. A crosscut is within 75 feet of the Decoration from the Champion. The Lone Star is down 225 feet and operating from the 150-foot level. This shaft is equipped with an 8x10 hoist, 60 H. P. boiler. They are hoisting ten tons per day, but will double this output. Work has also been done on the Tenderfoot. The company has built a 10-stamp amalgamating and concentrating mill, which has been in operation three months. Concentrates are being stored at the mill until the railroad is ready to receive freight. K. C. Parrish is consulting engineer and R. L. Alexander superintendent.

Josephson Bros. have a lease on the Beaver placer on Beaver creek. They started operations in April and have handled 10,000 yards of dirt. They report the dirt pans well so far as opened up. The first cleanup will be made June 15th. The gravel averages 11 to 13 feet to bedrock.

Rollinsville, May 29.

(Special Correspondence). — The Gold Dirt M. Co. will sink another shaft and put in an air compressor and drills. A mill will also be put up on the property in Gamble gulch. The company will sink the old shaft 100 feet deeper. It is down 600 feet. A 100 H. P. boiler is being set up. W. H. Knowles is manager and A. L. Williams superintendent.

Perigo, May 29.

(Special Correspondence).—The Perigo mines, owned and operated by Potter & Lightbourn of Central City, are making light production at present, but it is expected they will increase the capacity. They propose to drive another tunnel, starting farther down the gulch to gain greater depth. The 100-ton concentrating mill will be started this week.

Perigo, May 30.

(Special Correspondence).—F. P. Dovey has started work on the Copper King mine and will put in a hoisting plant.

Gilpin, May 30.

(Special Correspondence). — O. B. Thompson, who has charge of the consolidation formerly owned by the Cook-Fisk-Gregory-Bobtail Co. and others, is putting the plants and mill in shape to produce. One of the compressors has been disabled and is being repaired. The mill is an 80-stamp, rapid-drop, with twenty-six concentrators.

Black Hawk, May 29.

(Special Correspondence). — Considerable development work is going on in Russell Gulch section. The Old Town Con. M. Co., with headquarters in Idaho Springs, has put in additional machinery, including compressor and drills, 75 H. P. motor, 100 H. P. engine and a 1250-gallon per minute (under 1000-foot head) pump. The shaft is down 1500 feet. No work has been done below the 1100-foot level. Ore is coming from the second, ninth, tenth and eleventh levels. Other levels above the 600 are under lease to outside parties. They will begin this week to produce 100 tons of ore per day. The ore is being treated at the Jackson concentrator at Idaho Springs. They have $750,000 in ore blocked out at the mine, says G. K. Kimball, manager of the company. The company owns fourteen patented claims in one body. L. Hanchett is president. The company has built a heavier gallows frame and ore bins. The ore can be dumped into the bins or direct into the tramway cars. Ore is hauled by tramway to Black Hawk, and the portion for Idaho Springs is transferred to the Colorado & Southern for shipment to that point. The compressor is run by electricity furnished by the power company at Georgetown.

F. A. Scheuber of Livingston, Mont., and G. K. Kimball have a lease on the Lutz group, east of the Old Town mine, and are unwatering the shaft. The property has not been worked for the past ten years. Its end line is within 700 feet of the Newhouse tunnel.——The shaft on the Lilian mine is down 375 feet, and is under lease to W. Slater & Co., who are drifting toward the winze, which was sunk to a depth of 175 feet. They expect to open up ore in the winze.

R. I. Hughes has a lease on the Federal mine, which adjoins the Old Town on the west. He is doing development work and taking out ore. The Baker Shop group adjoins the Federal. also under lease to the same party.——E. A. Came, G. S. Crilly and H. W. Snell have a lease and bond on the Hall mine, and report taking out ore that runs $90 per ton.

Russell Gulch, May 30.

Sinking operations have been started at the Running Lode mine, near Black Hawk, with double shifts, the shaft to be sunk 100 feet, giving it total of 1050 feet. The mine is operated by the Gower M. Syndicate, Ltd. Developments are kept well ahead of production. T. Dunstone of Black Hawk is superintendent, and has fifty men on the payroll.——Sinking operations have been started at the Cui Bono group in Lake district, near Central City, which is owned by D. Bourk of Nevadaville. The shaft is down 110 feet and the owners intend to sink it at least 50 feet deeper.

The Black Hills & Denver G. M. Co. has been incorporated by S. H. Blakeslee, W. T. Skelton, J. M. Blakeslee, R. C. Hayes, M. H. French and W. T. Graham to operate in Gilpin county, with offices in Denver and Deadwood, S. D.

Gunnison County.

The Bowerman Independent mine at Bowerman has been sold to the J. C. Bowerman M., M. & Dev. Co. The Independent group and the Gold Belt group, the latter near the Raymond mine, are now owned by this company, and all operations will be conducted in future under supervision of J. C. Bowerman, president of the new company.

Hinsdale County.

R. M. Collins of Lake City, manager of the Monte Queen mine, reports that he has subleased the mill at Crooke's Falls to Vinton & Palmer under conditions that will give Monte Queen ore right of way. They will put in a Frue vanner and a canvas plant at the mill, increasing its capacity.

Lake County.

The Alps M. Co. has been incorporated to operate in South Evans gulch at Leadville. The directors of the company are: B. F. Stickley of Leadville, C. S. Burlingame, F. Prentice, J. F. Hume and M. J. Friedman of New York City. The company's properties include the Alps No. 1, Alps No. 2, the Helvetia and other claims on eastern end of Ball mountain and saddling both slopes of the mountain, extending down into both South Evans and Iowa gulches. These properties have been operated under leases.

Larimer County.

The National M. & M. Co. is preparing to put in two 115-ton copper matte furnaces for its reduction plant to be built at Pearl this year. The company will build two short tramways to take ore from neighboring mines, and is planning to take water from Big Creek lake, 7 miles distant, to supply power for the smelter and electrical plant. Matte from the Pearl smelter will be shipped to Grand Encampment, Wyo., and converted into blister copper.

Mineral County.

E. T. Elliott of Del Norte has an option on the Creedemoor mining property, consisting of six patented claims and a concentrating mill; also on the Mexico, Hiram and St. Peter's claims, near Creede, for $80,000. These properties are producers of lead and zinc ore. The concentrating mill has a capacity of sixty tons per day.

Ouray County.

The Smuggler Meteor G. M. & R. Co. has been organized, with F. Nelson of Topeka, Kan., as president, and is preparing to operate on its group in the gold belt north of Ouray. The Smuggler Meteor group comprises six claims covering the upper and lower quartzite. The company will drive the 400-foot tunnel ahead, where two veins will be cut—one within 75 feet and another in 100 feet more.

San Juan County.

The Silver Ledge mine, near Chattanooga, near Silverton, has thirty men at work in mine and mill. An addition is being built on the mill for electric zinc separators and twenty tables. The mill when complete will contain two Chilean mills, twenty large and small tables and the zinc separators. The number of men will be increased. Bodies of ore containing zinc exist in the section up Mineral creek, South Mineral and at the head of Animas Forks, says Manager Warner of the Silver Ledge.

The Hercules Con. M. Co., near Silverton, is getting ready to increase operations. The 75 H. P. compressor, sixteen machines capacity, has been put in operation and is supplying 9000 feet of tunnels, raises, etc., with air, while fifteen men are catching up bad ground.

San Miguel County

L. L. Nunn, manager of the Gold King Con. M. Co., owning the Gold King group, near Telluride, is reported to have a lease and option on the Summit mine, adjoining the Gold King side line and higher up the mountain. When last operated, seven years ago, connection was made between the Summit and Gold King workings. The product will be handled through the Gold King.

W. A. Berglund has men working in the Gold King and Gold King No. 2 mines the past winter, and there are twenty-three men on his payroll. These properties adjoin and Berglund has a lease on a portion of them. It is reported he has enough ore on the dump and cut out in the mines to keep twenty stamps of the Gold King 40-stamp mill running the rest of the year and that these stamps will be started dropping this week. The ore is free milling, the values being saved on the mill plates.

Summit County.

The Gold Pan placer at Breckenridge is in full operation, the present rush of water being utilized to full advantage. In the pit three elevators, three giants and two cranes are operated. and on the surface the cableway and belt conveyor are working.

Near Kokomo, the Union Con. group on Gold hill has placed an electric drill on the tunnel which is being run. They expect to drive 800 feet to reach the ore shoots opened in the upper working. M. Gagan is manager.

Teller County.

Five blocks of the Bull hill property of the Stratton estate at Cripple Creek were leased last week. The property leased comprises three blocks on the Longfellow No. 1 and two on the Longfellow No. 2. Ore has been shipped from both properties. Block 171 is leased to Stewart & Co., who have put in a plant of machinery and started to unwater. As soon as the water is out two shifts of men will he put to work and machine drills will be used. Heffron & Schoen have the lease on block 172. They intend putting in machinery. Block 170 has been leased to Heffron & Weaver. This block constitutes the east end of the claim, and it, too, will he equipped with machinery. H. M. Gilbert & Co. have a lease on blocks 176 and 177. They have unwatered the shaft.

The Mary McKinney M. Co. at Cripple Creek is having a larger compressor set up, one with a capacity of sixteen drills. The previous capacity was twelve drills.

It is reported that Lessees Harrison & Seaver, who last winter made a strike on the W. P. H. claim on Ironclad hill, Cripple Creek, have opened up another body of ore in their lower workings at a depth of 380 feet, and nearly under the rich shoot found above. It is stated the vein measures 10 feet in width and that streaks traverse the vein that show gold besides sylvanite. The returns received from shipments are running 4 to 7 ounces gold per ton. The lease is shipping out a broad-gauge car of ore daily, returning $75,000 a month.

W. Erickson, manager of the Hawkeye M. & L. Co., composed of Iowa men, who have a two-year lease on the Julia E. claim of the Jennie Sample company, near the Doctor-Jack Pot mine on Raven hill, Cripple Creek, is putting in a plant of machinery and has started to sink the shaft for depth of 200 feet. The lessees will not attempt any development work or shipments from that property until that point is reached. The lessees have opened up a body of ore, 15 feet below the 100-foot level.——The plant of machinery on the Victor mine is again in operation. The company has the levels from the twelfth to the surface cleaned out. The water has risen to a point a few feet below the top of the station 1000 feet from surface. However, this will not hinder the company for the present, as they intend to confine the work between surface and the 1000-foot point.

G. Jordan, who has a lease on the tailings of the Summit mill near Gillett, and worked a cyanide mill with a capacity of twenty tons daily all last summer, will start up again next week. The tailings averaged $6 per ton.

A cyanide mill will be built on the property of the Moon Anchor M. Co. of Colorado Springs, on Gold Hill at Cripple Creek.

The Beacon Hill Ajax and the Zenobia mines near Cripple Creek are closed down on account of pending litigation and are not expected to resume operations until the matter is settled. Both mines were under lease to J. Wright.

E. S. Johnson, president of the Blue Bird M. Co., operating on Bull hill, Cripple Creek, says construction work is in progress for the installation of a heavier plant of machinery. A new gallows-frame has been completed. The plant will be placed over the shaft, which was made by a raise from the 400-foot level of the inclined shaft, making the shaft vertical for a depth of 1367 feet. This mine has produced gray copper ore and free gold associated with it.

There are more lessees at work in the Cripple Creek district than there has been before during the past five years, says the Cripple Creek Times. A large percentage of the lessees are getting ore. The Cripple Creek district owes much to the leasing system. At present leases are in greater demand than for several years. Many properties are being worked by lessees which have been idle and closed down for a number of years.

IDAHO.

Blaine County.

J. Gorman, owner of the Young America group of mining claims in Smoky district, near Hailey, says operations will be increased. Two ledges were opened up

last fall, the larger one, 5 feet between walls, having been drifted on for 30 feet at a depth of 100 feet. In the face of this drift there is exposed 5 feet of ore, 2 feet of which is free milling.

Idaho County.

The cyanide plant on the Jumbo mine at Hump will be enlarged this summer to three times its present capacity, says F. Brown, manager. The plant will be made large enough to handle the entire output from the twenty-four stamps in the mill. They are working full capacity and what ore is not treated in the cyanido plant is being piled up on the dump. He is working forty men, and tunnel No. 4 is going in at the rate of 10 feet a day and by July 1st is expected to be in the main ore body. Ore is being taken from tunnel No. 3, but when tunnel No. 4. is finished, all mining will be done in that.——Seven men have been put to work on the Diamond Hitch group, which F. Brown has bought. The property is half way between Elk City and the Hump, 2 miles from the Hogan group. He has a group of seven claims, with three veins from 3 to 4 feet wide, carrying values in gold. A tunnel is in 100 feet, but will go in 1000 feet.——They are working twenty-one men on the Crackerjack in tunnel No. 2, and are getting under what was the main ledge in tunnel No. 1.

In the Big Creek district, J. W. Killinger et al. of Lowiston have incorporated the Hillside group, on Big creek, 10 miles southwest of Oro Grande and 6 miles southeast from the Jumbo mine of Buffalo Hump. This group consists of the Hillside, Hilltop, Lowland, Kansas City, St. Joseph and the Junction placer. About 1000 feet of development work has been done in two tunnels with two crosscuts, a shaft and open cuts and test pits.

The Dollar Bill M. & M. Co. has been organized in Lewiston, with mining properties in the Buffalo Hump mining district. The following are directors: G. W. Thompson, S. Heitfeld, J. Steele, J. M. Molloy and J. W. Briugolf. The company owns the Old Bill group of mining claims near Hump, 2000 feet north of the Jumbo mine. One of the claims is an extension of the Dewey. The property has been opened in several places and shows a ledge averaging 4 feet between walls, assaying $20. The Old Bill claim has one 30-foot and one 15-foot shaft. The company will start development as soon as the snow is off, and will prepare this summer to work through next winter. A small developing mill will be built.

The Fidelity placer mines, near Elk City, have been leased by C. H. Williams and C. Kogler from the Fidelity Co., and work has been started. Two giants were set up and a bedrock flume dug for a distance of 700 feet. The lessees are using two pipe heads of water and are washing out gravel. While the top dirt is being worked the men report removing about 200 yards of gravel per day.

Lemhi County.

E. Edwards of Gibbonsville, with Montana men, has formed a company and taken over the property of the American D. & M. Co. at Gibbonsville. The incorporators are F. W. Volger, F. M. Shaw, E. E. Edwards, J. Shineberger and E. Benedict. F. M. Shaw is manager.

Owyhee County.

F. T. and L. F. Clemons of Denver, Colo., will begin developing the Standard claim on South mountain, 23 miles southwest of Silver City. A shaft 20 feet deep has been sunk, but from this ore assaying 40% lead, 50 ounces silver and $10 in gold is reported opened up. After taking a bond on the property six other claims were located. These will all be developed during the summer. The Standard claim was bonded for $10,000 by T. F. Walsh of Denver, Colo., who, with others, organized the American Standard M. & M. Co., with F. T. Clemons as manager. It is intended to start work sinking a shaft, and as soon as it is down 100 feet a level will be started for exploration.

F. T. Clemmons, manager of the Standard M. Co. of Denver, Colo., owning properties at South Mountain, near Silver City, says he is preparing to do development work this summer.

Shoshone County.

W. J. McConnell, president of the company operating the True Fissure mining property in the Clearwater country, in the southeast corner of Shoshone county, near Lolo Hot Springs, Mont., says they have nine claims all carrying values in gold. They are in the Bitter Root mountains, 70 miles from railroad transportation. They have to pack supplies in over a trail 40 miles from Lolo Hot Springs. A new trail will be cut to reduce the distance to 20 miles by going by way of Granite creek. A 3½-foot Huntington mill will he put in this summer. At first they will mill only the ore taken out in development work. Water power from Cayuse creek will operate the mill. McConnell says he is working ten men on the property of the Greyhound M. & M. Co., in Custer county, a silver and lead group, and intends to put in mining machinery this summer. The mine is in the Sea Foam district. The ore is said to carry values in silver and lead, with gold enough to pay for treatment. It is 100 miles from railroad transportation.

At Delta the dredgers of the Mascot G. M. Co. are reported successfully working on Trail creek. Bedrock there is from 24 to 28 feet, and the machines work a breast of 6 or 8 feet across a pit 300 feet wide. The dredger is under supervision of H. P. Gilligan. It requires 50 H. P. to operate it and about three cords of wood daily, with nine men to run it continuously — three shifts of eight hours each.

It is thought the Northern Pacific Railroad will build a spur 1000 feet long from Burke up the gulch toward the Hercules mine this summer, says H. L. Day, manager of the Hercules. If the line is built it will have to cross the Shoo Fly No. 2. The Hercules Co. will then put in an aerial tramway from the mine down to the road, a distance of 7000 or 8000 feet. They will also put in a compressor plant. The output of the mine, which is now about 1000 tons a month, will he doubled. The electric plant is working.

Reports from the properties of the Little North Fork M. Co., near Wardner, say there are 8 feet of copper ore in the lower tunnel, with values also in gold. The tunnel has been driven 500 feet. The company is owned by Wardner men, and the group consists of several claims on the Little North Fork of the Cœur d'Alene river, 7 miles from Kingston. An upper tunnel was also run, showing a 4-foot ore body, giving an average assay of 15% in copper.

G. Gruhe, R. Paden, F. Magnus and A. L. Mogan of Orofino, who relocated the Mascot mine January 1st last, report having completed the necessary work and are about to apply for a patent to the ground. Since relocation they have taken out considerable rich ore and expect to make a mill run in June. The Mascot mine, formerly owned by the Gold Creek Con. M. Co., is a developed property, with a 7-stamp mill and a hoist. In the latter part of 1902 work was stopped and was never resumed by the company.

Manager Fitzgerald of the Cascade Power Co., which owns the water power at Orofino falls, near Orofino, reports making arrangements for putting on men to further develop the coal prospects on Orofino creek, 15 miles above Orofino. The power company has the mining prospects there under bond. The deepest shaft is 50 feet. In this a 6-foot seam of lignite has been uncovered. Strikes of lignite have been made on the Lolo Fork, Ford's creek and above Kamiah.

Washington County.

The Ford-Salzer M. Co., operating at Black Lake, near Council, E. D. Ford manager, will start the sawmill this week and cut lumber to rebuild the cyanide mill destroyed by fire last fall. The new mill will be practically the same as the former in design and capacity.

S. Dorsey of Nebraska and J. C. Rogers and W. Hayward of Weiser have a bond and lease on the Blue Jacket group of mines in the Seven Devils mining district, near Weiser, for $250,000. This is a copper property and has been opened up to a depth of 250 feet. J. C. Rogers is manager.

MICHIGAN.

Houghton County.

The report of the Copper Range Con. C. Co., operating the Baltic, Champion and Trimountain mines, in the South Range district, near Painesdale, has been issued for the year 1903, and includes the following results:

	Baltic.	Champion.	Trimountain.
Rock stamped, tons	490,237	398,082	507,377
Fine copper, lbs.	10,580,997	10,564,147	9,237,051
Copper per ton, %	1.08	1.36	0.91
Cost per ton stamped.	$1.538	$2.066	$1.970
Cost per lb. copper, c.	7.12	7.61	10.82
Development, ft.	5,669	8,342	6,647

MONTANA.

Deer Lodge County.

Fitzpatrick & Todd, who have a lease and bond on the Oro Fino mine, adjoining the Southern Cross group, near Anaconda, have begun operations. Men were put to work last week, sinking a new shaft, and at suitable deptb a tunnel will be driven. The old shaft was found unfit for use. They will drift under the old workings.

Flathead County.

J. F. Collins of Spokane, Wash., manager of the Spokane & Montana M. & M. Co., is operating on Fourth of July creek, in the West Fisher mining district, near Libby. They are driving a tunnel and will have 150 feet of work done next week. The tunnel is to tap three veins that crop from 50 to 100 feet above the tunnel. The ledges are stripped for several hundred feet, and vary from 1 to 3 feet wide. They show free gold. The company has, in addition to seven quartz claims, eighty-six acres of placer ground, a millsite, water right and timber. The Brick & Brannagan M. Co., which has a 10-stamp mill, will put in ten more stamps and a cyanide plant. The Libby company property has a 2-stamp mill, and is in 3 feet of ore.

Missoula County.

Work has been resumed on the Bullion group, 3½ miles south of Borax. A ledge 16 feet in width carries values in copper. In the upper tunnel a drift was run 200 feet on the ledge. A shaft was also sunk and a 50-foot crosscut run.

Silver Bow County.

A find of copper ore is reported made north of Walkerville, and a large number of locations have been made. The principal showing is said to have been made on the Bull Run claims. For years this district has been prospected for gold and silver and little attention paid to copper.

NEVADA.

Elko County.

The Dexter M. Co. of Salt Lake City, Utah, is preparing to start work at its mine at Tuscarora. In the past the company has experienced difficulty with slimes, and to overcome this, it is intended to put in a new process of treatment. During greater portion of past year the mine has been operated almost entirely by lessees.

Esmeralda County.

Superintendent Nelson of the Consolidated Esmeralda M. Co., near Hawthorne, last week shipped a gold bar, the result of a cleanup from Pamlico ore. He reports work progressing satisfactorily in the mines, although the mill is not running full time, owing to scarcity of water. The company is preparing to increase the supply, either from Whisky Flat or by running the pipe up Cottonwood canyon.

Eureka County.

W. Whalen has men at work in the mines of the United States G. & S. Co. at Alpha, and Manager C. Lay has men at work on the Whalen C. Co.'s properties at the same place. Work is reported progressing.

B. Smitb of Eureka, manager of the Rocco-Homestake mines, says shipments for the season have been resumed, the ores maintaining the usual percentages in lead and silver. The shaft has reached a depth of 150 feet, with the first level, established at 90 feet, extending north and south in ore, while in the incline is another exposure of galena.

Humboldt County.

E. W. Griffith of Salt Lake City, Utah, says he has bonded a group of seven claims in the Trinity range of mountains, 20 miles west of Humboldt station, on the Southern Pacific. The ores carry values principally in gold, lead and copper.

Winnemucca reports say the properties of the Golden Eagle M. Co. has been taken by O. Stalman and J. Farren on a lease and bond. Equipment will he put in, including a mill.

Lyon County.

The 5-stamp mill at Nordyke, owned by E. H. Whitacre, started up last week on ore from the Pierce & Sherry claim in Smith valley. The mill has been overhauled and repaired.

The Hanson & Fielding iron mine, 18 miles northeast from Virginia City, has been sold to Merritt & Smith of Minnesota for $24,000. The property consists of three locations near the Storey county line, 3 miles southwest of Siegel district and 17 miles from Wadsworth, the nearest point of connection with the Central Pacific Railroad. The ledge is 1200 feet wide and carries 66% of iron. Development work is in progress, with H. M. Hanson of Wadsworth as manager. The land on which the property is located is on that part of the public domain withdrawn from entry after the national irrigation Act became a law. There is an abundance of wood for fuel 3 miles from the property and spring water at hand. They will ship ore to some point in California, where they propose to put up a smelting plant, says Manager Hanson.

Nye County.

The Crown Point group of mines, 6 miles north of Tonopah, has been bought by Salt Lake City, Utah, men. J. M. Healy has put men to work. The group consists of five locations along the strike of the vein. The vein, which bas been opened up at intervals, reveals width of 10 feet, with the main workings exposing a breast of ore.

H. C. Park of San Francisco, Cal., has bought the Spokane group at Diamondfield, near Tonopah, south of the Daisy and Vernal.——C. L. & L. G. Wheeler have bought the Golden Chest and Golden Circle claims, 7 miles north of Tonopah, which will be incorporated under title of the Milwaukee-Tonopah M. Co.——F. Williams has bought twelve claims, north and east of the King Tonopah, which will be incorporated as the Tonopah-Mother Lode M. Co.

At the Leasers' mill at Tonopah, the new grinders having been put in position, the ten stamps are crushing from thirty-five to forty tons per day from the Douglass lease with satisfactory results. The Boss grinders are supplementary to the Huntington mills, which crush the ore to an 80 mesh, the grinders reducing it to the fineness of flour. Two more grinders will be added. W. J. Douglass is superintendent, with F. Gallagher as fureman.

Storey County.

Superintendent Roote of the Keyes-Graesler mine, near Virginia City, is preparing to put the mine in shape for development work. Power pumps will be set up and the shaft sunk deeper.

NEW MEXICO.

Grant County.

W. S. Cox and R. P. Thompson have bought a half interest in the Montoya lease at Santa Rita. There is said to be a 23-foot vein carrying native copper.

Machinery is on the ground for the Burro Mountain C. Co. plant in the Burro mountains, near Silver City, says Manager T. Carter. The consignment consists of two pumps, with a capacity of 100,000 gallons daily, an electric light plant with a capacity of seventy-five lights, steel rails for the mine and other machinery. The building for the concentrator is completed and machinery being placed. It is expected to have the plant running by July 1st. The management has added concentrating tables.

The Cupadero M. Co. has been incorporated by C. F. Blackington, R. M. Blackington and W. T. Harris of Socorro, with headquarters at Socorro.

Socorro County.

A strike is reported made in the Cooney mine at Cooney. The strike was made at depth of 400 feet in the level running eastward, says Manager Wetherby, of the Mongollon G. & C. Co.

Taos County.

Considerable placer prospecting is being done around Red River.——M. Parker has organized a company and will work the Little Gem and other mines on Bitter creek, near Red River.——E. Westoby and A. Hedges are developing the Willard mine in upper Red River mining district. In a week's run $40 in gold was cleared by the arrastra.

The Jayhawk G. M. & M. Co., at Red River, is working two shifts of four men each. The ore carries values in gold.——Two shifts are being worked on the tunnel of the Copper King group at Red River. The tunnel is in 1250 feet and the first vein has been cut through. It is 200 feet thick. The ore is a copper sulphide and also carries lead and zinc.

T. A. Melson reports finding a lead of gold ore on the Klondyke, at Red River. Melson & Logan are owners. The ore carries free gold.——The Jayhawk G. M. & M. Co. lead has been cut at a depth of 55 feet. It is 6 feet wide and carries gold and silver in equal values. The company will put in a hoist and will sink another 50 feet before putting up a new mill. In the meanwhile the old mill will be started.

Work has begun on a mill at South Fork, near Rio Hondo. It will be a 10-stamp mill, for purpose of crushing. Cyaniding vats will be put in. Water will be used for power and 2000 feet of pipe are being laid. A body of low-grade ore has been opened up.

OREGON.

Baker County.

Machinery for the Alpine mill, near Sumpter, is being put in place under direction of Superintendent R. Addoms. The plant is of 20-stamp capacity and is equipped with concentrating tables.

J. P. Smith of Sumpter has bonded the Mormon Boy group in Cable Cove district. A shaft has been sunk 40 feet.

Manager W. Techow of the Mountain View mine, near Sumpter, is preparing to build a milling plant. The equipment will include rock breaker, Chilean mill, plates, concentrating tables, percolating tanks for sands and an agitation process for slimes, adapted to Cracker creek basin ores. Gasoline power will be used, and an additional 25 H. P. engine will be put in, which, with the one at the mine, will give a total of 50 H. P. The plant is to have capacity of 30 tons daily.

M. H. Clark, manager of the Buckeye mine, 16 miles northeast of Baker City, has sent out supplies and men to resume operations. The mine will be further developed and tests made before a mode of treating the ore is decided upon. It is intended to make shipments of the highest grade ore to the smelter. This will be followed up by making a run of 150 tons through the stamp mill at Tellocasset and the concentrates shipped to the smelter. The Buckeye has a body of ore carrying

copper, gold and silver, and the working shaft is down 200 feet.

W. Cable of Baker City says he has an option on the Bunker Hill group, near the Annalulu mine. It is owned by a Canadian company. Cable says he will put men to work as soon as the snow is out of the way. The property has not been operated for several years. A compressor plant is on the ground and will be set up.

Bishop Bros. of Baker City, owners of the Climax mine in Cracker Creek district, near Sumpter, say work will be started there next week.

SOUTH DAKOTA.

Lawrence County.

Preparations by the Reliance M. Co., on west side of Terry's peak, near Terry, for work on erection of its 300-ton mill are under way. The mill will be built on Annie creek. The winter's work has resulted in opening up ore bodies on the east end of the ground and in the center, giving returns of $8 a ton. The ore is said to be a cyaniding proposition. Ore has been uncovered on four levels. Three hundred feet from the east side line of the property a tunnel has been driven for 50 feet, which has cut three shoots of ore.

The lateral work from the 500-foot level of the main shaft at the Columbus mine, near Deadwood, has opened up a body of free-milling quartz.

Work will start on a tract of 120 acres of ground between the Penohscot and Dizzy mine in Garden City district, near Deadwood, by the Omaha G. M. & M. Co., with headquarters at Omaha, Neb. W. Schmoller of Omaha is president. On the adjoining property of the Dizzy Co. a diamond drill has been sunk 115 feet, cutting the lower quartzite level. H. Rheinhold of Omaha is manager.

UTAH.

Beaver County.

Grading, building and the moving of supplies and materials for the equipment of the Cactus group, near Frisco, are under way. Meanwhile development operations continue.

The Estella mine, south of Milford in the Star district, will be equipped with stamp mill this season, says Manager Tarbet. The plans call for five 850-pound stamps. A 25 H. P. engine will be required to operate the machinery. It is expected concentrating tables or a cyanide plant for the tailings will be added later, this depending on the percentage of saving effected by the plates. The water supply will be secured by pumping. Manager Tarbet reports satisfactory conditions underground. Payable ore has been opened up in six places. This is an iron ore, carrying free gold to extent of $7.50 per ton.

Davis County.

At a depth of 700 feet the Union Gas & Pipe Line Co. last week struck a flow of gas in its well near Centerville, says Manager Bigger. This was after thirty days drilling. It is expected to get oil this month.

Salt Lake County.

Manager E. McCarrick of the Red Wing Extension mine, near Bingham, reports that the company will sink deeper and will build a concentrator in Freeman gulch as soon as a permanent water supply is developed.

The first of an additional battery of roasters to be installed at the Yampa smelter in Bingham canyon, near Bingham, was put in operation last week.

The American S. & R. Co. smelter at Murray treated a total of 630,000 tons of ore during the year ending April 30, 1904, according to Manager C. W. Whitley, in his annual report. The company has found it necessary to build additional furnaces to handle the output of the mines.

The Columbus Con. C. Co. of Bingham has bought the Tesora mill at Tintic. The plant will be moved to Alta and will be made a part of the big mill with which the Columbus Con. is to be equipped. The removal of the machinery of the Weber-Kearns mill at Park City, which was bought by same company, was begun last week.

Sevier County.

Near Monroe, 4 miles out on the D. & R. G. Railway from Elsinore, a gold strike is reported made.

Tooele County.

To simplify the method and reduce the cost of supplying its plant with water, the Stockton G. M. Co. at Stockton is preparing to put in 3 miles of 4-inch pipe that will be laid from a spring owned by the company to its shaft house. Hitherto the management has pumped its supply of water from the West Argent mine. As at the Honerine, the Stockton with a steady supply of water is expected to equip for the reduction of its second class ores.

The Galena King mine at Stockton has begun production again. It is producing two grades of ore, one which goes direct to the smelter assaying 25% lead and from sixteen to thirty ounces in silver, while the other, which goes to the Honerine mill to be concentrated, averages eight ounces in silver and 16% lead. The management expects to maintain a daily output of fifty tons.

WASHINGTON.

Ferry County.

The Huntington crushing mills at the Mountain Lion mine at Republic have been put in operation, and work has resumed in the mine.——The Knob Hill G. M. Co. expects to contract for the disposal of ore at the Hall mines smelter, at Nelson, B. C., and to begin shipping ore this week. The ore hin at the Knob Hill mine is full, and there are 150 tons on the dump. Stoping has been discontinued until the ore ready for shipment can be sent to the smelter.——B. Campbell has men at work on the Surprise tunnel on the Faithful - Surprise group of claims, near Danville.

S. L. Boyer, superintendent of the Minnehaha M. Co., operating at Danville, near Republic, reports the shaft at the Minnehaha mine down 250 feet. He has nine men on two shifts, crosscutting from the hottom of the shaft. A. McKinley, who has a contract for driving a tunnel across the Minnehaha group, is working and has driven the tunnel 260 feet. It is expected to cut the vein at 400 feet in.

Okanogan County.

The mill and the cyanide plant on the Bodie mine at Bodie will be ready to start next week, says C. M. Fassett of Spokane, president of the company. More development work will be done. They expect to work fifteen men, as it will take six men to run the mill. The ore carries gold and silver, and the milling ore averages $15 a ton. Bodie camp is 29 miles northwest of Republic. The mine is developed hy four tunnels to a depth of 400 feet.

Stevens County.

At Northport a small lead smelter will be built, says L. P. Larson of Spokane, owning the Last Chance mine, to handle the lead carhonates produced at the mine. Such a plant would produce pig lead ready for marketing. The silver values in the Last Chance ore are low, hut, says Larson, the ore is practically self-fluxing. They are putting in two trams and expect to carry coke up the hill on one side of the tram while ore goes down on the other side. The galena will he shipped as before. They are working thirty-five men. The furnace would employ twenty-five.

WYOMING.

Carbon County.

The Doane-Rambler mine, near Encampment, reports a strike made in crosscutting south from the new shaft. A crosscut was started to tap a vein previously located, but came into a body of sulphide ore at a point not anticipated. The strike is said to show 10 feet in widtb, with copper values of 8%. Considerable surface water is running and another pump will be put in.

At Grand Encampment the North American C. Co. concentrating mill is in full operation. It has been running since May 2 and is piling up concentrates to feed the smelter furnaces, which will start up this month. High-grade bornite ore is also heing brought from the mine over the tramway, and regular shipments of this grade of ore will follow.

FOREIGN.

AFRICA.

Transvaal.

The Transvaal Chamber of Mines at Johannesburg reports the gold output of the mines on the Witwatersrand for month of April amounted to 297,470 ounces, and 8476 ounces for outside districts, being a total of 305,946 ounces. This compares with the previous three months of 1904 as follows:

	Rand. Ounces.	Outside. Ounces.	Total. Ounces.
January	278,867	9,957	288,824
February	282,436	7,066	289,502
March	299,625	8,617	308,242
April	297,470	8,476	305,946
Totals	1,158,398	34,116	1,192,514

The following production of some of the principal mines on the Witwatersrand is reported for the month of April: Angelo Gold, ninety stamps crushed 12,533 tons for 4759 ozs. gold; 10,422 tons treated hy cyanide for 3012 ozs. —— Langlaagte Deep, 115 stamps working twenty-nine days and nine hours, crushed 18,147 tons, yield 3723 ozs.; 13,746 tons of sands and concentrates treated hy cyanide, yield 2030 ozs.; 4274 tons of slimes treated, yield 248 ozs. Total yield, 6001 ozs. fine gold. ——Langlaagte E. & G., 150 stamps running twenty-nine days, crushed 21,206 tons for 5048 ozs.; concentrates: cyanide process treated 564 tons for 910 ozs; tailings: cyanide process treated 17,600 tons for 2317 ozs.——Crown Deep, 155 stamps working twenty-nine days five hours, crushed 20,390 tons for 5232 ozs.; 13,600 tons of sands and concentrates treated by cyanide for 2562 ozs.; 5589 tons of slimes treated for 547 ounces. —— Crown Reef Gold, yield from mill, 7646 ozs; from cyanide works, 3256 ozs.; from slimes works, 271 ozs. Total, 11,173 ozs. fine gold: 120 stamps worked twenty-seven days fifteen hours, milled 18,261 tons. To mining, transport, milling, cyanide, treatment of slimes, general charges, maintenance, and mine development, £26,901. Revenue per ton crushed, £2 11s 11.74d; cost per ton crushed, £1 9s 5.55d.——Driefontein Con., 110 stamps crushed 14,983 tons for 4410 ozs.; 10,821 tons treated hv cvanide for 3081 ozs. ——Nourse Deep, 95 stamps working twenty-eight days twenty-three hours, crushed 12,570 tons for 3302 ounces; 9070 tons of sands and concentrates treated by cyanide for 1674 ounces; 3540 tons of slimes treated for 277 ounces.——Robinson Deep Gold, 180 stamps working twenty-eight days, crushed 24,790 tons for 8985 ounces; 3941 ounces from tailings by cyanide and 621 ounces from slimes. ——Rohinson Gold, 155 stamps crushed 19,867 tons, yield from mill, 8889 ounces; from tailings (by cyanide), 3379 ounces; from concentrates (hy chlorination), 965 ounces; from slimes, 779 ounces; total from company's ore, 14,012 ounces; yield from purchased concentrates, 552 ounces.—— Robinson Randfontein Gold, 95 stamps, twenty-seven days eight hours, crushed 12,137 tons for 3658 ounces; concentrates by cyanide process, 919 tons, for 359 ounces; tailings by cyanide process, 6720 tons for 1341 ounces; slimes, 4459 tons, for 306 ounces.——Glen Deep, 100 stamps, working twenty-six days eighteen hours, crushed 13,300 tons for 2699 ounces; 9240 tons of sands and concentrates treated by cyanide for 2691 ounces; 4143 tons of slimes, for 371 ounces.—— Rose Deep, 155 stamps, working twenty-nine days seventeen hours, crushed 22,174 tons for 5116 ounces; 14,525 tons of sand and concentrates by cyanide for 2801 ounces; 7379 tons of slimes for 643 ounces. ——Simmer & Jack Proprietary, 190 stamps, working twenty-nine days, crushed 28,500 tons for 5968 ounces; 4470 ounces from tailings hy cyanide, and 462 ounces from slimes.——South Randfontein Gold, 100 stamps, running twenty-seven days twelve hours, crushed 12,877 tons for 3470 ounces; concentrates by cyanide, 840 tons, for 295 ounces; tailings by cyanide, 7995 tons, for 1307 ounces; slimes, 3848 tons, for 391 ounces.——Jumpers Deep, 100 stamps, in twenty-eight days sixteen hours, crushed 15,827 tons for 3875 ounces; 10,735 tons of sand and concentrates hy cyanide for 2050 ounces; 5027 tons of slimes for 309 ounces.——Ferreira Gold, 120 stamps, in 28.58 days, crushed 17,439 tons for 8058 ounces; concentrates, 1400 tons, for 697 ounces; sand, 11,760 tons, for 2248 ounces; slimes, 4695 tons, for 487 ounces.——Geldenhuis Deep, 185 stamps, in twenty-nine days five hours, crushed 23,030 tons for 6939 ounces; 16,090 tons of sand and concentrates hy cyanide for 2900 ounces; 7044 tons of slimes for 698 ounces.——Knights Deep, 105 stamps ran twenty-eight days, crushing 15,550 tons for 7229 ounces fine gold, inclusive of 2102 ounces from cyanide.

AUSTRALIA.

Western Australia.

The Great Fingall Con. M. Co., at Kalgoorlie, reports its output as follows for month of April: Tons of ore treated hy 80-stamp mill, 13,300; ounces gold recovered, 10,634; tons of tailings treated hy cyanide, 13,010; ounces recovered, 1617; tons of concentrates treated, 149; ounces recovered, 843; total fine gold recovered, 13,094 ounces. The managers report the sands treatment is in course of transfer from the old to the new mill, and, consequently, that the tailings from the new mill have not heen treated, and that 960 ounces remain to he recovered. An additional ten stamps were started on April 28 and another five stamps on May 7, making ninety-five stamps running. April working expenses were £8875, distributed over 13,300 short tons, equal to 13s 4d per ton, divided as follows: Mining (including pumping), 4s 6d; treatment (including milling, cyaniding and concentrating), 8s; realization of hullion, 10d. (General expenses are included in the ahove.) Total development expenditure, £3583; total other capital expenditure (machinery, plant, etc.), £7070.

The Ivanhoe G. Co., at Kalgoorlie, reports April returns at: 14,080 short tons of ore crushed, yielding 3170 ounces gold (100-stamp mill running 29 days 6 hours); 7190 tons of sands treated for 2685 ounces; 6080 tons of slimes treated for 3133 ounces; 820 tons of concentrates treated yielded 1730 ounces; 330 tons of telluride ore treated yielded 330 ounces gold; total, 11,048 ounces fine gold recovered. Working expenses (equal 21s 7d per ton), £15,600; mine development, £3700; machinery and plant, £200; West Australian dividend duty (estimated), £1000.

The output figures for month of April for the Lake View Consols mine at Kalgoorlie show: 9102 tons (of 2000 pounds) of ore treated yielded 4218 ounces fine gold. Costs: Ore extraction, 12s 9d per ton; ore reduction, 13s 6d per ton; realization of bullion, 4d per ton; total working expenses, £1 6s 7d per ton; equals £12,118. Expenditure on machinery and plant, £217; expenditure on mine development, £2456.

Kalgoorlie reports to the Record say during 1903 the mines of Western Australia produced hullion to the value of $43,800,000 from the treatment of 2,160,656 long tons of ore. There were 16,987 men employed, also 4055 stamps, 165 other mills, 1309 leaching vats and 140 filter pressos. The dividends paid amounted to $10,120,000. The total production of Western Australia from 1886 to 1904 is $232,000,000 from the treatment of 9,682,932 long tons; the dividends for that period amounting to $47,500,000. Kalgoorlie's contribution to these totals is as follows: In 1903 the fifteen principal mines treated 893,668 tons for a yield of $21,200,000. The dividends for the period were $7,000,000. On this part of the field 6077 men were employed, also 570 stamps, 92 other mills, 318 leaching vats and 105 filter presses. The total production of Kalgoorlie since 1894 approximates $116,000,000. Dividends total $37,900,000. Individual outputs of main Kalgoorlie mines during 1903:

	Long Tons.	Value.
Golden Horseshoe	152,183	$3,750,000
Perseverance	132,593	3,700,000
Boulder Proprietary	109,844	2,850,000
Ivanhoe	149,131	2,750,000
Oroya-Brown Hill	52,259	2,100,000
Associated	58,008	1,400,000
Lake View Consols	92,497	1,200,000
Kalgurli	48,160	850,000
Brown Hill Extended	12,3.5	600,000
Associated Northern	5,963	550,000

The consumption of water from the government water scheme is increasing. It now totals 1,500,000 gallons daily, the mines taking 600,000 gallons daily. Water is pumped 383 miles through a 30-inch pipe to the gold fields. The pipe line and pumping plants have a capacity of 6,000,000 gallons daily and were constructed at a cost of $15,000,000.

BRITISH COLUMBIA.

The annual report of the Minister of Mines for British Columhia has been issued and includes the following statistics relating to mineral products for the year 1903:

	Quantity.	Value.
Gold, placer, ozs.	53,021	$1,060,420
Gold, lode, ozs.	232,831	4,812,616
Silver, ozs.	2,996,204	1,521,472
Copper, lbs.	34,359,921	4,547,535
Lead, lbs.	18,089,283	689,744
Coal, tons (2240 lbs)	1,168,194	3,504,582
Coke, tons (2240 lbs)	165,543	827,715
Other materials		531,870
Total		$17,495,954

Compared with 1902, gold, silver, lead and coal show a decrease, lead having the greatest loss (4,500,000 pounds). Copper, coke and miscellaneous made an increased output over 1902. The total production for 1902 was $17,486,550 in value. The production for 1903 hy divisions and districts was as follows:

Name.	Divisions.	Districts.
Cariboo District		$475,200
Cariboo Mining Division	$314,400	
Quesnel " "	132,000	
Omineca " "	28,800	
Cassiar District		480,368
Kootenay, East, District		1,951,128
Kootenay, West, District		6,603,981
Ainsworth Division	219,818	
Nelson "	653,457	
Slocan "	1,126,986	
Trail Creek "	4,308,458	
Other parts	295,262	
Lillooet District		31,283
Yale District		3,714,422
Osoyoos, Grand Forks & Kettle River Divisions	3,654,234	
Similkameen Division	2,000	
Yale "	58,188	
Coast Districts (Nanaimo, Alberni, W. Coast V. I., Victoria)		4,239,572
		$17,495,954

The principal placer gold producers were Cariboo and Cassiar districts; of lode gold, Trail Creek (Rossland division), Slocan and Yale; of silver, the Slocan; of copper, Yale (Boundary division) and Rossland; of lead, the Slocan.

Boundary District.

J. C. Haas has an option on the group of claims formerly owned hy the Boundary Creek M. & M. Co., near Phœnix. There are twelve claims in the group, including the D. A.——Connections have been made in the No. 4 tunnel of the Granby mines, work on which has been under way since last fall. It will make the portal of this tunnel 1500 feet from the No. 2 shaft of the Old Ironsides mine, the grade heing ahout 5%. The tunnel will be widened and improved. The Great Northern survey reaches the mouth of this tunnel.

A diamond drill has been put in operation on the Rathmullen group in Summit camp, near Phœnix.

It is reported G. A. McLeod of Grand

Forks has a working bond on the McKinley, a rich gold-copper proposition in Franklin camp.

Development work was started last week on the Lottie F. group, up the main Kettle river, near Phoenix, owned by G. W. Rumberger, J. Marshall, J. B. McCaulay and W. Fernie.

J. H. Peet, of Spokane, Wash., a director of the Providence mine, near Greenwood, reports work is improving. The shaft is down 325 feet and they are drifting and have struck ore. The vein has widened to 2 feet, and they have let a contract to sink 100 feet more, and also propose putting in electric drills. They have electric air fans, and the mine is lighted with electricity.

Cassiar District.

In Atlin section the power plant of the British American Dredging Co. at Pine Falls is reported working satisfactorily. This plant supplies power to the dredge built last season on Gold Run, 6 miles up Pine creek. The dredger has been put in full operation.——Hydraulic operations have begun on Otter creek. Water is two weeks earlier than last year.

On Boulder creek, near Atlin, good pay is reported as being exposed on the ground of the Societe Minieres de Columbie Britannique, and they are ready to start hydraulicking. Black & Grant, operating above the Societe's ground, are taking out gold in drifting.——The McKee Creek Con. and the Atlin M. Co., Ltd., (working under one management) have started piping. They will operate two lines this season.——On Spruce creek the Spruce Power Co. has completed its plant and piping will start this week. Prospecting on Ferguson & Walker's claims and adjacent ground has developed pay to open up on.

East Kootenay District.

It is expected the Canadian Pacific Railway will build a road 28 miles long from Michel to the properties of the Imperial Coal & Coke Co. this summer, says O. G. Laberee of Spokane, Wash., a director of the company. Superintendent J. Brown will put men to work developing and preparing to ship. Buildings will also go up during the summer. As soon as the road is built the company will put in coke ovens. Ultimately they intend to have 1000 coke ovens on the property and the output will be 10,000 tons of coal a day, a part of which will be made into coke. The property is north of the Crow's Nest coal fields. W. H. Evans of Montreal, Canada, is president. The company is said to have 96 square miles of coal lands in southeast Kootenay.

The John Bull group of claims on the St. Mary's river, in southeastern Kootenay, has been sold to C. A. Jarnigan of Spokane, Wash., J. M. Ely and W. F. Rickets of Pullman, Wash. Development work will be started this month. It is a copper mine.

J. Brown of Spokane, Wash., of the Imperial Coal & Coke Co., has made preparations to survey and exploit the company's claims in the coal areas of Fording river, near Fort Steele.

Rossland District.

Machinery for a 25-ton experimental concentrating plant will be put in for the Velvet-Portland mines on Sophie mountain, near Rossland, by W. Thompson of Rossland, consulting engineer. Water concentration will be used on gold and copper ores. Two steam stamps, with a capacity of twenty-five tons a day, will be used to reduce the ore to 10 or 20 mesh. It will be separated on tables. The concentrates will be shipped. The company expects to put in a small smelting plant this fall to reduce ores not amenable to water concentration.

Work is under way on the White Bear Con. M. Co. 100-ton concentrator at Rossland. The plant is expected to be completed in September, and at that time Rossland will have three concentrators in operation—Le Roi Two, Rossland Power Co. and White Bear—handling the low-grade output of at least four mines, Josie, War Eagle, Center Star and White Bear.

Vancouver Island.

Property of the Western Fuel Co. at Nanaimo, valued at $80,000, was destroyed by fire on the 30th ult., that started in the shaft house of Pit No. 1. All the men in the coal mine were saved. The blaze was started by a spark from a passing locomotive, which fell upon a timber of the pit head. The timber was dry, and everywhere coal dust was lying to a depth of several inches. The mine has another entrance from Protection Island, across the harbor, and from this point the men were warned. They brought out with them a large number of horses and mules, which were stabled at the bottom of the shaft.

CANADA.

Yukon Territory.

It is reported the placer mining regulations in the Yukon have been amended to give latitude to the Yukon commissioner, who may, in his discretion, cause the mining property of any deceased or insane person to be worked, as the necessity of the case may demand. He may also cause the public administrator of the territory to take possession of the property until it is administered by him, or until such mining property has been taken possession of under letters of administration granted by the proper court in that behalf. The charges and expenses incurred will be the first charge against the property.

CHILE.

The report of the Association Salitrera de Propaganda for last quarter of 1903 contains the following figures relating to the nitrate industry: The production for the year 1903 amounted to 1,614,434 tons, as compared with 1,419,483 tons in 1902. Exportations in 1903 amounted to 1,584,142 tons, as compared with 1,504,472 tons in 1902. The deliveries for consumption in 1903 amounted to 1,641,374 tons, as compared with 1,420,041 tons in 1902. If the consumption in February, March and April of the current year should be equal to that in the corresponding months of last year, the consumption in the "nitrate year" 1903-4 will be 1,650,013 tons.——The total of the quotas assigned to the several works to January 31, 1904, amounts to 2,249,500 tons, and there are eight new works in course of construction, the product of which will equal 405,000 tons, making total for the next nitrate year of 2,654,500 tons.——It is noted that the majority of the operators of the new nitrate works and "officinas" being established in the "pampa" are Germans.

MEXICO.

Chihuahua.

The iron mines northeast of Jimonez, on the Mexican Central railway, have been bought by H. Ginther for a French, Belgian and Dutch company, which will operate the property. It is proposed to build a railway from Jimenez to the mines.

The Compania Minera Sensitiva de Naica has been incorporated at Chihuahua to exploit a mining property in Naica district, and on which work was started last week. The officers are R. F. & M. L. Lujan, J. G. Acosta, G. Kraft, V. A. Cabrero.

Durango.

E. F. White reports that he has a concession to build reduction works at Mapimi.

Jalisco.

H. S. Church, manager of the Mascote M. Co., has arranged for building a smelter with a capacity of 100 tons on the mines of the company, north of Mascote. The ore from the company's mine is said to contain 22% of zinc, with copper, lead, silver and gold.

Nuevo Leon.

The Monterey News says E. Ludlow, manager of the Mexican Coal & Coke Co., is preparing to build a railroad from Las Esperansas through Musquiz to the company's coal fields at Nogalitos. Extensive development work is anticipated as soon as the road is built, and it is expected coal shipments will start by January 1st next. Shipments from Las Esperansas are at present thirty cars of coal per day. The town has a population of 10,000 and 3000 men are employed in the mines. Most of the coal is shipped to Monterey's industrial plants. The branch railroad which will develop the lands will be 30 kilometers long and will extend from the International Railroad.

Oaxaca.

I. Z. Mason of Cleveland, O., has an option on the La Purissima mine and a group of five other claims in Penoles district, which he will develop.

San Luis Potosi.

At San Luis Potosi the municipality has granted a concession to a company to take up the low-grade ore that was used in paving the streets, and to fill in plazas. The company agrees to replace the ore used by a better pavement. The company is composed of San Luis Potosi men, says the Enterprise.

Sinaloa.

L. Warfield, at Mazatlan, proposes to build a reduction plant of 100 tons daily capacity.

Sonora.

President W. C. Greene of the Cananea Con. C. Co., operating at Cananea, in his monthly letter to the stockholders says the product of the company during April was valued at $750,000. The company produced 370,000 pounds more of copper in April than in March. Developments at Cananea are exposing more ore of a high grade. The statement of the treasurer shows that the company has on hand cash and copper to the value of $1,229,086.19.

The Mines Company of America of Colorado Springs, Colo., owning and operating the Creston-Colorado mine, near Torres, and also owning an interest in the Dolores mine, in Chihuahua, is building a cyanide plant at a cost of $75,000 at the Creston-Colorado. The company employs 300 men at the property and the production amounts to about 6000 tons of ore a month.

Sahuaripa reports say W. O'Neill and L. Coombs will take over the Montoroy group of mines at Sahuaripa for $20,000. They will start development work next week.

The International Dev. Co. has been formed in Clifton, Ariz., to acquire and develop mining property in Sonora. The company has an option on forty pertenencias, near the Yaqui river, east of Hermosillo, on which it will start work next month. The workings will be cleaned out and opened up. The lode is 6 feet in width and carries gold and copper values. J. A. Baylor is manager.

The Dewey mine, near Hermosillo, has resumed shipment of graphite and is sending out several carloads each week. Superintendent T. Bentley says in the mine there has been opened a body of high-grade material. Besides graphite there is in the Dewey a copper ledge, carrying also gold and silver.

Personal.

W. J. DOUGLASS is superintendent of the Leasers' mill at Tonopah, Nev.

C. GEGNOR is superintendent of the Victor mine at Cripple Creek, Colo.

S. F. PARRISH has resigned as manager of the Le Roi mine at Rossland, B. C.

O. B. STEEN of Santa Monica, Cal., is in San Francisco, Cal., on mining business.

L. B. DE LA MORA, a mine owner of Guadalajara, Mexico, is in San Francisco, Cal.

W. J. NELSON of San Andreas, Cal., is in San Francisco, Cal., on mining business.

J. A. GILFILLAN is manager of the Mogul tunnel project at Eldora, Boulder Co., Colo.

H. J. BARTON of Yreka, Cal., interested in Siskiyou county mines, is in San Francisco, Cal.

T. F. SINGISER, president of the American Flag mine at Park City, Utah, is in Sioux City, Iowa.

W. F. GRIDER is superintendent of the Sugar Pine mine near Murphys, Calaveras county, Cal.

F. H. COLLINS is manager of the Republic Con. M. Co., operating near Georgetown, Colo.

J. SIPP is superintendent of the Gopher-Boulder group of mines near Kelsey, El Dorado Co., Cal.

C. F. BREED of Chicago, Ill., is in northern Gilpin county, Colo., looking after mining interests.

W. G. SCOTT, superintendent of the Black Oak mine, near Soulshyville, Cal., is in San Francisco, Cal.

E. L. WHITE, commissioner of mines for Colorado, has returned to Denver, Colo., from St. Louis, Mo.

J. B. COPLEN is superintendent of the Clipper group of mines of the Pacific M. & M. Co., near Globe, Ariz.

A. H. ELFTMAN of Minneapolis, Minn., has returned there from a trip through the West on mining business.

P. A. BRADY has resigned as superintendent of the Belcher group in the Greenhorns, near Granite, Or.

F. DAINES is superintendent of the Belcher group of mines, near Granite, Or., vice P. A. Brady, resigned.

G. RECKHART of El Paso, Texas, is manager of the Aberdeen C. Co., operating copper mines near Lordsburg, N. M.

R. KNOX, manager of the Revenue mines and mill at Norris, Mont., has returned to camp from Salt Lake City, Utah.

G. B. ADAMS, manager of the Hermosa M. Co., has returned to the mines of his company, near Nogales, Ariz., from Oklahoma.

J. T. TERRY of San Francisco, Cal., is in charge of the cyanide plant at the Rawhide mine, near Jamestown, Tuolumne county, Cal.

G. W. DRYDEN of Boston, Mass., manager of the Pelican M. & M. Co., is in Lake City, Colo., in the interests of the Pelican properties.

T. W. DAVIDSON, of the Eastern Oregon Dev. Co., returned to Sumpter, Or., last week after a trip East in the interest of the Morning mine.

A. F. DOWNS of Davenport, Iowa, president of the Spar M. Co., has returned from the company's mines at White Pine, Gunnison county, Colo.

L. H. WILKINS, superintendent of the Darling mine, near Georgetown, El Dorado county, Cal., has gone to London, Eng., on company business.

F. CLARK is superintendent of the Trade Dollar Extension M. Co., operating near Silver City, Owyhee county, Idaho, vice A. F. Stevens, resigned.

G. R. DUBOIS of Battle Creek, Mich., secretary of the Huron Sub-Marine G. M. Con. Co., operating gold dredger near Redding, Cal., is in California.

T. F. TURNER of Canton, Ohio, president of the Mexican-American M. & Dev. Co., owning the San Ricardo mine, east of Poza, Sonora, Mexico, is at the mine.

J. R. SPEER of Pittsburg, Pa., and F. E. Himrod of New York City attended the annual meeting of the Old Town Con. M. Co. in Idaho Springs, Colo., recently.

M. A. REPLOGLE of Akron, Ohio, having perfected his "differential" water wheel governor, has been retained by the Replogle Governor Works as chief engineer.

DANIEL A. JONES, formerly with the Buffalo, Rochester & Pittsburg Railway, in charge of construction work, is on his way to Nome, Alaska, to open an engineering office.

J. F. COLLINS, manager of the Spokane & Montana M. & M. Co., returned last week to Spokane, Wash., after an extended visit to the company's mines, near Libby, Mont.

A. F. STEVENS has resigned as superintendent of the Trade Dollar Extension M. Co., near Silver City, Idaho, to devote his time to management of the Addie C. property in same section.

G. W. MYERS of the Chrome Steel Works of New York has returned to San Francisco, Cal., from a business trip in Siskiyou, Calaveras and Tuolumne counties, Cal., and leaves next week for Alaska.

HENRY VENTRESS, assayer at the Centennial-Eureka mine at Eureka, Utah, for the past five years, has resigned and has gone to Bingham Junction, Salt Lake county, Utah, as assayer at the smelter of the United States M. Co.

S. W. TRAYLOR, mechanical and metallurgical engineer, whose headquarters are at 116 Liberty street, New York, has returned East from Nevada and Colorado camps which he visited in the interests of mining companies of Boston and New York.

F. A. GOODALE of the Colorado School of Mines at Golden, Colo., has been appointed to go to St. Louis, Mo., to assist in installation and operation of the chemical and assay departments which are to be exhibited by the Colorado School of Mines.

PROF. A. MARSTON, who has been in charge of the civil engineering department of the Iowa State College, at Ames, Iowa, for the last twelve years, was recently elected dean of the engineering division. Prof. G. W. Bissell has charge of the department of mechanical engineering, Prof. L. B. Spinney of the electrical engineering, and Prof. S. W. Beyer of the mining engineering.

J. W. LIEB, JR., of New York City, N. Y., vice-president and associate general manager of the New York Edison Co., has been elected president of the American Institute of Electrical Engineers. The following officers were also elected at the same meeting of the Institute: Vice-presidents, W. E. Goldsborough, J. J. Carty, S. Reber; managers, H. G. Scott, L. A. Ferguson, J. G. White, S. S. Wheeler; treasurer, G. A. Hamilton; secretary, R. W. Pope.

Books Received.

"Encyclopedia of Mexican Mining Law," being a digest of the Mexican mining code, by Richard E. Chism, Ph. D. This little volume, well known to all mining men in Mexico, has just been issued, bringing the work up to the present year, 1904. In addition to the mining laws of Mexico, which every operator, prospector and owner of Mexican mines should understand, the work contains a carefully compiled glossary of mining terms in Spanish, and the weights and measures in use in Mexico.

Commercial Paragraphs.

C. R. HEWITT has accepted a position as salesman with the Rand Drill Co. of New York, and will be connected directly with the selling of the Imperial tools.

THE Chrome Steel Works of Brooklyn, N. Y., and Chrome, N. J., have an exhibit of stamp mill parts, etc., at section 73 of the Mines and Metallurgy Building at St. Louis, Mo., in charge of H. Hussa.

THE C. O. Bartlett & Snow Co. of Cleveland, Ohio, report an order from the United States Geological Survey for one of their No. 3 style "C" four-compartment direct heat rotary dryers to be used in the plant located within the Exposition grounds of the Exposition at St. Louis for testing the coals and lignites of the United States.

THE Colorado Iron Works Co., from its New York office, 116 Liberty street, reports closing contracts for several mills to be erected in Idaho. One of these, in the Big Creek district, is for the Wordenhoff M. & M. Co., and consists of a complete 30-stamp amalgamation mill, with cyanide plant. This mill is to have both water and steam power plant, that it may be operated by either, as the case requires. Also a complete 15-stamp amalgamation mill for the Thunder Mountain Climax G. M. Co. and the Thunder Mountain H. Y. G. M. Co., together with the necessary power. Also a contract for the Idabo Gold Coin M. Co. for a dry crushing cyanide mill, with 36x16-inch improved standard rolls. In addition to this the firm reports shipping to the St. Joe Lead Co., near St. Louis, Mo., one of the largest modern lead smelting furnaces installed in that district.

Obituary.

J. BAXTER, a mining engineer of Boise, Idaho, died at Boise, May 19th.

G. RENNICK, a California mining man, died at Marysville, Yuba Co., Cal., on the 1st inst. Deceased was 38 years of age.

J. CLAWSON, assistant superintendent of the O. K. mine at Dale, San Bernardino Co., Cal., died May 25th. It appears he had started down the ladder leading into the shaft, when either his foot slipped or the timbers gave way, dropping bim a distance of 200 feet.

DAVID R. FRASER, one of the founders of the Fraser & Chalmers Co. of Cbicago, Ill. (now the Allis-Chalmers Co.), and identified with the concern until 1893, died May 31st of apoplexy. Deceased was 80 years old. Fraser was the inventor of machinery used in the mining industry.

P. H. SCOTT, consulting engineer in the Denver, Colo., office of the Power & Mining Machinery Co. of Milwaukee, Wis., died in Denver, Colo., May 24, 1904, aged 73 years. Deceased was born in Napanee, Upper Canada, and while a young man went to California during the early gold rush. He worked on the Comstock at Virginia City, Nev., as constructing engineer, and later on the Bassick mine at Querida, Colo. At one time he was associated with H. C. Holthoff and R. J. Cory as erecting engineers and contractors for mining and metallurgical plants. He bad charge of construction of the Dahlonega 120-stamp mill at Dahlonega, Ga., and also built the two chlorination plants at Colorado City, Colo.

Trade Treatises.

The Rand Drill Co. of 128 Broadway, New York City, N. Y., has issued a neat little pamphlet on air and gas compressors which it describes briefly, giving the facts and figures which those wishing to buy machinery of tbe kind referred to want to know.

"Sawmill and Woodworking Machinery" is the latest catalogue from the Eby Machinery Co. of San Francisco, Cal., and Seattle, Wash., handsomely illustrated with cuts of plants in operation, and of the varied machines for handling such materials, from the rough log to the finished mill product.

Dividends.

The Bunker Hill & Sullivan M. & Con. Co. on the 4th inst. paid dividend No. 80 of $75,000, a total since Jan. 1, 1904, of $288,000, and total to date, $1,821,000.

Latest Market Reports.

SAN FRANCISCO, June 3, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅜d (standard ounce, 925 fine); New York, bar silver, 55c, refined (1000 fine); San Francisco, 55c; Mexican dollars, 45½c San Francisco, 44¼c New York.

COPPER. — New York: Standard, $13.12½; Lake, 1 to 3 casks, $13.00@13.12½; Electrolytic, 1 to 3 casks, $12.75; Casting, 1 to 3 casks, $12.50; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 5s 6d spot per ton.

LEAD. — New York, $4.40; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 1¼c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £11 13s 9d ℔ long ton.

SPELTER.—New York, $5.30; St. Louis, $5.00; London, £26 ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

TIN.—New York, pig, $27.00@27.20; San Francisco, ton lots, 29c; 500 lbs., 29½c; 200 lbs., 30c; less, 30¼c; bar tin, ℔ lb., 32¼@35c. London, £126 2s 6d spot.

PLATINUM. — San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER. — New York, $44.50@45.50, large lots; London, £8 2s 6d; San Francisco, local, $43@43.50 ℔ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c: No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 19.00c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 40@47c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.60@13.75; gray forge, $12.75; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less tban 500 lbs., per lb., 7c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ℔ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¾c; Hallett's, 6⅝c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less tban one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE. —Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14c; Mineral Seal, iron bbls., 19c; wooden bbls., 21½c; cs., 25c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 70c; Bleacbed, do., 80c; Whale Oil, cs., 52@57c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7½c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.00 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., $1.00.

PHOSPHORUS.—American, ℔ lb., 70c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

HYDROCARBON OIL BURNER.—No. 760 818. May 24, 1904. L. J. Strait, San Francisco, Cal. This invention consists of an oil reservoir or chamber, means for automatically keeping up a supply of oil within it, pipes connecting the steam space of a boiler with the space above the oil in the chamber, and means for automatically regulating the pressure, pipes leading from the oil space and the steam above it to a common burner, through which they discharge, and means for automatically regulating the supply of fuel to correspond with the steam requirements of the boiler, said means being controlled by the increase or decrease of steam pressure within the boiler.

GRAIN CLEANER. — No. 760,832. May 24, 1904. Wm. Williamson, San Francisco, Cal: one-half assigned to C. J. Williamson and H. E Williamson of same place. This invention consists in the combination, with loosely suspended, superposed and connected shoes containing suitable screens, of a fan by which a blast of air may be discharged, two pairs of eccentrics upon said fan shaft, one pair being connected with the upper and the other with the lower shoe, substantially at right angles with each other, and a means for adjusting the second pair of eccentrics to increase, diminish or reverse the stroke and to make a reciprocation with any desired relation to the first pair of eccentrics. In conjunction with this device is a superposed hopper and a means for directing a blast through the space between the hoppers, and thus separating out the larger chaff and straw before the grain reaches the screen-carrying shoe.

COMPRESSIBLE PISTON PACKING.—No. 760,632. May 24, 1904. J. C. Kitton, San Francisco. Cal. This invention consists in forming the piston with a reduced portion or chamber between itself and the inner sides of the cylinder in which it operates and in the employment of a sleeve inclosing the piston rod and passing with it out through the gland or stuffing box, said sleeve being movable with relation to the piston rod and having its upper end forming one portion of the piston chamber. Within this chamber a suitable compressible packing is placed, and this can be moved or adjusted from the outside without opening the cylinder.

OIL BURNER.—No. 760,826. May 24, 1904. G. B. Von Boden, Sacramento, Cal., and E. F. Ingles, San Francisco, Cal. This invention relates to an atomizer or burner for use in the utilization of petroleum o · other liquid or pulverized fuel to produce steam or generate heat for any purposes; but it is designed particularly to generate steam for locomotive, stationary and marine boilers. The particular feature of the device consists in combining the fuel and vapor on or above a lip or plane having a smooth or irregular surface projecting in front of the oil and steam discharge and slightly below the latter for the purpose of more thoroughly mixing the discharge or controlling its movement before passing into the fire.

New Patents.

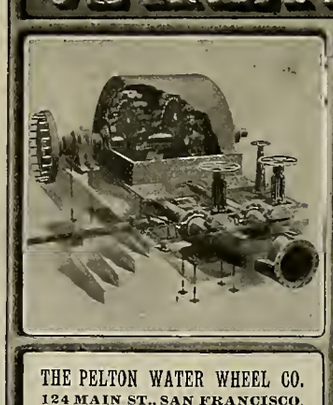
DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 24, 1901.

761,029.—ELECTRIC BELT—F. H. Brown, Los Angeles, Cal.
760,608.—MANIFOLDING TABLET — H. P. Brown, S. F.
760,609.—MANIFOLDING BLANK — H. P. Brown, S. F.
760,610.—SHINGLE MACHINE—F. W. Burpee, Fairhaven, Wash.
760,729.—OIL BURNER—J. G. Camp, Sacramento, Cal.
760,730.—ACCORDION—R. Carbonari, S. F.
760,777.—DISH WASHER—C. S. Chamberlain, Emeryville, Cal.
760,780.—DOOR OPENER—J. F. Connell, Los Angeles, Cal.
760,530.—MANGLE—J. W. Durr, Portland, Or.
760,982.—MITER BOX—W. H. Gordon, Portland, Or.
760,691.—PROSPECTOR'S PAN—B. P. Herndon, Florence, Ariz.
760,996.—CAR STEP—E. Howe, Everett, Wash.
760,539.—TREATMENT OF ORES—W. J. & J. H. Jory, S. F.
760,632.—PISTON PACKING—J. C. Kitton, S. F.
760,910.—COPY HOLDER—M. L. McAloney, Seattle, Wash.
760,472.—LACED SHOE—G, T. McGuinness. S. F.
760,798.—CIRCUIT BREAKER—A. C. Miller, Corona, Cal.
760,641.—TROLLEY POLE—A. W. Morgan, Long Beach, Cal.
760,552.—SPRING BED—L. P. Norton, Los Angeles, Cal.
760 553.—TABLE—D. F. Oliver, S. F.
760,753.—POT COVER—C. H. Pickett, Eugene, Or.
760,703.—OIL BURNER—A. C. Rush, Los Angeles, Cal.
761,049.—ORE FURNACE—W. H. Smyth, Berkeley, Cal.
761,050.—ORE FURNACE—W. H. Smyth, Berkeley, Cal.
760,496.—BOTTLE—S. N. Sparks, Everett, Wash.
760,818.—OIL BURNER—L. J. Strait, S. F.
760,819.—CORD ADJUSTER—H. E. E. Strunk, Upland, Cal
760,826.—OIL BURNER—Von Boden & Ingles, S. F.
760,678.—VAPORIZER—White & Duryea, Los Angeles, Cal.
760,596.—PUMP HEAD—W. & H. M. Williams, Lordsburg, Cal.
760,832.—GRAIN CLEANER—W. Williamson, S. F.
760,510.—ROASTING FURNACE—L. T. Wright, Keswick, Cal.

THE CALIFORNIA DEBRIS COMMISSION having received application to mine by hydraulic process from Geo. E. Waggoner and David Upton, in Telegraph Mine, at Indian Diggings, El Dorado County, Cal., draining into Indian Diggings Creek which reaches Cosumnes River, gives notice that meeting will be held at Room 96 Flood Building, San Francisco, Cal., June 20, 1904, at 1:30 P. M.

PELTON WATER WHEELS



THE PELTON WATER WHEEL CO.
124 MAIN ST., SAN FRANCISCO.
147 LIBERTY ST., NEW YORK.

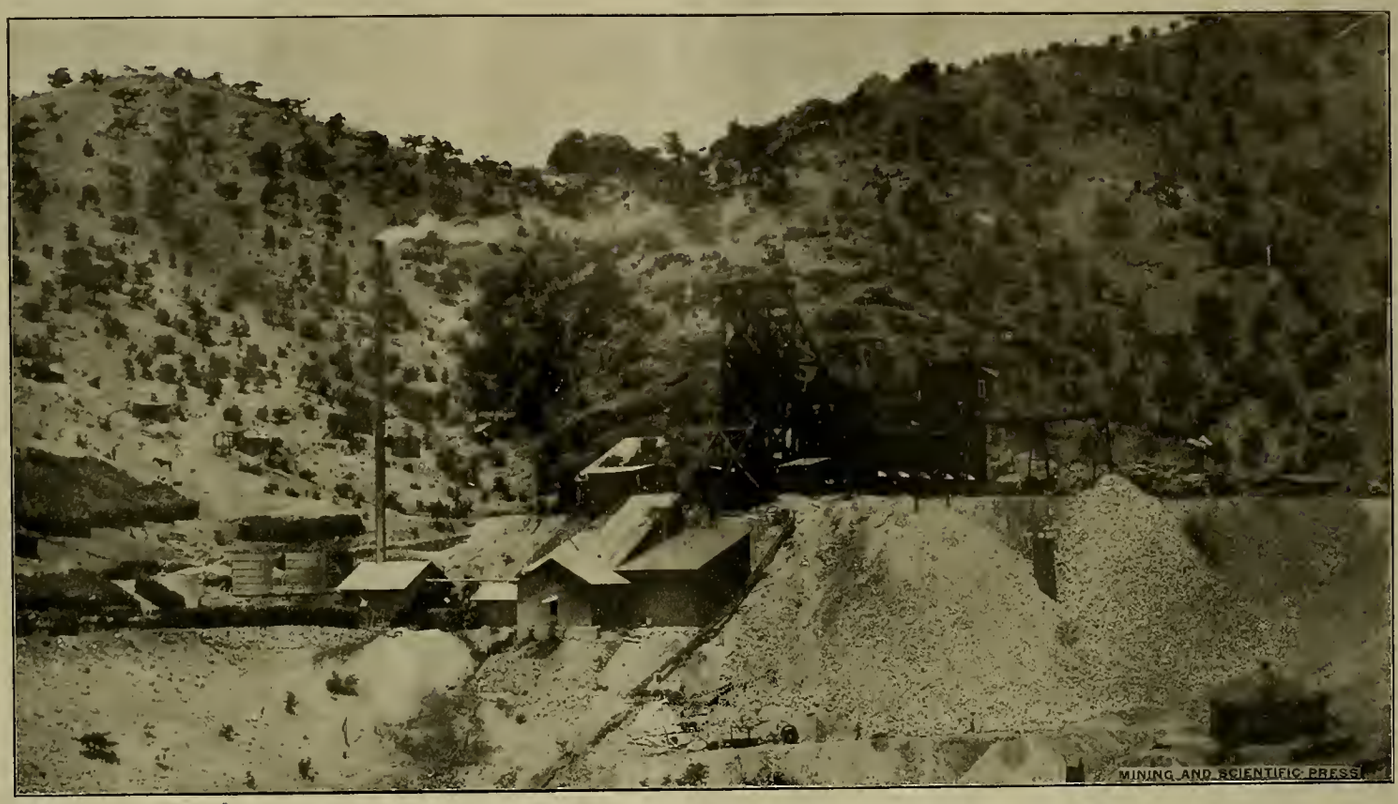
THE Pelton Water Wheel Company has just been awarded a contract from the Washington & Oregon Power Co., Walla Walla, Washington, covering three multiple Pelton units, each having a maximum capacity of 1000 h.p. operating under a head of 360 ft.—direct-connected to electric generators, running at a speed of 600 r.p.m. Also two exciter units similarly driven. The power is to be transmitted electrically and used for general industrial purposes throughout Southeastern Washington and Northeastern Oregon.

MINING AND SCIENTIFIC PRESS.

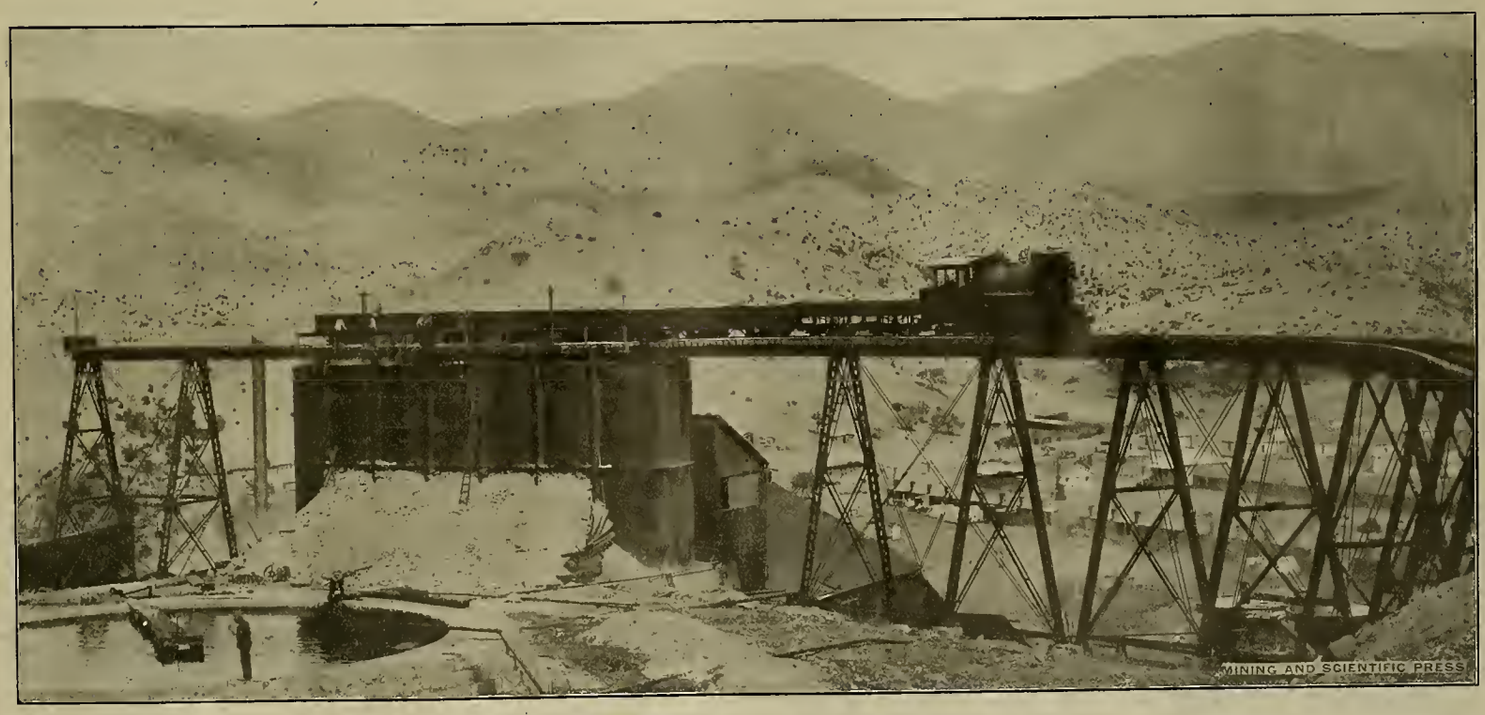
Whole No. 2290.—VOLUME LXXXVIII. Number 24. SAN FRANCISCO, CAL., SATURDAY, JUNE 11, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Mining Enterprise in Mexico.

Mexico is rapidly taking a place among the important mining countries of the world. The mineral resources of that Republic have long been known, but it is only within recent years that they have attracted marked attention from capital. There is much about Mexican mines attractive to capital, but without doubt one of the foremost incentives for monied men to undertake the development of Mexican mines is the absence of labor trouble of any sort. Mexico is not a good country for the walking delegate to attempt to exercise his autocratic sway, and knowing this he studiously avoids taking any such risks as the pursuit of his peculiar calling involves. The class of mines which attract the greatest attention and those most sought are large gold-bearing veins. The native Mexicans understand silver milling, and extract by their primitive, but effective patio process, a large percentage of the white metal, but for some reason they have given less attention to gold mining. In modern Mexico the mines having the greatest attractiveness are the antiguas—old mines abandoned many years since—and those in which mining was discontinued on account of carrying operations below the drainage level, may be looked upon with some favor, but the idle dry mines should be approached with caution, as when the Mexicans failed to make a mine pay it may be assumed that the elements of success are of doubtful character.



Main Shaft, Moctezuma Copper Co., Dos Pilares Mine, near Nacozari, Mexico.—See Page 393.



Ore Bins and Mill, Moctezuma Copper Co., Nacozari, Mexico.—See Page 393.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal.
Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union.....5 00

Entered at the San Francisco Postoffice as second-class mail matter.

BRANCH OFFICES:

NEW YORK CITY, 720 Park Row Bldg. BOSTON, 27 School St.
CHICAGO, 1164 Monadnock Block. DENVER, 606 Mack Block.

J. F. HALLORAN.....Publisher

SAN FRANCISCO, JUNE 11, 1904.

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Mistakes in Cyaniding.

In view of the fact that the manipulation of the cyanide process requires more than an ordinary knowledge of chemistry to understand the complicated reactions that take place, it is a matter of surprise to note how many there are who without this very necessary fundameutal knowledge undertake to operate cyanide plants. Mistakes are of more than common occurrence—they are abundant, due to lack of knowledge. Not only is this true of the chemistry of the process, but iu the mechanical department as well, and these mistakes are by no means limited to the small operators. As an instance may be mentioned one where a retaining wall was built and the rock removed in grading the hillside for the plant was dumped into the space between the wall and the hillside. On this insecure pile were placed large tanks, which were set directly upon the "made" ground, no sills being first laid. The natural result followed. The first time the tanks were filled to overflowing—something likely to occur in any similar works where particular mechanical means are uot provided to prevent it—the solution saturated the loose ground, and in a few hours the tanks were badly out of level, necessitating much expense in reconstruction and adjustment, all of which might have been avoided had a competent engineer beeu employed at the outstart. Since those high in the profession continue to disagree about certain more or less important chemical reactions, and the methods to be employed, it seems a waste of time for those wholly unfamiliar with the process and its iutricate details to attempt it, but many do nevertheless, and often with a meed of success scarcely to be anticipated. The cyanide process is always an experiment. No one can say that any particular ore cannot be successfully treated until the test is made. Apparently similar ores often give widely differing results under the same treatment. Raw sulphides yield up their gold more readily to the process on the Rand in South Africa than anywhere else where this has been attempted thus far, and that with relatively coarse crushing. Elsewhere very fine grinding or roasting have been found essential to success in treating pyritic ores. Flinty ores containing extremely fine gold or gold associated with tellurium seem particularly adapted to it, but the results obtained are not always by the same methods, nor at anything like a similar cost. Ores in South Dakota are mined and profitably treated at a cost below that of treatment alone in the Cripple Creek district of Colorado, which makes the low grade ores of Dakota—carrying $4.50 to $5.00 per ton—valuable, while those of Cripple Creek containing an assay value of double this amount are worth nothing at present, though in time changes in the process and additional knowledge may make this class of ores available—at least, the history of the process in the past leads to that conclusion.

Reaping the Whirlwind.

Within the week the entire civilized world has been startled and horrified by the dastardly murder of eleven men at Independence, Colo., whose only "crime" was in the fact that they were engaged in giving an honest day's work for a reasonable—and to them satisfactory—day's pay, and that they preferred to live, act and work independently, refusing to ally themselves with the miuers' union of that district. Ever since the organization of the association known as the Western Federation of Miners in the mining regions of the West, there has been a state of unrest where they have become strong, and clashes between the members of the Federation and mine operators have beeu frequent and bitter. Just what the teachings and tenets of the Western Federation are, thosc outside of that organization cannot reasonably claim to know, but the world judges what they must be by the acts of violence committed at times wheu this organization has had difficulties with miue operators.

Years ago in Pennsylvania there grew up a stroug secret organization of miners, known as the "Molly McGuires." This name soon became a synonym of all that was brutal, fiendish and lawless. Those who refused to yield to the dictates of this organized band of cutthroats were ruthlessly murdered. At great cost of money and sacrifice of human life this organization was finally broken up, and those of its leaders who were not hanged scattered throughout the mining regions of the West. The first indication that a similar organization had grown into power in the West was in Shoshone county, Idaho, where they ruled for a time with an iron hand. Finally they became so autocratic and uureasonable in their demands that the mine operators of the Cœur d'Alene refused longer to submit. Then followed a reign of terror. Men were waylaid and beaten, and others were shot when in the peaceful pursuit of their business. Still others were warned to leave the country. The trouble finally culminated in 1899 in the complete destruction by dynamite of the Bunker Hill and Sullivan mill at Wardner. Troops were sent into the country and the Westeru Federation men were driven out. They scattered into other Western States and into British Columbia, and extended and strengthened their organizatiou, and as a result in many camps, where peace and prosperity only had been known for years, followed strikes, bloodshed and the destruction of property. Intimidation was the weapon usually employed, and threats backed up by their activc execution drove many men into the ranks who preferred to remain outside of them.

Colorado particularly became the scene of frequent strikes, followed by violence. In almost every mining State the mine owners and operators were driven to organize protective associations to resist by organization the intolerant demands and threats of the Federation. In San Miguel county the long drawn contest between union miners and mine operators resulted in the assassination of A. L. Collius, superintendent of the Smuggler-Union mine, on November 19, 1902. This so incensed the law abiding element of that section, that with the assistance of the military many union miners were driven out, and for months the district was under martial law. Other troubles have since occurred throughout Colorado, and among them was the blowing up of the Sun and Moon electric plant at Idaho Springs by union miners or their sympathizers last fall. Closely following this on November 21, 1903, the superintendent and foreman of the Viudicator mine at Cripple Creek, while descending the shaft of that mine, were instantly killed by an infernal machine placed at a disused station. The individual perpetrator of this crime has never been discovered. Since then the agitators have been more quiet than before and the labor condition in Cripple Creek district was considered very much improved, as nearly all the mines were operating, though the majority of men employed were not members of the union, or were those who had resigned from the union in order to secure employment.

Between 2 and 3 o'clock A. M. of the 6th inst. the most dastardly of the long series of crimes, committed in aid of the cause of uniouism, was perpetuated when eleven non-union miners were blown into eternity and many more seriously injured by an infernal machine similar to that employed in the Vindicator outrage. This is supposed to have consisted of a large amount of dynamite which, having been placed beneath the depot at Independence, was discharged as the men collected on thc platform to take a train for their homes, after coming off shifts from the neighboring mines. It is believed, from evidence found, that the explosiou was effected by the discharge of a revolver secured to the platform timbers, the trigger being pulled by means of a wire which had been laid nearly 300 feet to the shaft house of the Delmonico, a neighboring mine. Can anyone conceive a plot more fiendish, morc cold blooded, and revengeful? It was not done in the heat of passion, but was the result of cold and remorseless calculation. These honest toilers werc hurled into eternity without an instant's warning, simply because they preferred to work rather than lie idly about for months waiting for the mine owners to submit to unreasonable dictation.

No one believes that the rank and file of the Western Federation approves of such murderous methods of obtaining the success of their aims, but without doubt the inflammatory speeches by their leaders and such disreputable characters as "Mother" Jones and others—who live at the expense of these misguided men—are responsible for crimes such as are above described.

Here is an example of "sowing the wind and reaping the whirlwind." Every Westeru Federation miner in Colorado is considered by the law-abiding people of that commonwealth as in a measure culpable for this—the climax of a long list of atrocities—and the leaders as directly responsible, and the people of the Cripple Creek district, aided by civil and military authorities, have started in to purge the county of Teller of an element dangerous to its existence. It has become evident that neither life nor property are safe as long as this element remains, and the mine and property owners are determined it must go. Union men are being deported from the district in large numbers and warned never to return. How far-reaching the reactionary effect of this crime will be it is difficult to say at this time, but it is bound to have a salutary effect—though at what a terrible cost!

THE recent completion of the Poland tunnel through the northern Bradshaw mountains, near the head of Lynx creek, in Yavapai county, Ariz., should mark a new era in the prosperity of the mining industry of that sectiou. Iu that vicinity are a great many mines in various stages of development. As a class they are not among what are generally considered free-milling mines, the ores being for most part sulphides of the base metals. Heretofore these mines have found the topographical situatiou a serious drawback to their development and operation; but the completion of the tunnel, through which a railroad is constructed, will render many of these properties easily accessible, so that the orcs may be shipped at a profit, or machinery may be set up at the miues to treat the ores, whichever seems the better course from an economic standpoint. The values are largely in the gold and silver contents of the ores; but in most cases, as by-products of greater or less importance, are also copper, lead and zinc. The separation of the sulphides of the several base metals is now comparatively easy iu the light of modern knowledge and methods, and ores which only a short time ago were commercially without value are now brought within the range of profitable reduction.

CONCENTRATES.

A SUITABLE GRADE for tracks in mines is 5 inches in 100 feet. A grade greatly in excess of this is too heavy for tramming empty cars up grade.

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ANY arsenic in ores being treated hy cyanido process tho arsenic will bo precipitated in the zinc precipitation boxes. Precipitates from such boxes must be refined with much care, as the arsenurated hydrogen evolved is a deadly poison.

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SLIMY ORES are estimated to average about 30 cuhic feet to tho ton. Dry sand will pack whon dampened and occupy loss space than before. Whon figuring on tho contents of a tailings pile tho calculations should be mado en a hasis of dry sand.

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IT has hoen decided by the Supreme Courts of several States that a tunnel cannot be driven threugh the prepcrty of another to reach ground beyond. If A starts a cresscut tunnel on his own ground, and undertakes to reach a claim located beyond B's claim, B may stop A, if he is so disposed.

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THE only instance known to "Concentrates" whero a drain tunnel is utilized as a means of transportation by water underground is at the mines of Clausthal, Germany, whero a large tunnel was employed as a "navigablo stream" to float ore laden boats, which conveyed the ore from the loading chutes to tho cencentration works.

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TALCOSE gold-bearing ores have been successfully worked by the cyanido process in Montana, by the decantatiou method. The gold usually occurs in talc, in extremely thin sheets—tbinner, if possible, than geld foil. It disselves readily, but the difficulties encountered are in classifying the solution and removing what remains of it frem the slimy sludge after decantation.

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AT many of the Butte, Mont., mines the water pumped or hoisted from the mines is run into tanks containing scrap iron, upon which the copper contained in the water, probably as sulphate, is precipitated in the metallic form. These waters are acid and rapidly corrode ropes and iron work in the shafts and about the surface works that they may reach.

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WHEN designing a stamp mill in which concentrating machines are to be operated, provision should be made for a separate means of power for the concentrators, to insure steady running. Concentrators operated by the same power—water wheel, steam engine or other motive power—are usually affected when the heavier machinery starts or steps. Particularly is this noticeable with the intermittent working of the rock breakers.

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VALVES on water pipes should he closed slewly or the "water hammer" incident to the sudden closing of a tap or valve may cause the pipe line to burst at any point between the valve and the reservoir or pressure box. This is due to the sudden stoppage of the water in motion, and the danger increases with the increasing size of the valve. For this reasen large valves or gates are so made that they can only he closed slowly with a screw.

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THERE are conditions under which stoping may be carried on with little or no timber. Such conditions, however, do not always exist. Some mines occurring in limestone, and in massive formations of tuff in dry regions, are among these that it is pessible to work extensively without timber. Methods of stoping with a minimum of timber were described in the MINING AND SCIENTIFIC PRESS, in the issues of February 13 te March 12, inclusive.

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THERE may appear to be some error in the statement that tailings after concentration contain a higher percentage of lead sulphide than was found in the original ore. This is due to differential separation of the sulphides. Where zinc sulphide is also present in considerable quantity, if it is removed by any process of concentration te a greater extent than the lead sulphide, the latter may appear in the tailings to contain a higher percentage of lead sulphide than the original ore.

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WHAT is known as the "rhombohedral theory" in relation to vein formation was intreduced by Louis Janin in the case of the Pennsylvania Mining Co. vs. the Grass Valley Exploration Co. of Grass Valley, Cal., and conceives that certain vein formation in those claims was due to the jointing planes of the rocks breaking the rock masses inte rhembohedral blecks, or forms approaching a figure of that description, and that the veins, or certain parts of them, were formed along these jointing planes.

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FAILURE te perform the necessary amount of assessment work on an unpatented claim will result in the forfeiture of the claim should it be taken up by another. Where there is more than one partner, the fact that one partner performs his share of the work will not save the claim. The Government requires not less than $100 worth of work, and this must be performed by some one of the owners, if not by all concerned. The only recourse of the one doing the work, in the event of failure of the co-owners to do their share, is to advertise the delinquent non-contributors out, as required by law. As perfect a title may be secured in this manner as in any other.

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THE depth to which mining may be carried has never been determined, except locally. In some instances it has been determined by economic conditions; in others by physical conditions, such as large floods of hot water, or high temperature of the air and surrounding rocks. Is is holieved that from a mechanical standpoint equipment may be provided which will enable the sinking of shafts and the operation of mines to a depth approximating 10,000 feet. At present, about 5000 feet is the limit. It is probable that the only inducement required to carry mining oporations to a dopth of 2 miles is rock sufficiently rich to pay a profit on the operation.

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WHERE the tailings in a gold mill are worth $2.50 te $3 after amalgamation and cencentration on a machine, it is probable that a large percentage of theso values may bo saved by sending the pulp to a spitzkasten or some form of hydraulic sizer, which will produce a separation of coarse and fine particles, then sending the coarse material discharged from the bettom of the box to a shaking table, and the fine slimes overflowing to a belt machine. If these operations are carefully carried out hy a competent, experienced operator, there will prebably be a very noticable lowering of values in the tailings—in some instances, no doubt, making an accessory cyanide plant unnecessary.

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WHERE a placer location, whether in a modern stream or an ancient river channel like those of California, is properly made, and is in valid existence, no outsider may enter the placer for the purpose of prospecting for a vein or lead, no matter hew strong the belief may be that a voin exists there, owing to surrounding geological conditions. A quartz claim cannot be located without a discovery and as a discovery under the alluvial and gravel of a placer claim, or beneath a lava-capped ancient river channel is impossible without sinking a shaft or driving a tunnel, such discevery cannot be made hy the stranger, as he may not enter within the boundaries of the placer claim for the purpose of prespecting, as he is a trespasser.

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IF there is any suspicion that the fuse being used is defective, make actual tests of pieces from several coils. Cut the pieces 3 feet or more from each coil and light one end of all the pieces simultaneously and notice if there is a material difference in the time of burning through to the opposite ends. In case such discrepancy in time is very noticeable, the fuse is unreliable. It is net expected that a second or two on a short piece of fuse should condemn it; but half a minute or mere on a 3-foot piece is an indication that the fuse is irregular, and further tests should he made, and, if the results seem to justify it, the fuse should he condemned as dangerous. Tripple tape fuse should he used in wet holes, and it is also the safest to use under any circumstances.

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THE law requires that the end lines of mining locations shall be parallel, but it is not essential that these end lines cross the vein or lede at right angles. As the end lines projected in the direction of the dip determines the extralateral right, and the end lines may he so placed as to give this right in a direction not at right angles to the strike, so that the extralateral right may be taken somewhat more along the strike than along the dip. Ore shoots usually have a trend to the right or left of a line normal to the strike, and if this direction of trend of an ere shoot can be ascertained before finally marking the boundaries of a claim, this knowledge may be taken advantage of and the extralateral right may then conform more completely to the downward extension of the ore bodies than if the end lines were laid at right angles across the vein.

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WHERE the pressure gauge at the entrance of a hydraulic giant shows a pressure of sixty pounds per square inch, the pressure at the nozzle will be slightly less than that at the point ef entrance to the giant. Troutwine gives the following fermula for determining the pressure at any point in a pipe line: "The pressure head of running water upon any point in a pipe between the orifice and the reservoir is equal to the total head on that point minus (the head due to the velocity at that point + the entry head + the head consumed in overcoming resistances in the pipe between the reserveir and the point). The static pressure at any peint in a pipe line is determined by the head above that point, but when the water is in motion the pressure may be determined by the above formula. The velocity is much greater at the nozzle than at the entrance to the giant, but as abeve stated the pressure is lewer."

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THE federal statute requires the discovery of "mineral hearing rock in place" before a valid location can be made, though many mining claims are located without having a discovery of prefitable ore. In some States a period of time—from 30 to 60 days—is allewed for prospecting purposes. The law does not say or require that the mineral discovered shall he of a commercially profitable character, or that it shall contain a stated amount of metal or mineral of any particular kind. It has been frequently said, says "Lindley on Mines" that a valid location may be made whenever the prospector has discovered such indications of mineral that he is willing to spend his time and money in following it, in expectation of finding ore, and such location may be made of a ledge deep in the ground and appearing at the surface, not in the shape of ore, but as vein matter only. Doubtless a discovery made by means of a diamond drill, er even a churn drill, would form a sufficient basis upon which to base a mining claim, whero flat or nearly flat ore bodies eccur beneath sedimentary formations or sheets of perphyry, as at Leadville, Colo., or in the Terry peak region of South Dakota.

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IT is ofteu difficult to ascertain the hardness of a mineral, owing to the condition in which it occurs. A hard mineral which is in a granular and friable condition may seem much softer than a compact mineral of inferior hardness. The artificial mineral carborundum is an example. It has a hardness equal te or exceeding cerundum, being 9 in the scale of hardness, yet owing to the fact that it eccurs as a greup of small incoherent crystals it seems much softer than massive quartz, which is 7 in hardness. Carhorundum, as it comes from the electric furnace, can usually be disintegrated with the fingers, but a small crystal will give an idea of its hardness by scratching the face of a quartz crystal. Some minerals are harder on one crystal face than on anether. The mineral cyanite, also called disthene, is an example of this peculiar property. The hardness ranges from 5 on one face to 7.75 on another.

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THERE is not the same relation between the lead and silver in slags from lead furnaces as between the copper, silver and gold in slags from copper furnaces. When lead furnace slags are low in lead and silver there must be a definite and constant ratio between the iron, lime and silica forming the principal constituents of the slag. In cepper smelting no such ratio seems necessary, as a slag may vary widely in its silica content, and still the slags be almost free frem copper, silver and gold. The cepper smelter, in considering the formation of new slags, is guided to a great extent rather hy commercial than by chemical or technical considerations. Skill in furnace manipulation and proper equipment may result in making a slag nearly free from valuahle metallic constituents, yet it is considered easier and better to make a mere siliceeus slag on this without additienal fuel. Where the copper centent in the ore is low a siliceons slag is considered by some of the most successful smelters as ahsolutely necessary to success.

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IN theory one ounce of zinc decompesed by a gold-bearing cyanide solution should precipitate six ounces of gold, but in practice it is found that a much larger quantity of zinc is required per ounce of gold recovered. This is thought to he due to the fact that an excess of cyanide in the solution decompeses the greater amount of zinc. It is a fact, however, that the preeipitatien of gold from cyanide solutions is more rapid and perfect from stronger than from weak solutions. To hring this about, the solution is strengthened by adding strong solution constantly from a barrel or tank centaining it, and placed at the head of the precipitation boxes. The strong solutien is allowed to drip steadily into the weak gold-bearing solution while precipitation is in progress. Where copper precipitates on zinc shavings in the cyanide precess, the precipitatien of this metal may be checked by strengthening the solution as abeve suggested, as it has been found that copper precipitates much more readily from a weak than a strong solution. It is claimed hy Park that generally where the zinc shavings are first dipped into a 10% selution of lead acetate until cevered with a coating of the lead the gold will he precipitated more rapidly, and that no copper will be precipitated, even from the weakest selutions. Where the lead acetate fails to give satisfactory results, better success resulted frem dipping the zinc shavings inte a weak solution of mercuric chloride until coated with a film of mercury. The gold precipitates readily and the mercury is recovered, and dees not pass into the bullion, as does the lead by the previous method.

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MECHANICAL ENGINEERS are net agreed upon the relative merit or value in heisting from great depths of plants located wholly at the surface or partly on the surface and partly below ground. Stage winding has generally come to be leoked upon as necessary or advisable in depths exceeding 5000 feet; but some think that stage winding may be best accomplished by placing the hoisting plant on the surface, sinking a vertical shaft directly to the depth required—6000 feet or more—and dispensing with any offset in the shaft, such as would be necessary in the case where the machinery for the lower lift is placed under ground. Where the winding plant is placed en the surface in a relay lift, the principal advantage for such an arrangement would be in the fact that the winding reels or drums would only be required to wind about 3000 feet of cable instead of 6000 feet. The rope operating the lower skip would be placed beneath the upper skip. At a 6000-foot shaft, when the upper skip was at the surface the lower skip would be at the relay station 3000 feet below, where it would dump automatically. The two skips would then descend—the lower one te the 6000 level to be reloaded and the upper one to the 3000 level, where it would automatically take the load deposited in the ore pocket hy the lower skip on the last trip. This system admits of only operating a single level, but is designed to work in a vertical shaft which has been sunk to exploit a flat or low-lying vein, such as the Lake Superior copper deposits or the conglomerate beds of the Rand in South Africa.

The Nacozari District of Mexico.*

Nacozari, Sonora, Mexico, is 78 miles south of Douglas, Arizona, and has recently been connected with the latter city by railroad. The Nacozari road has been building for three years past and for a year has had its terminus at Cos, 22 miles north of Nacozari, necessitating freighting of copper out and fuel and supplies in, and the discomforts of stage travel for passengers.

Phelps-Dodge Co. own the principal interests at Nacozari, under the name of the Moctezuma Copper Co., and it is their capital which has constructed the railroad. They have a smelter and concentrator there for the reduction of ores of their Dos Pilares copper mine, situated 6 miles southeast of the plant and connected with it by a narrow gauge railroad. The operation of the mine and works has always been carried on under difficulties due to lack of transportation facilities. Fortunately the mine required little timber, there being stopes (the largest 150x125 and 80 feet high) without a stick of timber in them. Gas engines supply the motive power of the plant.

Simultaneously with the building of the road has been the erection of the Copper Queen smelter at Douglas and the constructing of a mile-long tunnel through the mountain connecting with the Pilares shaft at the 600 level. This last piece of work is now almost completed and will facilitate the production and transportation of ore, for instead of hoisting by a shaft and dropping by a tramway to the railroad level, it will now be dumped down shoots to bins in the tunnel and drawn off directly into the cars.

This mile of tunnel cut a total of 600 feet of ore in different places which previously had been unknown and which will now be developed. The Dos Pilares ore is chalcopyrite and while of low grade is good concentrating ore. The concentrator has at present a capacity of about 300 tons per day. It is likely that the smelter will be discontinued and the concentrates sent to the Copper Queen smelter at Douglas when transportation runs smoothly, but this is not likely to be done for six months.

The company has a number of private houses for its employes, beside a general boarding-house, and a hotel is now being erected.

The company operates two stores, one at the mine and one at Nacozari, where it also has an ice plant and a hospital. Apart from the town on a neighboring slope are the residences of Manager Jas. Douglas, Superintendent Williams and the company physician.

The greater part of labor employed is Mexican, which is largely depended upon in this country.

Northeast of Nacozari a distance of 6 miles is Huacal gold district, with El Globo on the eastern extremity, San Jose midway and Churinibabi on the north. All of these properties, while now idle for various causes, have been extensively developed. El Globo is owned by the Romadkas of Milwaukee, the San Jose by a French company, with M. Clere in charge, and Churinibabi by the Moctezuma Copper Co.

Scattered along this strip are many prospects of more or less merit. Among them is the New York, owned by W. L. York and M. Bridgeman, which has been shipping sixty tons per month from development work, very little stoping having been done. There are now 800 feet of work done, which is said to have been more than paid for by the ore taken out. It is a gold and silver ore. The property, consisting of twenty-six pertenencias, occupies the west spur of Huacal mountain. El Globo is on the east of the same mountain.

Another property is the Providencia, which is developing under the direction of F. P. Thomas.

Edward E. Miller and Henry Eisenhart also own property in the neighborhood, while Spencer Shaw and H. G. McCulloch are doing development work on the Monterey. The Sonora Land & Mines Co., F. M. Watts, manager, owns thousands of acres of land in the vicinity, they, with the Moctezuma Copper Co., being the most important land owners in Moctezuma mining district.

At present it is not proposed to extend the railroad to Moctezuma and Cumpas, 40 miles south of Nacozari, but when this is eventually done it will open up one of the most promising districts of Sonora.

Ysabel station, on the Nacozari road, is the shipping point of El Tigre mine, which has come into prominence during the past two years and is now a steady producer of high-grade gold ore. It is 30 miles east of the railroad on the Yaqui river. At present it is shipping five tons per day, which it is said averages about $250 per ton. The original purchase was 311 acres, which comprises their most important holding, though the property has since been increased to 600 acres. The ledge is from 4 to 20 feet in width and is cut by canyons in four places. From these it is worked by tunnel and upraise. The pay ore blocked out averages about 10 feet wide and $30 per ton. Though some bodies of it are of higher grade.

Present plans of the company, of which B. F. Graham of Douglas is president, are to put a 100-ton mill on the river connected by a 12-mile narrow gauge road with the mine, and concentrate the low-grade ore while continuing to sort and ship the high grade. A branch road from Ysabel is among the possibilities, as there are other producing properties in the neighborhood, among them the Ray and the Cinco de Mayo.

A short distance south of Ysabal is Turichachi, shipping point of El Picacho mine, 35 miles west in Bacoachi district on the Sonora river. This is a Phelps-Dodge gold property and has been undergoing development for about three years. For the past two years it has been a shipper of high-grade ore.

In the Ceniza mountains, about 16 miles southeast of Douglas, the most important mine is the Santa Rosa. The district has been taken up by locations and there are several good prospects being developed.

The Copper Queen smelter is responsible for much activity throughout this section. It has four furnaces in operation and a fifth almost ready to be blown in. The probability is that the Bisbee, Globe and Nacozari ores will be brought here for treatment in the course of time. Custom ores are bought to furnish proper combinations for fluxes.

The Calumet & Arizona smelter is operating two furnaces and turning out their customary amount of copper.

* See illustrations on front page.

Hook to Prevent Overwinding.

TO THE EDITOR:—Noticing that the problem of preventing overwinding has engaged the attention of many since the accident at the Independence mine at Cripple Creek, I wish to offer my quota to the literature on the subject.

The disengaging hook here shown is intended to avoid accidents in overwinding by releasing the rope

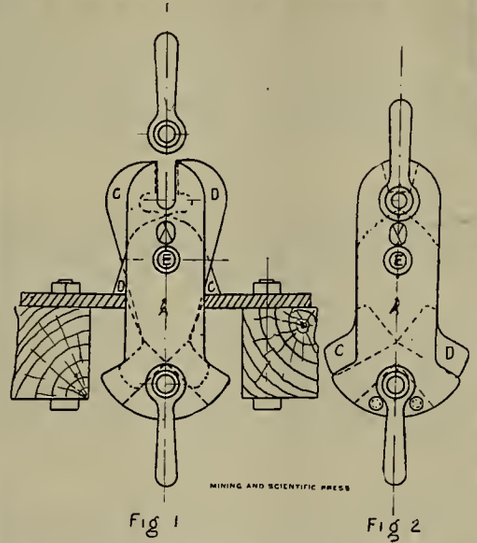


Fig 1 Fig 2

from the cage and at the same time suspending the cage. The action of the hook will be readily understood by comparison of the figures 1 and 2.

The thimble or collar plate is secured close under the pithead sheave and will support the cage when the rope is released. The hook is made up of four leaves, the outer two riveted together with a packing piece between at the bottom. The inner two leaves are held to place by the through bolt "E," about which they are free to revolve through a small arc, sufficient to open the slot for the release of the hook above, which is, of course, attached firmly to the winding rope. A small copper rivet "A," insures the hook against release, unless in actual cases of overwinding. This copper rivet is easily sheared by the action of the thimble against the inner leaves. The letters "C, C, C" refer to one inner leaf, the letters "D, D, D" to the other.

A modification of this hook is one which does not suspend the cage, in which case reliance is placed upon the usual safety catches. Either one of these devices is a sure thing, and may be applied to vertical or incline shafts with no alterations to existing arrangements, and will satisfy the most exacting Government regulation.

A recent contrivance on a winding engine to prevent overwinding consists in an automatic brake which is firmly set when the cage passes a given mark. This is not always applicable, as there are cases where not over 2 feet of overwinding room is to be had above the required station, and the automatic brake would not have time to work, in the 2 feet, or it would be set too quickly and so interfere with the regular work.

We have heard recommended a great catapult so set that it should be released by overwinding and strike the engine driver such a blow as would send him to kingdom come, there to give his excuses. This is hardly worthy of this, the engineering age, but illustrates the feeling most of us have in the matter, who entrust our lives to these contrivances.

D. E. BIGELOW.

Boulder, Western Australia, April 30.

A Dome of Lepidolite.

One of the striking features of the California exhibit at the St. Louis Exposition will be a dome of lepidolite, surmounted by a shaft and ball of the same material, as shown in the accompanying illustration. Lepidolite is a variety of lithia mica, of

Dome and Shaft of Lepidolite, California Exhibit, St. Louis Exposition.

colors ranging from white through shades of silvery gray, and varied shades of violet. The mineral is bright and glistening and much of it contains radiated groups of the pink tourmaline—rubellite. This mineral is obtained at several localities in San Diego county, Cal., notably at Pala, and near Mesa Grande. The structure is 25 feet in height, the dome being 9 feet above the floor and 12 feet in diameter. The interior of the dome is formed into a grotto, which is lighted by electricity. It will form one of the most conspicuous and attractive of the mining exhibits. Beyond the dome and column is an arch, shown in the illustration, which is now completed. It is made up of various mineral exhibits and is also an attractive exhibit. These structures have been erected under the direction of L. E. Aubury, State Mineralogist of California.

Gold Mining in Nova Scotia.

A large plate glass model of the Canadian Geological Survey, to illustrate the forty-nine gold mining districts of Nova Scotia, has been prepared for exhibition at the St. Louis Exposition. The model was prepared by E. R. Fairbault of the Canadian Geological Survey, and is considered an improvement on the one exhibited at the Paris Exposition. The section represented, 1 mile long by 2000 feet wide and 2000 feet deep, shows by lines of different colors the veins at the surface and in the working to a depth of 475 feet, the probable succession of deeper veins, their richest portions on the north and south dips, and the direction that should be followed in deep mining.

On the model are given the following explanatory notes: The gold-bearing rocks of Nova Scotia cover an area of some 5000 square miles along the Atlantic coast. Their total thickness is about 27,000 feet and they are probably of the Lower Cambrian age. Siuce their deposition on a sea floor they have been folded into a series of anticlines and synclines, roughly parallel with the coast line, the folds having an average distance of 3 miles apart. This folding was accompanied by a fissuring of the strata along the planes of sedimentation at the summits of the anticlines and gave rise to a succession of superposed saddle-shaped auriferous veins.

Mining operations have so far been confiued to the veins outcropping at the surface and have not reached a greater depth than 600 feet, and although often conducted in a very unskillful manner they have been remunerative. The recent study of this region by the Geological Survey has proved conclusively, however, that the auriferous saddle veins recur one below the other on the anticlinal domes, like the "saddle reefs" of Bendigo, Australia, which are mined extensively to depths reaching 4000 feet. This succession of saddle veins presents a most important field of operation for deep and permanent mining.

The El Paso Mine, Cripple Creek, Colo.

The Cripple Creek district of Colorado is keeping up the production and new strikes are reported frequently. On this page is an engraving illustrating the El Paso Con. G. M. Co.'s property on the western slope of Beacon hill. This company owns sixty acres of ground. The engraving shows the El Paso buildings in the center and the C. K. & N. in the extreme right, and near it is the Old Gold (not shown). Both of these latter properties are good producers. The El Paso are sinking their shaft from the 600-foot to the 800-foot level, and may continue to the 1000-foot level later. They have encountered the Tillery vein in the bottom of the shaft, just below the 700-foot level. This vein is from 2 to 3 feet wide and carries large quantities of sylvanite. But a small amount of water has been encountered in this shaft so far. The company is aiming to make a production each month of $75,000 to $95,000 gross, which means $40,000 to $55,000 per month net, out of which they are paying $24,500 per month in dividends and the remainder is being added to the reserve. The production for April was closed on the 27th of that month, owing to the fact that the company did not care to produce any more than they had during that month. The production for May was closed on the 20th of the month for the same reason as above. S. S. Bernard is president, J. M. Jordan secretary and treasurer, W. M. Bainbridge superintendent.

No. 2 Shaft of Vindicator Mine, Cripple Creek, Colo.

The El Paso shaft has come into considerable prominence through its connection with the drainage tunnel, a large portion of which was cut in headings driven both ways on its course from the El Paso shaft. The tunnel reaches the shaft at about 580 feet from the surface. Since the tunnel has drained the ground the El Paso shaft makes less water than previously, and the pumps are only required to raise it to the tunnel level, a comparatively short distance, consequently they should be able to control the water for some time to come. With such mines as the El Paso, C. K. & N., Old Gold, W. P. H., Elkton, Portland, Strong, Independence, Granite, Golden Cycle, Vindicator, Gold Coin and others producing regularly the camp has a long period of prosperity before it, which would, no doubt, be prolonged indefinitely by the driving of a deeper drainage tunnel.

There are more operating leases in the Cripple Creek district than ever before, and to this class of operators is much of the success of the district due. The fact that the leasing system as applied to the mines of the district is superior to any other method thus far tried is evidenced by the fact that a number of the larger corporate companies have adopted the system for the more extensive development and operation of its mines. Some of the most important and extensively developed mines of the district are operated largely under a system of leases. The leasing system is one involving the least expense in mine operation. The men interested in the lease are generally practical mining men who work, either actively in the mine or have charge of some branch of the business in an executive position. Expensive management is, to a great extent, dispensed with, and office expenses are reduced to a minimum. The work is done under the personal supervision of those interested or by contract, with proper restrictions and limitations of a practical and business-like character. The result is that there are to-day working in the district more men than at any time in its history, and the output is being maintained in a satisfactory manner.

The El Paso Gold Mine, Cripple Creek, Colo.

THE PROSPECTOR.

The three mineral specimens from Glendale, Or., are: 1. A small amount of chalcopyrite (copper sulphide) in a gangue of quartz and earthy material. 2. Pyrrhotite in quartz, with a little copper sulphide. It is not uncommon for pyrrhotite (a magnetic subsulphide of iron) to contain nickel and sometimes cobalt to the extent of several per cent; a careful sampling of the ore should be made. 3. A small amount of copper sulphide with iron sulphide in gangue.

The samples from Grizzly Flat, Cal., are: 1. Quartz rock, evidently metamorphic. 2. Iron sulphide. 3. Iron and lead sulphide, with a little disseminated granular quartz; the ores are probably both gold and silver bearing.

The rock specimens from J. J. B., Manvel, Cal., are quartz, stained with iron oxide; the light yellow crystals are wulfenite (molybdate of lead); it may also contain gold or silver, probably both; the wulfenite may be mistaken for gold in panning. Wulfenite is decomposed by hydrochloric acid with formation of lead chloride and molybdic oxide, which, on moistening with water and adding metallic zinc, produces an intense blue color, which does not fade on dilution of the liquid.

The specimens from Pearce, Ariz., are: 1. Liparite (a variety of rhyolite). 2. Fragmental rock, composed of pieces of chert, quartz and feldspars, with a feldspathic cement. 3. Trachyte; the latter very much altered, giving reaction for calcium carbonate, due to decomposition of feldspars.

The specimens from Springhill, Mont., are: 1. The black mineral magnetite (magnetic iron oxide); the green mineral serpentine. 2. Mica schist, with green iron silicate, resembling glauconite. 3. Very siliceous aplite, a variety of micaless granite occurring in dikes and bosses. 4. Much altered semi-schistose rock, containing abundant scales of black mica (biotite). 5. Coarse granite, the variety known as pegmatite. 6. Quartz with mica, possibly gold bearing. 7. Quartz and feldspar, with a little chalcopyrite.

The black rock from Argenta, Mont., is graywhacke, a variety of metamorphic sand rock, compact and hard.

The specimen from Sumpter, Or., is quartz—the variety known as chert. The bluish mineral on the side marked with ink is chalcedony (silica).

The three samples from Big Bug, Ariz., are: 1. Diorite, the hornblende largely altered to epidote. 2. Diorite, with a little disseminated pyrite. 3. Chlo-

rite schist, probably the result of alteration of diorite.

The samples from Baker, Idaho, are: 1. Missing. 2. Chalcopyrite, with small crystals of magnetite. 3. Quartz with chlorite and pyrite. 4. Schistose diorite. 5. Siliceous greenstone schist.

The green and blue colors in the rock specimen from Fletcher, Nev., are due to the carbonates of copper, which has resulted from the decomposition of copper sulphide, which occurs in small amount in the ore.

Important Legal Decision.

Among the recent legal decisions affecting the mining industry is that rendered by the United States Circuit Court of Appeals for the ninth circuit in the case of Last Chance Mining Co. et al., appellants, vs. Bunker Hill & Sullivan Mining & Concentrating Co., appellee, a brief allusion to which was made in the issue of June 4. In consideration of the importance of the case and the fact that a high court has enunciated legal principles which had previously been uncertain, the decision is published in full, together with the engraving necessary to a more comprehensive understanding of the facts of the case, and the legal problems involved:

IN THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE NINTH CIRCUIT.

LAST CHANCE MINING COMPANY, ET AL., Appellants, vs. BUNKER HILL AND SULLIVAN MINING AND CONCENTRATING COMPANY, Appellee. } No. 985.

Appeal from the United States Circuit Court for the District of Idaho, Northern Division.

W. B. Heyburn, and John P. Gray, attorneys for appellants.

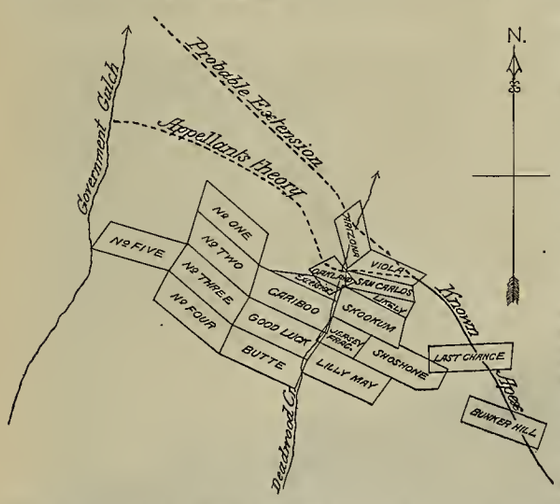
Curtis H. Lindley, Henry Eickhoff, and M. A. Folsom, attorneys for appellee.

Before Gilbert, Ross, and Morrow, Circuit Judges.

Ross, Circuit Judge, delivered the opinion of the court.

In the court below the appellee was complainant, and the appellants, defendants. For convenience of reference, the complainant Bunker Hill and Sullivan Mining and Concentrating Company will he referred to as the Bunker Hill Company; the defendant Last Chance Mining Company as the Last Chance Company; the defendant Shoshone Mining Company as the Shoshone Company; and the defendant Empire State - Idaho Mining and Development Company as the Empire Company.

The bill of complaint alleges the Bunker Hill Company to he the owner in fee, in possession, and entitled to the possession, of that certain mine and lode mining claim situated in Yreka mining district, Shoshone county, Idaho, known as the Bunker Hill lode mining claim, and specifically described in the bill; that within that claim there is a vein or lode of rock in place carrying silver, lead, and other valuable minerals, the general course or strike of the top or apex of which, at the surface within the claim, is northerly and southerly, on which course the top or apex of the vein crosses the southerly end line thereof at a point 300 feet westerly from its corner No. 3, and, continuing on its northerly course, the top or apex of the vein passes through the claim and crosses the northerly end line thereof at a point about 700 feet westerly of corner No. 2 of the claim, and that the said vein or lode on its downward course westerly passes out of and extends indefinitely beyond a vertical plane drawn through the westerly boundary thereof; that this vein or lode is the only vein or lode having its top or apex within the limits of the Bunker Hill claim, and is the vein or lode originally discovered on the 10th day of September, 1885, hy the grantors of the Bunker Hill Company. Attached to and made a part of the hill is a diagram which shows that the claim was located across the top or apex of the vein, instead of along it. It is not shown or suggested that this was knowingly or purposely done; on the contrary, it appears in this and other records in this court that at the time the Bunker Hill claim, and others within the immediate vicinity, were located, it was supposed hy the locators thereof that the vein or lode outcropping thereon ran in an easterly and westerly direction. That fact is referred to by counsel for the present appellants in his brief on behalf of the Empire Company in cause numbered 950, where, in speaking of a dispute between the owners of the Stemwinder and Emma claims in December, 1885, he said: "The Stemwinder at that time lay in an easterly and westerly direction; it was supposed that the ledges ran easterly and westerly; and that the ledges of the Stemwinder and Emma were separate and parallel ledges." What were intended as side lines of the Bunker Hill claim, therefore, actually became its end lines, under the familiar doctrine hereinafter referred to.



The hill further alleges that the Bunker Hill Company is, and for many years has been, the owner in fee and in the actual and exclusive possession of the Bunker Hill claim, and of the apex of the Bunker Hill lode within the claim, and of such part of the said vein or lode throughout its entire depth as lies westerly from, outside of, and beyond a vertical plane drawn downward through the westerly side line of the claim, and between vertical planes drawn downward through the end lines thereof extended indefinitely in their own direction westwardly; that neither of the defendants to the suit is, or ever has been, in possession of any part of the Bunker Hill claim, or of the Bunker Hill lode as thus described, and that each of them claims an estate or interest therein adverse to the Bunker Hill Company, which the latter alleges to be false and groundless and without any right whatever, and a cloud upon its title; that the value of that part of the Bunker Hill lode situated westerly of its side line, and between vertical planes drawn downward through its end lines, exceeds the sum of $500,000, exclusive of interest and costs. The prayer of the bill is, among other things, that the defendants, and each of them, he required to set forth the nature of their respective claims, and for a decree adjudging the alleged title of tho complainant to he good and valid, and that the defendants have no interest in or to the Bunker Hill claim or lode as described in the hill.

The defendants interposed a demurrer to the hill on the ground that it did not make or state such a case as doth or ought to entitle the complainant to any such discovery or relief as is thereby sought or prayed for. The demurrer being overruled, each of the defendants filed a separate and similar answer, and also a cross-bill, differing only in that each alleged ownership in the respective defendants of separate and distinct mining claims. Each of the answers admits that the complainant owns the surface of the Bunker Hill claim, and tho vein or lode within its boundaries, hut denies that the course of the vein is northerly and southerly, or that it crosses the alleged side line thereof, or that in its downward course it passes westerly beyond a vertical plane drawn through the west side line of the Bunker Hill claim, or that the complainant company is the owner of any part of the lode situated west of its alleged west side line.

The cross-hills alleged ownership, respectively, in the Last Chance Company of the Last Chance mining claim; in the Shoshone Company of the Shoshone and Summit mining claims; and in the Empire Company of sixteen other mining claims, specifically named and described, all of which, with the outcrop of the vein or lode therein, its course and dip, and its conflict with the extralateral right claimed by the Bunker Hill Company, are described in the respective cross-hills. They also allege that the vein or lode described in the Bunker Hill claim does not cross its end lines as now claimed, hut crosses its original end lines, and that the Bunker Hill Company's right to follow its vein or lode downward is between the parallel vertical planes drawn through its located end lines; that the course of the vein or lode, instead of being northerly and southerly, is north about 51° west, and that to follow it westerly, as complainant claims the right to do, would he following it more along its course or strike than upon its true dip. The prayer of the cross-hill was to the effect that the Bunker Hill Company be required to set forth any and every adverse interest, claim, or demand which it had to the claims, veins, or lodes described in the cross-bills, whether the same be claimed hy the Bunker Hill Company hy virtue of its ownership of the Bunker Hill claim and of the lode apexing therein, or hy virtue of its ownership of any other claim, vein, or lode, and that such adverse claim, interest, or demand be decreed null and void as against the cross-complainants, and that their respective titles thereto he quieted.

To each of the cross hills the Bunker Hill Company demurred on the ground that it presented mere matter of defense, and that the mining claims therein described were not included in or embraced by the original hill of complaint. The demurrers to the cross hills were sustained hy the court below.

We think the ruling of the court helow upon all of the demurrers was right. Two objections are made to the hill. One is that it contains no allegation concerning the general course of the vein beyond the limits of the Bunker Hill claim; and the other, that the bill does not show that the complainant is the legal owner and in the exclusive possession of the ore hodies in controversy.

In respect to the first objection, it is not perceived that there is any necessity for an averment in such a hill concerning the general course of the vein beyond the limits of the claim. The statute authorizes citizens of the United States and those who have declared their intention to become such, who find a vein or lode upon the public land, carrying any valuable deposit, to locate and claim the same, not exceeding 1500 feet along its length, and not exceeding 300 feet on each side of its middle at the surface, making the end lines of the claim parallel. R. S., Sec. 2320. The right of location is in no respect made dependent upon the course of the vein beyond the limits so fixed. A location so made, and marked and claimed as further provided by statute, or by the local rules and regulations of the particular mining district, when not inconsistent with statutory regulations, confers upon the locator, and his assigns and successors, the rights defined and specified by Section 2322 of the Revised Statutes, to wit: "The exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations. But their right of possession to such outside parts of such veins or ledges shall he confined to such portions thereof as lie hetween vertical planes drawn downward, as above described, through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges." Whether the lines of the Bunker Hill claim were so laid with respect to the vein or lode outcropping within them, as entitles the complainant to the extralateral right there defined and here claimed, depends upon the prohative facts of the case.

In respect to the second objection urged to the hill, it is enough to say that it has heretofore been held by this court that the ownership and possession of a vein at the surface carries with it the ownership and possession of all that pertains to the location. "The mining right," as said by us in Empire State-Idaho M. & D. Co. v. Bunker Hill & Sullivan M. & C. Co., 58 C. C. A., 315, "is an integral one. It is secured by a single location. The title to it is conveyed by one patent." It is a separate and distinct thing from any and every other claim. The fact that one individual, company, or corporation locates or acquires many such claims is wholly unimportant. Congress has never yet seen proper to put a limit on the number of such claims that one individual, company or corporation may locate or acquire. Whether, in view of its well-known policy to encourage the development of the mineral wealth of the country, it shall ever deem it wise to do so rests with Congress, and is a matter with which the courts have nothing to do. The rights which a valid location of such a claim secures to the locator and his grantees or successors are clearly defined hy law, and are wholly unaffected by any subsequent conflicting location. In all such matters the first in time is the first in right. Therefore, it heing conceded by the defendant's answers in the present suit that there is a vein or lode outcropping within the surface boundaries of the Bunker Hill claim, and that the complainant is the owner of the surface of that claim and of the vein or lode within its boundaries, it follows, as a matter of law, that if the vein or lode so crosses the lines of the claim as to entitle its owner to extralateral rights at all, the complainant has, as against any and every other claim not founded on a prior location, precisely the same right, hy virtue of Section 2322 of the Revised Statutes, to such parts of all veins, lodes and ledges throughout their entire depth, the tops or apexes of which lie inside of its surface lines, as lie between vertical planes drawn downward vertically through the end lines of the location extended indefinitely in their own direction.

A stipulation of the parties is to the effect that every one of the claims here in question, except the Last Chance, is subsequent in point of time to the Bunker Hill. Priority is asserted for the Last Chance only upon the fact that it was located, marked, and the notice of location recorded, hefore the location notice of the Bunker Hill was recorded.

A statute of the State in which the claims are situate requires that such notice be recorded within fifteen days after the making of the location, in the office of the Recorder of the county, or with the Recorder of the district designated hy the resident miners, as provided hy Section 3103 of the Revised Statutes of Idaho. The statute, however, prescribes no penalty for a failure to record such notice.

The master found as facts that the Bunker Hill claim was located September 10, 1885, hy one O'Rourke, who possessed the necessary qualifications and who had theretofore discovered within its limits a vein of rock in place carrying silver and lead; that on the day named O'Rourke posted "a discovery notice of location," containing the name of the location and claim, the date of its location, a description of the claim hy reference to such natural objects and permanent monuments as identified it, and reciting "such other matters as were then required hy the laws of the United States and the Territory of Idaho;" that at the same time O'Rourke marked the boundaries of the claim on the ground so that they could be readily traced, and then entered into the actual possession of the claim and commenced working it, which possession has ever since been maintained hy him and his successors in interest; that on September 29, 1885, O'Rourke caused a notice of location of the claim, duly verified, to be recorded in the office of the Recorder of the county in which it is situate; that prior to March 21, 1902, the complainant duly acquired through mesne conveyances from O'Rourke the title to the claim, and on the day last mentioned made application to the United States for patent therefor, which application recited the facts just stated, and upon which application a patent was issued hy the Government to the complainant on the 17th day of November, 1903; that the Last Chance claim was duly located September 17, 1885, and the location notice thereof recorded on the 22d day of the same month; that prior to the discovery and location of the Last Chance its discoverers and locators "had actual knowledge of the discovery and location of the Bunker Hill claim; they had visited the discovery, read the notice posted thereon, saw the discovery stake, the east end stakes, and knew that the locator was in the actual possession of the claim and was then engaged in development work thereon."

The record shows that during the proceedings before the master, the following stipulation was entered into hy and between counsel for the respective parties:

"Mr. Heyburn. It is stipulated that the discovery of the Bunker Hill lode claim was on the 10th of September, 1885; that the acts of location, except as to recording, were performed at or prior to that time, and that the recording of the claim was on the 29th day of September.

"Mr. Lindley. In other words, it will he admitted hy all the parties to this action, that all the acts establishing a perfected location were completed prior to the acquisition of any rights asserted hy respondents, or any

of them, in this action, respondents reserving, however, such legal objection as they may hereafter desire to make with regard to the application of the doctrine of relation, for the failure to record the Bunker Hill location prior to the 29th day of September.

"Mr. Heyburn. No objection is raised to the sufficiency of the location of any of our claims.

"Mr. Lindley. I must make a reservation in there in reference to the Shoshone and Summit. That is the only reservation that I make.

"Mr. Heyburn. I think we will have to stipulate all or none, Judge. As to the Shoshone and Summit, we will only be required to make proofs of the acts of location, and the admission goes to the effect that whatever title the locators got is vested in the Shoshone Mining Company.

"Mr. Lindley. If any title goes by that location, it is vested in you by mesne conveyances."

The record further shows that at a subsequent stage in the proceedings the following stipulation between the counsel was read in evidence:

"Mr. Heyburn. I offer in evidence a stipulation entered into this day, signed in open court by the counsel for the respective parties to this suit, as follows: 'It is hereby stipulated in the above entitled cause, that if Philip O'Rourke, the locator of the Bunker Hill lode claim, were present as a witness in this case, he would testify that the west end stakes of the Bunker Hill lode claim were not put up, nor was the west end of said claim marked upon the ground by the locators, until after the location and recording of the Last Chance and Emma lode claims.' That stipulation is signed by counsel for the respective parties in this suit. I offer it in evidence, in order that it may be here in the record.

"Mr. Lindley. We will reserve a formal objection to the materiality and admissibility of it.

"(Overruled. Exception.)"

We do not think it necessary to decide whether a stipulation to the effect that a certain witness would, if present, testify in contradiction of one or more of the facts already agreed to by counsel; could be properly held to modify such prior stipulation, for the reason that upon the facts expressly conceded, found, and in no wise contested, the Last Chance was located after the Bunker Hill, and while the latter was a valid, subsisting claim. At the time of the location of the Last Chance claim the time prescribed by the Idaho statute within which the Bunker Hill location should be recorded, had not expired. The Last Chance locators had actual notice of the Bunker Hill location, had read the description of it, and the locator of the Bunker Hill was in actual possession of that claim and actually engaged in working it. No part of the claim, therefore, whether above or underground, was then open to location by any other person. Belk v. Meagher, 104 U. S. 279; Book v. Justice Mining Co., 58 Fed. 106; Meydenbauer v. Stevens, 78 Fed. 787; Jerdan v. Duke, 53 Pac. 197.

It is conceded by the counsel for the appellants that the locators of the Last Chance could not then have entered upon the surface of the Bunker Hill claim and acquired any right as against it; but he insists that it is different in respect to such portions of its veins or lodes as lie outside of the vertical boundaries of that claim. The mistake of the learned counsel is in supposing, as he does througout his argument, that there is a radical difference in the nature of the right by which the locator of a valid lode claim holds the veins or lodes embraced by the surface lines extended vertically downward, and such of the veins or lodes belonging to the claim as extend in their downward course outside of the side lines; and that as to the latter, adverse rights may be acquired which could not be acquired in respect to the former. As has been already said herein, there is no such distinction. The mining right is an integral one, and is precisely the same to all that belongs to the location—its surface, and all veins or lodes apexing within it, and all not apexing elsewhere, found within the surface lines extending vertically downward, as well as the extralateral right defined by Section 2322 of the Revised Statutes of the United States. The St. Louis Mining and Milling Company of Montana et al. v. the Montana Mining Company, Limited, U. S. Supreme Court, decided May 2, 1904.

That the failure of the locator of the Bunker Hill claim to record his notice of location within the time prescribed by the Idaho statute did not work a forfeiture of the claim, there being no such penalty affixed by the statute, is well settled. Jupiter Mining Co. v. Bodie Con. Min. Co., 11 Fed. 666; Bell v. Bedrock T. & M. Co., 36 Cal. 214; McGarrity v. Byington, 12 Cal. 426; Johnson et al. v. McLaughlin et al., 4 Pac. 130; Emerson v. McWhirter, 65 Pac. 1036; Rush v. French, 25 Pac. 816. Besides, the issuance by the government of its patent for the claim is conclusive evidence of the sufficiency of the steps taken by the complainant. Davis v. Weibold, 139 U. S. 507; United States v. Idaho & S. M. Co., 128 U. S. 673; Montana Cent. Ry. Co. v. Migeon, 68 Fed. 811.

Whether the surface lines of the Bunker Hill claim were so laid as to entitle its owner to any extralateral right at all; whether, if it exists, it should be bounded by vertical planes drawn downward through what were originally located as the end lines of the claim or through those originally located as its side lines; and whether the extralateral rigbt claimed by the complainant and awarded it by the court below is to permit the complainant to follow the vein along its length and not on its downward course as prescribed by the statute, were matters of defonse open to all of the defendants in the court below, and upon which much evidence was given by the respective parties.

The master, to wbom the cause was referred to take the proofs and report to the court his findings of fact and conclusions of law, found, among other things, the following to be facts: That within the Bunker Hill claim there is a vein or lode of rock in place carrying silver and lead, commonly known in the district as the Bunker Hill lode, the apex of which is indicated by the outcrop of the foot wall which traverses the claim in a general northwesterly course from where it cuts the south boundary; that the foot wall is the well defined and persistent feature of this vein, and enters the Bunker Hill claim at a point on its south line about 300 feet from the southeast corner, and, exteuding along its course at tho surface northwesterly, passes out of the north line of the claim about 726 from the northeast corner of the claim; that the Bunker Hill lodo has no physical hanging wall, no marked line complement to the feot wall, in defining the limit of the fissure; that for its underlying boundary it has a well-defined, continuous bed of barren quartzite, but for its overlying boundary it bas only an irregular and vague outline of the limit of mineralization, from which fact, and the peculiar geological formation of tho lode, it is very difficult to define this limit with any degree of certainty, for which reason much confusion and some contradictiou appears in the testimony upon this point; that the weight of the testimony shows, however, that the mineralization of this lede or ledge extending from the foot wall into the hanging wall country, gradually fades in value until a point is reached 350 or 400 feet out, where the rock is practically barren; that the lode er veiu in passing through the Bunker Hill claim takes a northwesterly and southeasterly direction, and so intersects the north and south lines of the claim, wbich lines, while originally located as side lines, are in fact its end lines, and the original end lines became its side lines; that there is within the surface boundaries of the Bunker Hill claim the entire apex of the vein for a length of 676 feet, measured en the line of the foot wall at the surface, and that a segment ef part of that vein departs from tbe perpendicular in its downward course, and extends in a westerly direction under the outside of the westerly side of the claim, the same having been originally located as the westerly end line, and between vertical planes drawn downward through the end lines of the claim as above designated, so continued in their own westerly direction indefinitely; that tho vein, or segment thereof, having its apex within the surface boundaries of the Bunker Hill claim on its downward course between the extended end line planes thereof, extended in their own direction, passes underneath respective portions of the surface of the following lode claims owned by the Empire State-Idaho Mining and Developing Cempany, namely: The Lily May, Butte, Good Luck and Number 4; all of which are junior in point of time to the location of the Bunker Hill claim.

And as conclusions of law, the master found:

"1. That the surface lines of the Bunker Hill claim, originally located as side lines, are in law the end lines of the claim, and its extralateral right is defined by vertical planes drawn downward through these lines extended in their own direction westerly indefinitely.

"2. That the complainant is the owner and entitled to the possession of the sogment of said Bunker Hill lode and the ore bodies thereef in controversy herein, as against the respendents, Last Chance Mining Company, the Shoshone Mining Company, the Empire State-Idaho Mining and Developing Company; and that complainant is entitled to a decree against said respondents, and each of them, in accordance with these findings and conclusions, and agreeable to the practice of this court."

Certain exceptiens were filed by the defendants to the master's report, but none calling in question any ruling of his in admitting or rejecting evidence. Findings of fact made without any evidence to support them may, and should, as a matter of course and of law, be disregarded, but findings made by a master in pursuance of an order to take the preefs and report the facts and conclusions of law to the court, that depend upon conflicting testimony, or upen the credibility of witnesses, especially where, as in the present case, they are approved by the trial ceurt, will not be disturbed. Davis v. Schwartz, 155 U. S. 631; Warren v. Keep, id. 265; Crawford v. Neal, 144 U. S. 585; The Irequois, — U. S. — (May 2, 1904); The S. B. Wheeler, 20 Wall. 385; The Lady Pike, 21 Wall. 1, 8; The Richmond, 103 U. S. 540; Towson v. Moore, 173 U. S. 17; Smith v. Burnett, 173 U. S. 430, 436; Singleton v. Felton, 101 Fed. 526; The Columbian, 100 Fed. 991; North American Exploration Co. v. Adams, 104 Fed. 404; Fidelity & Casualty Co. v. St. Mathews Sav. Bank, 104 Fed. 858; Western Unien Tel. Co. v. American Bell Tel. Co., 105 Fed. 684; National Hollow B. B. Co. v. Interchangeable B. B. Co., 106 Fed. 693; Chauncey v. Dyke Bros., 119 Fed. 1; Thallman v. Thomas, 111 Fed. 277.

The Appellants do not, and, in view of the record, could not contend that there is no evidence to support the findings; but they urge that the weight of the evidence is to the effect that the true course of the vein or lode in question runs easterly and westerly instead of northwesterly and southeasterly through the Bunker Hill claim, and crosses the lines originally located as the end lines of that claim, and even if its course through the Bunker Hill claim he as found by the master, its width is far greater than found by him and in fact extends outside of and beyond the westerly boundary of that claim, originally located as one of its end lines and now treated as its westerly side line.

The conclusive answer to all of this is that above indicated, viz: that the findings by the master, made, in tbis instance, upon evidence that is decidedly conflicting, and approved by the court below, are against the appellants upon these points. But it may be added, that even if the vein or lode be as extensive in width upon the surface as contended by the appellants, the priority of the Bunker Hill claim over those here in controversy being here established, the extralateral right of the appellee would remain as fixed and determined by the decree of the court below. Empire State-Idaho M. & D. Co. v. Bunker Hill & Sullivan M. & C. Co., 114 Fed. 417; St. Louis M. & M. Co. v. Montana Min. Co., 104 Fed. 664, and like cases there cited.

The case showing that the lines originally located as the side lines of the claim are parallel, and it appearing from the findings that the apex of the vein or lode in question crosses those lines, they become in law the real end lines of the claim, under the well-settled doctrine upon that subject. Flagstaff M. Co. v. Tarbet, 98 U. S. 463; Argentine M. Co. v. Terrible M. Co, 122 U. S. 478; Del Monte M. & M. Co. v. Last Chance M. Co., 171 U. S. 55; Tyler Min. Co. v. Last Chance M. Co., 71 Fed. 849; Tyler v. Sweeney, 79 Fed. 277; Last Chance M. Co. v. Tyler Min. Co., 157 U. S. 683; Empire M. & M. Co. v. Tombstone M. & M. Co., 100 Fed. 910; Cosmopolitan M. Co. v. Foote, 101 Fed. 518; Bunker Hill & Sullivan M. & C. Co. v. Empire State-Idaho M. & D. Co., 109 Fed. 538a.

It is further and strenuously urged on behalf of the appellants, that the appellee, in following the vein underground between vertical planes drawn downward through its adjudicated end lines, decs so more upen its strike than upon its dip; and this, it is insisted, is not permissible under the law. In respect to this matter the master made no findings, holding it immaterial, as did the court below, and confining his finding in that regard to the fact that the course of the vein was downward between the end line planes fixed by him.

The extralateral right to a vein or lode outcropping at the surface, where it exists, is fixed by the course of the vein or lodo at the surfacc, and not by its course on a level. "We do not mean te say that a vein must necessarily crop out upon the surface, in order that locations may be properly laid upen it," said the Supreme Court in Mining Co. vs. Tarbet, 98 U. S. 469. "If it lies entirely heneath the surface, and the course of its apex can he ascertained by sinking shafts at different points, such shafts may be adopted as indicating the position and course of tho vein; and locations may be properly made on the surface above it, so as to secure a right to the vein heneath. But where the vein does crop out along the surface, or is so slightly covered hy foreign matter that the course of its apex can be ascertained by erdinary surface exploration, we think that the Act of Congress requires that this course should he substantially fellowed in laying claims and locations upon it. Perhaps the law is net so perfect in this regard as it might be; perhaps the true course of a vein should correspond with its strike, or the line of a level run through it; but this can rarely be ascertained until considerable work has heen done, and after claims and locations have become fixed. The most practical rule is te regard the course ef the vein as that which is indicated hy surface outcrop, or surface explorations and workings. It is on this line that claims will naturally be laid, whatever be the character of the surface, whether level or inclined."

In the subsequent case of Iron Silver Mining Co. vs. Elgin Mining Co., 118 U. S. 196, 206, the same court, after queting Section 2322 of the Revised Statutes, said: "This section appears sufficiently clear on its face. There is no patent or latent ambiguity in it. The locators have the exclusive right of possession and enjoyment of 'all the surface included within the lines of their locations,' and the location by another section, must be distinctly marked on the ground so that its boundaries can he readily traced. Rev. Stat. Sec. 2324. They have also the exclusive right of possession and enjoyment 'of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended dewnward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of said surface locatiens.' The surface side lines extended downward vertically determine the extent of the claim, except when in its descent the vein passes outside of them, and the outside portions are to lie between vertical planes drawn downward through the end lines. This means the end lines ef the surface location, for all locations are measured on the surface.

"The difficulty arising from the sectien grows out of its application to claims where the course ef the vein is so variant from a straight line that the end lines of the surface location are not parallel, or, if so, are not at a right angle to the course of the vein. This difficulty must often occur where the lines of the surface location are made to control the direction of the vertical planes. The remedy must be found, until the statute is changed, in carefully making the location, and in pestponing the marking of its boundaries until explorations can he made to ascertain, as near as possible, the course and directien of the vein. In Colerade the statute allows for this purpose sixty days after notice of the discovery of the lode. Then the location must be distinctly marked en the ground, and thirty days thereafter are given for the preparation of the proper certificate to be recorded. Erhard v. Boaro, 113 U. S., 527, 533. Even then, with all the care possible, the end lines marked on the surface will often vary greatly from a right angle to the true course of the vein. But whatever inconvenience or hardship may thus happen, it is better that the boundary planes should be definitely determined by the lines of the surface location, than that they should be subject to perpetual readjustment according to subterranean developments made by mine workings. Such readjustment at every discovery of a change in the course of the vein would create great uncertainty in titles to mining claims. This rule, whatever hardship it may work in particular cases, should be settled, and thus prevent, as far as practicable, such uncertainty. * * * *

"The provision of the statute that the locator is entitled throughout their entire depth to all the veins, lodes, or ledges, the top or apex of which lies inside of the surface lines of his location, tends strongly to show that the end lines marked on the ground must control. It often happens that the top or apex of more than one vein lies within such surface lines, and the veins may have different courses and dips, yet his right to follow them outside of the side lines of the location must be bound by planes drawn vertically through the same end lines. The planes of the end lines cannot be drawn at a right angle to the courses of all the veins if they are not identical."

While the statute requires parallelism of the end linos, and the courts have held that they may not be laid so divergent as to include more in length upon the dip of the vein than is allowed in length upon the surface, neither the statute nor any decision to which our attention has heen called, defines auy particular angle at which the end lines shall cross the general course of the vein in order that the extralateral right given by the statute may exist. And as said by the Supreme Court in the case last cited, where more than one vein apexes within the surface lines, it would be a physical impossibility for the end lines to be drawn at a right angle to the course of all such veins. And that tbe extralateral right conferred by the statute may and does exist without regard to the angle at which the end lines cross the general course of the vein has been held both hy the Supreme court and by this court. Last Chance Min. Co. v. Tyler Min. Co., 157 U. S., 683; Empire State-Idaho M. & D. Co. v. Bunker Hill & Sullivan M. & C. Co., 114

Fed., 417, in which last-named case the court awarded the appellant Empire State-Idaho M. & D. Co. the right to follow the vein outcropping within the surface boundaries of its San Carlos location between planes drawn down through its end lines, at almost if not quite as much an angle to the general course of the outcrop of the vein within its surface boundaries as is the angle at which the appellee herein was permitted by the court below to pursue the segment of the vein here in question.

The judgment is affirmed.

(Endorsed): Opinion. Filed May 31, 1904. F. D. Monckton, clerk.

The Park City Mining District, Utah.*

NUMBER II.—CONCLUDED.

Written by J. M. BOUTWELL.

DEVELOPMENT.—The opinion is current among miners that the ore bodies of this district lie deep aud do not crop out. The means and determination to explore widely and at depth have resulted in very extensive development. Twenty-two shafts, now accessible, have reached a depth of at least 500 feet, ten a depth of at least 1000 feet, six a depth of 1300 feet, and one a depth of 2000 feet. Lateral development has been proportionately extensive. According in position with that of the great fissure zone, and of the ore-bearing limestone formations, the underground workings of the main properties lie in two parallel northeast-southwest belts. In addition to the shafts on individual properties, the northern belt is entered by two loug tunnels, the Hanauer and the Alliance, and the southern by three, the Ontario drain, the main Ontario-Daly-Daly West work, and the Daly-Judge drain tunnels. The adjoining mines in each belt have been connected, so that it is possible to pass continuously underground from one end of each belt to its opposite end. Thus in the southeast belt there is continuous underground connection in a northeast-southwest direction for a distance of over 5 miles. Furthermore, a crosscut only 450 feet in length would connect these two belts and afford continuous underground connection between all the great mines of the district.

CHARACTER OF ORES.—The ores mined in this district are essentially argentiferous lead ores, with accessory gold and copper and a siliceous gangue. The values in the sulphide ore lie in galena (lead sulphide), tetrahedrite (gray copper) and pyrite (iron sulphide); and in the oxidized ore in cerussite (lead carbonate), angelsite (lead sulphate), azurite (blue copper carbonate), malachite (green copper carbonate), and complex oxidation products. Silver is obtained from the iron, lead and zinc approximately as follows: 3 ounces to each per cent of iron, 1 ounce to each per cent of lead, and $\frac{5}{10}$ ounce to each per cent of zinc, which statement is based upon results secured from a large number of precise tests by F. W. Sherman, superintendent of the Daly West and Daly-Judge mills. Silver has also been found in its native state. Zinc is a common associate in fissure ore, and appears to increase in depth and toward the great intrusive mass at the southwest. Barite and fluorite occur sparingly. Oxidized ores are still mined to a limited depth, but the bulk of the shipments of both crude ore and concentrates is composed of sulphides.

Although values as a whole run rather high, a noticeable difference in value exists between ores from different parts of the district.

An average high-grade ore carries about 60 ounces silver, 40% lead, 0.25 ounce gold and 2.5% copper. Ordinary crude ore carries 50 to 55 ounces silver, 20% lead, 0.04 to 0.05 ounce gold, 1.5% copper and 10% to 18% zinc. Just as the values vary in different parts of the camp, so the degree of concentration required in milling ores varies. Some ores are concentrated four times, others five. It may be stated that in general the degree of concentration ranges from four to six into one. A good concentrate of sulphide ore carries approximately 55 ounces silver, 30% to 40% lead, 0.05 ounce gold and 15% zinc. The above figures are based on published and reported average values of ores extracted at the present time. Bonanzas have been and are encountered, and excessively high assays of silver, lead and gold are occasionally reported.

OCCURRENCE OF ORES.—The principal ore bodies which have been opened in this district occur either (1) in lodes or fissures or (2) in limestone beds. Although in early days the high-grade silver ore was from fissure veins, at present the bulk of the shipments of crude ore is from bedded ore bodies in limestone. Fissures occur abundantly throughout the district. Those fissures which have been found to carry the largest and richest ore bodies lie in the northeast-southwest zone in the center of the camp and dip (with rare exceptions) steeply towards the northwest. They are branching systems, in which individual members may be single, narrow fissures or broad, breccia zones. Thus ore is found in narrow paystreaks frozen to the walls and in groups of paystreaks included iu lodes which are 2 to 35 feet wide.

The ore bodies in limestone have replaced portions of certain members in both the upper Carboniferous and "Permo-Carboniferous" limestone formations, and they lie between siliceous members as walls. Those occurring in the upper Carboniferous formation which have been studied thus far have replaced a limestone bed that overlies a brown sandy or quartzitic member at a distance varying from 50 to 100 feet above the Ontario quartzite. Occasionally the calcareous bed underlying this sandy member is found replaced by ore, and the sandstone, normally the foot wall, is left barren between these two productive horizons. Ore in the Carboniferous limestones has been observed to have replaced certain metamorphosed calcareous members, and also to have been deposited in a quartzose breccia adjacent to a dike.

Both the lodes and the replacement bodies occur in frequent and intimate association with porphyry. Fissures occupied by ore bodies cut indiscriminately across porphyry and all other formations. Among the numerous cases observed in which ore-bearing limestone has suffered intrusion by porphyry, several have been noted in which the ore is in immediate contact with porphyry. The evidence now at hand tends to show that a period of igneous activity preceded the period of ore deposition.

EXPLOITATION.—In underground exploration, in mining, in milling, and in shipping ore, the economies afforded by perfect mine and mill equipment are practiced. Air drills are used in development work. Stoping is done by the overhand process. Timbering is done on the square set system when the size of chambers admit, in narrow fissures by props, and in low, flat stopes by props and cribs. Mine ventilation is good. Drainage, the lack of which has been for many years a serious obstacle in the development of the mines of the district, is now adequately effected through the long Ontario, Daly-Judge and Alliance drain tunnels. Three properties, which apparently lie outside of the ground drained by these deep tunnels, are now encountering considerable water in sinking to explore virgin ground.

For the treatment of low-grade ores four large and four smaller concentrating mills have been erected by individual companies on their properties, and another large mill is expected to go into commission in the near future. These large mills effect an unusually high saving. Two of the large properties ship directly to the smelters in the Salt Lake valley. The output of all the other mines passes to a local custom sampler en route to the valley smelters. One of the large mines transports its ore from the mine to the railroad by aerial tramway, the others by trams drawn by horse power through long work tunnels. Labor is well paid and employes may procure good board and lodging, if desired, from the companies at their mines.

RECENT INDUSTRIAL PROGRESS.—During the last year the mining industry in Park City advanced to the highest stage ever reached. More men were employed and more work in surface improvements, in underground development, and in perfecting methods of mining and milling was accomplished than during any previous year in the history of the camp. In spite of two serious declines in the price of silver, no properties were closed down. At date of writing, however, one of the most extensive properties has closed its mill, to conduct experiments on treating its ores, and has reduced its activity to exploration of virgin ground. The large paying mines have increased their plants and extended exploitation. Thus the Silver King Co. has added to its mill; the Daly West Co. is deepening its main shaft and erecting a tailings mill; the Ontario Co. has sunk its main shaft to a depth of 2000 feet, extensively explored its great lode at depth, and remodeled its amalgamation mill into a modern concentration mill; the Daly-Judge Co. has entirely refitted its draiu and work tunnel with heavier rails and equipment preparatory to utilizing it for regular shipping by power, has conducted extensive underground developments, and extensively expanded and remodeled its concentration mill; the Kearns-Keith Co. has continued mining through the Hanauer and Alliance tunnels, erected a concentration mill, and begun regular shipments. In the other working properties the year has witnessed extensive underground operations. Following the unusual activity in the fall of 1902 in the incorporation of mining companies, resulting from the recent discovery of valuable ore bodies, exploration was undertaken which is still being vigorously prosecuted. One of these new companies has sunk a shaft 600 feet, explored its ground on the 400-foot level, and is uow drifting on the 600; another sunk 800 feet to catch a vein previously developed above; another is down 400 feet and has explored at the 200, 300 and 400-foot levels; another, after sinking 600 feet and extensively exploring the ground at that level, has put its shaft down to a total depth of 800 feet, and is now drifting on that level; another, guided by considerable previous development, has sunk 900 feet and drifted at the 700-foot level. Four of the older properties of intermediate size have carried on considerable prospecting and made some shipments.

As a net result of these operations, some slightly mineralized ground has been opened up, a small amount of ore has been discovered, and in the ground which was more wisely located the indications are good. So far as observed, however, no ore bodies of any considerable value have yet been uncovered. Although this exploratory work has been conducted with great vigor and persistence, if definite prospect of adequate returns is not soon disclosed it is inevitable that the work must be abandoned.

RECENT PRODUCTION.—It might have been expected from the generally increased activity of last year that the output would also increase. On the contrary, the output fell from a total shipment, including crude ore and concentrates, in 1902 of 330,662,628 pounds to 292,588,365 pounds in 1903, a decrease in the shipments of last year amounting to 38,064,263 pounds. Notwithstanding this small decrease, the mines of Park City were the prime factors in making Utah the leading silver producing State in the country in 1903. The decrease is not as unpropitious as might appear, for it is due to the fact that the Ontario Co., on deciding to erect a concentrating mill, greatly reduced its shipments. Neglecting the Ontario shipments during these two years, the total output from the camp increased in 1903 approximately 17,500,000 pounds. Each of the great mines contributed an individual increase to this total, but the larger portion of the increase was supplied by the Silver King mine. The two great producing mines alone paid dividends last year amounting to a total of $2,704,000. With regard to the future, the outcome of exploration and of experimentation on zinciferous ores by one of the great properties, the results of development by the several young properties, and the proof of the capability of the mines and the new mills of two important properties, are awaited with deep interest. On these factors and the continuance of good prices for lead and silver the future expansion of the camp depends. As to the immediate future, it is assured that, if the lead and silver market holds its present strength, the productive mines—even without continuing their current rate of increase—equal their shipments of last year, and the Ontario and Kearns-Keith mines ship regularly, the total output of the mines of the Park City district in 1904 will considerably exceed that of any previous year.

* Abstract Bulletin No. 225 U. S. Geological Survey.

Pan Amalgamation at Rosario, Mexico.*

Written by A. E. DRUCKER.

The Tajo mines are situated on the west coast of Mexico, near the Rosario river, 60 miles southeast from Mazatlan. These mines are one of the oldest, largest and most extensively worked properties in Mexico. About 700 men are employed and over 80 miles of tunneling have been done, while the mine has only reached a depth of 650 feet. The vein has an average width of 300 feet and dips at a low angle of about 24°.

Tajo ore is made up mainly of quartz and calcite, but contains 10% to 12% sulphides, such as galena, chalcopyrite, zincblende and iron pyrites. Silver occurs metallic in the wire form, as argentite (Ag_2S), and as cerargyrite (AgCl). Gold occurs free, except for some that may be in chemical combination with the pyrites. The ore iu these mines occurs in bunches, ore shoots and pockets. The greater part of the 300-foot vein is barren.

The pan amalgamation plant, situated on the Rosario river about ½ mile from the mines, consists of a 60-stamp mill, thirty-six amalgamating pans, eighteen settlers, four concentrators, two agitators, blanket sluices, retort and melting rooms aud assay and chemical laboratories.

During the time the writer acted as assayer and chemist for this company and later as mill superintendent, experimenting on a large scale with pan amalgamation was carried on and a number of valuable points in regard to the preventing and saving of "floured" quicksilver gained.

In the past too little attention has been paid to the mechanical side of the process, and it is this side which is largely instrumental in reducing the quicksilver loss. Formerly at this plant everything had been regulated for an almost free-milling and oxidized ore, and as the mine got deeper, and the ore more base and rebellious, the loss of quicksilver through flouring became greater. Besides the large loss of mercury, there was the gold and silver contained within the floured quicksilver, which amounts to considerable within a month. The principal loss of mercury is due to flouring in the pans. Each little particle of floured mercury, so small that it will float on water, without detection by the eye, contains a high percentage of gold and silver and floats off when it reaches the settler and is lost with the tailings.

All the pans here are made of iron and are 5 feet in diameter and 3 feet high, holding about one ton of ore each. Each pan has a false bottom, dies, shoes, muller, pan ring to protect sides, cone, and a screw to raise or lower the muller.

ORE TREATMENT.—The ore as it comes from the battery is stamped to a 30-mesh and run into settling tanks, where the slimes are allowed to flow off into other slime tanks and saved. All slimes that go over seven ounces of silver per ton are mixed with sands and worked in the pans. The two main chemicals used are bluestone ($CuSO_4$) and salt (NaCl), while the

* Abstract Cal. Jour. Tech.

caustic soda is used to cut grease and prevent it from coating the quicksilver particles. As the coarse sands from the first settling tank are charged into the pans, bluestone and salt are also added and the muller lowered so as to grind. At the end of 1½ hour grinding, caustic soda is also added to destroy any grease that may have gotten into the pans, and the grinding is coutinued for half an hour more. Next two quarts of quicksilver are added, the muller raised and the amalgamation of the gold and silver continued for two hours more. After the amalgamation is finished the ore is discharged into a settler, the pan washed out, the muller lowered and new ore charged with bluestone and salt, ready for another run.

Reactions.—Important reactions take place in a pan, causing a reduction of the sulphide and chloride of silver. Native silver, as well as the sulphide and chloride, but not that chemically combined in the galena, are the values saved by pan amalgamation. Salt and bluestone form cupric chloride, which acts on the silver sulphide in the ore and changes it to the chloride, cuprous chloride being also formed.

(1) $CuSO_4 + NaCl = CuCl_2 + Na_2SO_4$.

(2) $2CuCl_2 + Ag_2S = 2AgCl + Cu_2Cl_2 + S$. Cuprous chloride acts on any unchanged Ag_2S and converts it into the chloride.

(3) $Cu_2Cl_2 + Ag_2S = 2AgCl + Cu_2S$. Metallic silver is acted upon by cupric chloride, silver chloride and cuprous chloride being formed.

(4) $2Ag + 2CuCl_2 = Cu_2Cl_2 + 2AgCl$.

The following reaction may take place, but it is not probable, on account of the cupric chloride being changed over to the cuprous form in a very short time:

$$Ag_2S + CuCl_2 = 2AgCl + CuS.$$

The reaction of Hg, Cu, Fe and $FeSO_4$ on $CuCl_2$ reduces it to Cu_2Cl_2.

$2CuCl_2 + 2Hg = Cu_2Cl_2 + 2HgCl$.
$CuCl_2 + Cu = Cu_2Cl_2$.
$2CuCl_2 + Fe = Cu_2Cl_2 + FeCl_2$.
$2CuCl_2 + 3FeSO_4 = Cu_2Cl_2 + FeCl_2\ Fe_2(SO_4)_3$.

The main reaction towards reducing or changing Ag_2S to AgCl is equation No. 3.

Silver chloride is very easily reduced to metallic silver by the small particles of iron caused by the wearing of shocs upou the dies. This is amalgamated by the quicksilver.

$$2AgCl + Fe = FeCl_2 + Ag.$$

Also AgCl is soluble to a certain extent in the strong solution of salt and is reduced by Hg to metallic silver.

$$2AgCl + 2Hg = 2HgCl + 2Ag.$$

The silver is then amalgamated. Large excesses of $CuCl_2$ cause a reduction to copper aud may change metallic Ag into its chloride.

$CuCl_2 + 2Ag = 2AgCl + Cu$.
$CuCl_2 + Fe = FeCl_2 + Cu$.
$CuCl_2 + Zn = ZnCl_2 + Cu$.

Such reduced copper will bc amalgamated and give base bullion. It must be remembered that salt and bluestone are only needed when silver sulphide is present in the ore so as to change it into chloride, in which form it can be readily reduced and amalgamated. They are harmful to the amalgamation of free gold.

Action of $CuCl_2$ and Cu_2Cl_2 on Quicksilver.—An excess of cupric and cuprous chlorides causes a flouring of the quicksilver, coating it with a film of chloride of mercury, thus preventing finely divided quicksilver from uniting. This may plainly be seen by trying an experiment in a bottle with mercury, bluestone, salt and water, shaking well. Notice the finely divided mercury with a dull gray coating, and even floured quicksilver. It will be impossible to have the floured join with the larger globules of mercury, but if a very small piece of zinc amalgam be added you will at once see all combine. The same thing will be seen after mercury has been charged into the pans upon panning several charges after running for some time. The quicksilver will be finely divided and have a dark coating, and even some floured will be seen at times. By panning along the row of pans we are able to tell just how amalgamation is proceeding and to judge the loss of quicksilver.

A large loss of mercury is caused by the forming of the chloride of mercury film which coats the quicksilver particles. This chloride was found with the Comstock tailings, and, after cyaniding, considerable mercury was saved. The chloride could be saved by cyaniding, but the floured Hg could not.

Excesses of bluestone are to be avoided, since large losses in quicksilver through flouring and the forming of the chloride are caused by it. The amount of bluestone needed in the pans from day to day is told by a simple test on the amalgam obtained. Take an average sample of the amalgam (1 gram) and dissolve in 3 c.c. of strong nitric acid. Add ammonia until a blue color is shown, and, by a comparison of colors, the percentage of copper is estimated. Regulate the bluestone so as to have always a faint blue color. By doing so we obtained very pure bullion along with a high extraction. Some went as high as 920 fine in silver and 65 in gold, a total fineness of 985. The remaining 15 was principally copper, with traces of zinc, lead and iron. The total fineness would seldom fall below 950. The amount of bluestone necessary for each pan varied from ten to sixteen ounces, according to the richness of the ore. Rich sulphide of silver ore required more bluestone.

Iron reduces $CuCl_2$ and Cu_2Cl_2, forming metallic copper, which is amalgamated by quicksilver. For this reason but slight excess of bluestone should be used in the pans over that necessary to convert the sulphide of silver into its chloride. Large excesses will only result in very base bullion aud low extraction. I have proved this point on a large scale. Mercury charged with copper readily becomes coated by iron particles, and in the pulp it is readily coated by irou pyrites, lead and slimes. Any substance coating the mercury and keeping it dirty will interfere with amalgamation and increase the loss of mercury. The mercury particles should be bright to give best results.

Both chlorides of copper decompose galena and zincblende to a certain extent. $CuSO_4$ (bluestone) expels lead to a certain extent from quicksilver, copper being amalgamated and lead sulphide formed. Some say the copper amalgam formed by the presence of bluestone with the mercury aets on silver sulphide and decomposes it and helps to put it into a form to amalgamate.

The Action of Caustic Soda.—The amount of NaOH necessary for each pan depends upon the amount of bluestone added. If an excess of bluestone be used, then enough NaOH must be added to counteract that excess and also to destroy the grease. The action of NaOH on the excess of Cu_2Cl_2 is:

$$CuCl_2 + 2NaOH = Cu(OH)_2 + 2NaCl.$$

The use of caustic soda hinders amalgamation to a certain extent, and large excesses are very harmful. I saw this clearly while experimenting with the pans. Every other week caustic soda was used, and when it was not used a noticeable increase in the extractions was shown. There was no need of oil getting into the pans after we had taken proper precautions against it, and so NaOH was dispensed with. While caustic soda was detrimental to amalgamation, especially when in large excess, it was also helpful in one respect, as it changed the copper chlorides to the hydroxide, thus preventing the chloride film (HgCl) being formed.

Lime was found to take the place of NaOH in that respect, as:—

$CaO + H_2O = Ca(OH)_2$ (lime).
$CuCl_2 + Ca(OH)_2 = Cu(OH)_2 + CaCl_2$.

One pound of lime was added to each pan fifteen minutes before the quicksilver was charged, causing the excess of copper chloride to be changed to the harmless $Cu(OH)_2$. After the mercury had been in the pans for some time, it was found to be bright and free from the grayish black film that had formerly been noticed. Its use did not affect the extractions of silver or gold. The addition of lime always thickens the charge, so that water must be added to have the pulp of the proper consistency.

(To be continued.)

Provincial Mining Association of British Columbia.

The executive committee of the Provincial Mining Association of British Columbia recently held a meeting at Nelson, West Kootenay district, to consider several matters connected with the mining industry of the province. The most important business transacted was the passing of two resolutions, which were discussed at length during the two days' session. One of these endorsed the application of the silver-lead miners for the extension of the benefits of the lead bounty act so as to permit, for a period of one year, of the bounty being paid on lead mined in the province and shipped abroad for smelting, the capacity of the home smelting not yet being sufficiently large to admit of all the lead ore produced in the province being treated at home. The other involves an application to the provincial legislature to so amend the statutes relating to the location of placer claims as to prevent such locations being made on ground already covered by lode mining claims, also asking that the surface rights be granted to mineral claim owners. The necessity for the amended legislation asked for has lately been made evident by the location of a placer claim over the Lucky Jack mineral claim at Poplar creek, and the decision of the supreme court that the applicant for the placer claim was entitled to have his location recorded, the local gold commissioner having previously given instructions not to record same.

An unusual accident occurred at the smelters of the Mountain Copper Co. at Keswick, Cal., recently, in which several workmen lost their lives. From all that can be learned at this time it had become neeessary to make repairs in one of the water-jacketed furuaccs, and to hasten the operation of cooliug after "blowing out" the furnace a stream of water from a hose was directed into the interior of the furnace, but it appears that there still remained considerable molten matte and metal in the crucible of the furnaco, and an explosion immediately followed the introduction of the water, the great volume of steam destroying the stack, scattering debris and molten metal over the workmen standing about. Whether this is the usual practice in cooling furnaces at Keswick is not known, but as a similar accident has not been previously reported from there it is probable that some one erred in his judgmeut as to a safe time to turn the hose into the furnace. Hereafter it is not unlikely that this branch of the work will bo conducted under the immediate personal supervision of a competent foreman.

The First Hurdy Wheel.

To the Editor:—I notice you state that Hamilton Smith used onc of the first hurdy gurdy wheels, which was introduced about 1875. Thos. Pattison, now deceased, made and operated on a derrick in 1858 the first hurdy wheel in Nevada couuty. At Liberty Hill he used wooden buckets between rims. His derricks were afterwards put up in Dutch Flat and all over the hydraulic mining section. Mr. Pattison was a resident of Little York, Nevada couuty. He hoisted with his wooden buckets as large rocks as are hoisted with modern wheels, as his old rock piles, still in evidence, show to bear out the statement. The wheel was operated with pipe aud hose, the pipe having been made by Chas. Macy of Iowa Hill.

Subscriber.

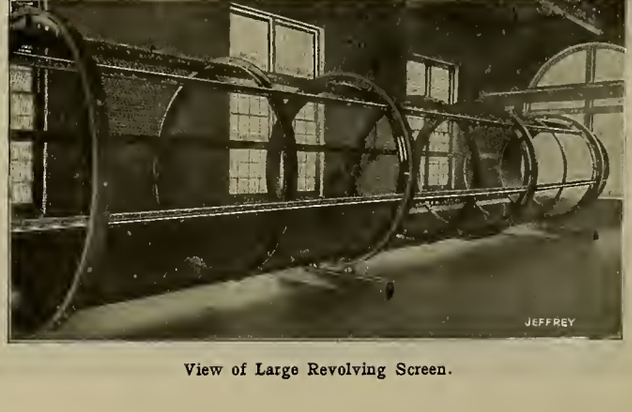
Dutch Flat, June 1.

A Giant Trommel.

The accompanying side and end view illustrations show a large revolving screen built by the Jeffrey Manufacturing Co. of Columbus, Ohio. It is 7 feet in diameter and 54 feet long, mounted on friction rollers. This screen is for separating coal into a number of sizes and was built for one of the large coal companies in Virginia. As will be seen from the illustration, the screen has no central shaft but is supported on friction rollers.

Cross Section of Revolving Screen.

When installed at the mine the screen will be supported on heavy friction rollers, carried on shafts extending the full length of the screen, the rotation of which causes motion to be imparted to the screen by the friction rollers on the shafts bearing against the friction rings attached to the outside of the screen. The coal is fed into the screen by means of a special bucket elevator at the rate of about 250 to 275 tons per hour. This type of screen is also suitable and used in mills for screening shavings in large quantities.



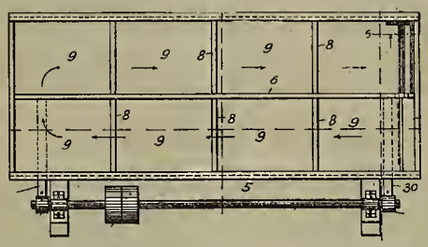
View of Large Revolving Screen.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 31, 1904.

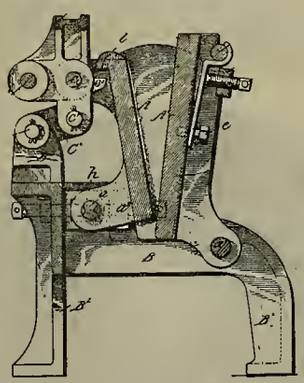
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SLIME SAVING APPARATUS.—No. 761,615; J. J. Smith, Denver, Colo.



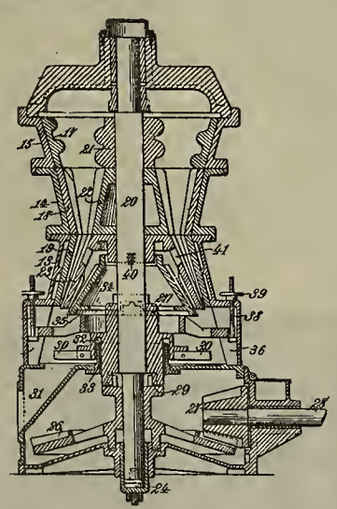
Horizontally arranged slime saving table having vibratory movement transverse to travel of pulp thereon, table being provided with feed compartment having gate controlled openings for admitting pulp to body of table, and discharge opening for gangue or tailings, discharge opening being remote from feed box or compartment, table being also provided with gate pivotally mounted near discharge opening, normally occupying horizontal position below opening and capable of adjustment on hinge or pivot to maintain suitable predetermined depth of water or pulp above slime bed as it accumulates on table.

PROSPECTOR ORE BREAKER.—No. 761,579; A. C. Calkins, Los Angeles, Cal.



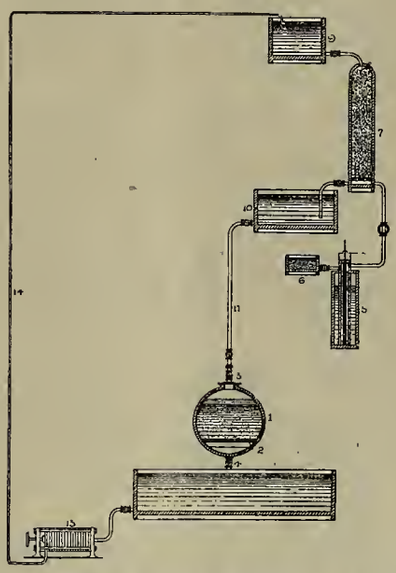
Ore breaker comprising rigid framework, two jaws formed at lower ends with perforated lugs offset outwardly from face of jaws, and two axes for jaws passing through outer ends of lugs and arranged at different elevations, and means for causing jaws to approach and recede from each other at top and to turn about axes.

VERTICAL CRUSHING AND GRINDING MILL.—No. 761,334; T. L. Sturtevant, Quincy, and T. J. Sturtevant, Wellesley, Mass.



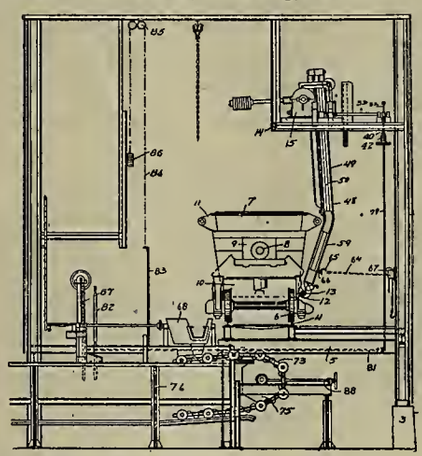
In vertical crushing mill, combination with central vertical driving shaft 20, provided near its lower end with driving gear 26, of vertically adjustable support in which lower end of shaft is stepped, outer and inner stationary shells or cones, as 19 and 34, and intermediate shell or cone 23 hung to shaft to rotate and to be vertically adjustable therewith and provided with openings to admit material into inner chamber formed by three shells or cones.

PROCESS OF EXTRACTING METALS FROM ORES.—No. 761,164; W. E. Greenawalt, Denver, Colo.



Process of extracting metals from ores, comprising electrolyzing sodium chloride for purpose of generating chlorine, absorbing chlorine so generated in aqueous solution, charging solution and ore to be treated into closed vessel, agitating it for some time, then introducing fresh solution under pressure thereby displacing first solution, again agitating contents of vessel, then filtering solution from ore and precipitating desired metals.

LADLE-TILTING DEVICE.—No. 761,319; W. J. Patterson and A. M. Acklin, Pittsburg, Pa.

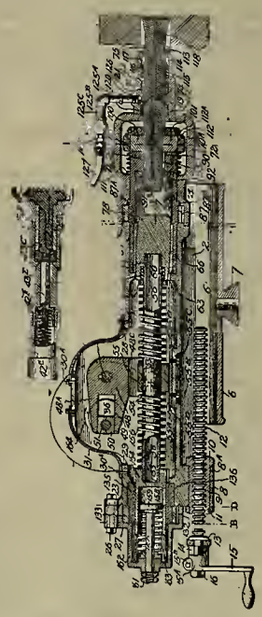


In ladle-tilting device, combination with tilting ladle, of shaft, swinging frame mounted thereon, pinion on shaft, beam adapted to engage ladle and having rack adapted to engage pinion, worm wheel on shaft, worm shaft, gear wheel on worm shaft, pinion meshing with gear wheel, friction wheel on last-named pinion shaft, oppositely driven friction wheels mounted on adjustable shafts on each side of first-mentioned friction wheel, and mechanism for throwing oppositely driven friction wheels alternately into engagement with friction wheel.

CORE DRILL.—No. 761,332; F. Stone, Spokane, Wash.

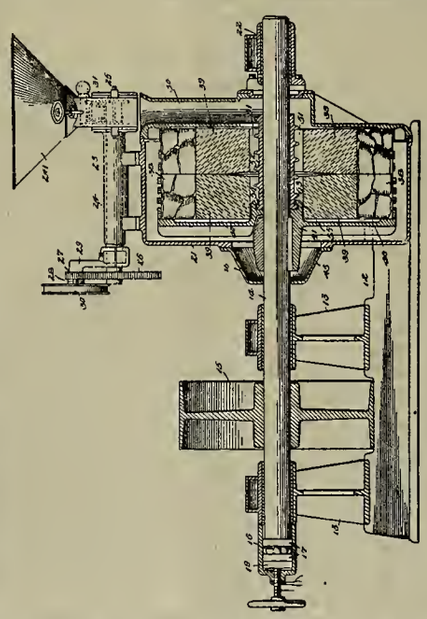
In drill of character described, combination with rotatable hollow rod and shell rigid therewith; concentric inner core barrel, means for delivering water into core barrel from rod and means for discharging water from top of core barrel exterior to rod.

ROCK DRILLING ENGINE.—No. 761,153; L. Durkee, Denver, Colo.



In rock drilling engine, combination with casing and its screw feed sliding supporting base, of piston hammer reciprocally mounted in casing, hammer having spirally grooved peripheral surface at one end, spirally fluted nut rotatably mounted on hammer, sleeve secured to nut, rock cutting drill bit operatively and removably secured to sleeve in relatively fixed position to piston hammer, means including coiled springs operatively mounted on piston hammer for reciprocating piston hammer against drill bit, straight fluted portion on rear end of piston, straight fluted nut rotatably mounted in casing having its fluted portion in operative mesh with straight flutes on piston hammer, ratchet toothed ring on nut and spring controlled pawls arranged in operative relation to ratchet teeth and provided with resilient buffer support.

GRINDING MILL.—No. 761,333; T. L. Sturtevant, Quincy, and T. J. Sturtevant, Newton Center, Mass.



In grinding mill, combination with mill shaft and bed and runner stones, of runner head to which runner stone is attached and which is provided with hub having undercut recess, and feed screw mounted on shaft and provided at one end with one or more peripheral lugs by which it is operatively connected with undercut recess of hub so as to rotate with runner head and be held against longitudinal movement.

BOTH amalgamation and cyaniding of gold ores have been successfully accomplished by the use of salt water. A large cyanide plant is operated in Bolivia, S. A., where the only water available is that of the Pacific ocean. The salt water of the mines of Western Australia has been used to amalgamate ores. There appears to be nothing detrimental in the salt to either process.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ALASKA.

H. H. Hildreth, U. S. Commissioner at Seward, reports a strike on the Shushitna river made by R. C. Richardson and C. A. Peterson of Sunrise. They spent the wintor opening up claims. The spring clean-up gave results of 30 cents to 50 cents per pan. Tho diggings are shallow. This strike was made on Gold creek, a tributary of the Shushitna river. 100 miles from its mouth and below the falls of the river. From Seward and Cook inlet miners are going to the new diggings. The routo is via Tyoonic, and thence in small boats, a journey of ten days.

The Little Basin M. Co. property of Windham Bay has been honded to A. Gfeller, ot al., of Scattle, Wash. The bond extends for fivo years, the terms of which are that the parties honding the mine guarantee a dividend annually and to turn over 10% of the gross output of the minc. They will build a 20-stamp mill.

Tho English Oil Co. at Kayak is reportod to have struck another gusher. The flow of oil was capped, as are the othor three wells of the company. It is estimated the output of the three wells will be 6000 barrels per day. Pipe lines are heing laid from the wolls to the harbor, a distance of 5 miles, and it is expected they will bo shipping oil by fall. Considerable oil drilling machinery is on the docks and being set up, preparatory to beginning development.——The White & Abornethy Co., the Ivey Co., the Spokane (Wash.) Co., of which G. Turner is president, tho English Co. and the Lippy Co. are all making preparations to develop their coal holdings this summer.

ARIZONA.

Cochise County.

Diamond drill operations have been suspended at the Marquette and Arizona group near Bisbee.

The Dutchoven group, incorporated as the Bisbee Dev. Co., which consists of sixteen claims, 1 mile northwest from the center of Bisbee, is reported improving. In the 100-foot shaft copper ore was found, several tons having been taken from the dump and shipped. Cowan, Clawson, Hicks, Mitchell and Seymour are principal owners.

Gila County.

The Pacific M. & M. Co. has made a payment of $70,000 in cash ($10,000 having been previously made) for the Clipper group of mines, says the Globe Silver Belt. The Clipper group comprises twelve claims, 8 miles west of Globe. J. D. Coplen, manager of the Pacific M. & M. Co., says work will be started this month under the direction of J. B. Coplen as superintendent. The company also has three other claims adjacent to the Clipper group under bond.

Graham County.

President C. A. Ross of the Standard Con. C. Co., near Morenci, says he has bought control of the Copper Center group, which consists of eight patented claims adjoining the holdings of the Standard mines on the east. Considerable development work has been done on these claims, showing ore of the same general character as that in the Standard mines. The group lies along the crest of the mountains east of the Standard, and will be opened through Standard workings at depth. The veins of the Copper Center run parallel with the Standard mines. This gives the Standard Con. twenty-three claims in one group (besides the twenty-nine Coronado claims). Since starting work on the San Jose claim, Manager Rosecrans has opened up a 2-foot vein of glanee which averages 22% copper. This vein will be cut by lower workings, and will be stoped later and brought to the railroad over the Standard tramway.

The Polaris M. & M. Co. has bought the Russian Bear and sixteen other claims in Greenlee district, ncar Clifton, for $20,000.

Maricopa County.

The Grijalva M. Co., under the management of the Goldberg Brothers, of Phœnix, is preparing to put on a 10-stamp mill.

H. J. Bennett, who owns the New York group of claims, near Phœnix, says he has put men to work. With Eastern men he has incorporated the Buffalo-Arizona M. & M. Co. to develop the mine.——The Gold Quarry M. Co. property is temporarily shut down.

Mohave County.

J. Barry, who has a hond on the Alger-Tohy mine, near Kingman, will put men to work opening it up. The mine shows gold values in the outcrop and in the shaft.——It is reported the Samoan Co. will put in a hoisting plant and sink a shaft on the Samoa mine.

C. G. Krook, who has bought the interests of J. A. Marshall and W. Chapman in a group of mines near Burro Creek, near Kingman, has put men to work.

J. Carter, superintendent of the Cedar Valley M. & M. Co., reports completion of tho wagon road from Yucca to Cedar. High grade ore has been struck and will be shipped. A mill will be built.

Pima County.

The Arizona C. M. Co., near Tucson, proposes building a smoltor. G. H. Parker of Los Angeles, Cal., is secretary of the company. Ore is being piled on the dumps. The mines are 4 miles from the Southern Pacific main line.

The Indiana-Arizona Dev. Co. has hought the Carbonate group of mines near the Old Boot mines, in Silver Hill mining district near Tueson. Development work has begun.

Pinal County.

(Special Correspondence).—The Phœnix & Eastern railroad has laid its track up to Cochran station, on the Gila river. On both sides of the road are said to be bodies of copper and gold ores. The Cochran mines are showing progress. The railroad line runs to the mouth of the tunnel driven on a dyke showing copper.

Florence, June 6.

Santa Cruz County.

Manager J. T. Brickwood of the Chicago-Patagonia G. M. Co. has fifteen men at work at the Old Soldier camp near Harshaw.

Yavapai County.

The J. Phillips group of minos, 7 miles south of Prescott, has been leased to G. U. Young. He has put additional men to work.

The Oro Grande mine, north of Wickenburg, is placing its machinery for additional five stamps, and will have ten stamps dropping by June 15th. The only question left to solve is the water problem. A well is being dug on the Hassayampa river.

The Cypress and Burlington mines, near Prescott, will be equipped with additional machinery, including an air compressor and drills. H. L. Dooley of Rock Island, Ill., and P. Federson of Davenport, Ia., are interested.

Manager J. S. Jones of the Jessie M. Co. says the company will build a 200-ton daily capacity cyanide mill at its mines at Chaparral, to handle the low-grade ores. The high-grade ores will be shipped to the smelter. He is enlarging the shaft to double compartment and is down 265 feet. The shaft is 665 feet deep.

Fire on the 2nd inst. at the Hackberry mine, near Big Bug, destroyed the hoisting plant and is reported to have resulted in the death of two miners. The hoist building was located directly over the shaft, and when the fire occurred two miners were at work in the mine and the exit was cut off by the fire.

CALIFORNIA.

Amador County.

(Special Correspondence).—The report of the Central Eureka M. Co., operating near Sutter Creek, for the year ended April 1st, shows the shaft has been sunk 225 feet, making total depth of 2380 feet. The 2100-foot level north drift has been extended 285 feet, the face showing 20 feet of low-grade quartz. Other work has been done on the 1500, 1700, 1800, 1900 and 2000-foot levels.

ORE MILLED DURING THE YEAR.

	Tons.
From 1500-foot level	3,868
From 1700 foot level	925
From 1800-foot level	3,814
From 1900-foot level	10,490
From 2000-foot level	11,493
From 2100 foot level	24,536
From 2200-foot level	1,000
From 2300-foot level	875
Total ore milled during the year	57,001
57,001 tons ore yielded in free gold	$194,228 09
1,054⅛ tons of sulphurets yielded	57,663 72
Total	$251,891 81
Average value in free gold per ton	$3.407
Average value in sulphurets per ton	1.0116
Average assay of tailings per ton	.38
Actual value of ore	$4.7086
Net value, after deducting cost of refining bullion and reduction of sulphurets.	$4.1979
Quicksilver fed inside batteries, ounces	17,284
Amalgam cleaned up, ounces	33,486
Average yield per ounce of amalgam	$5 80

The mill was idle ten days owing to a strike among the miners in the district.

COST SHEET.

Items.	Mining.	Deadwork and Development.	Milling.
Salaries	$1,700 00	$1,700 00	$1,650 00
Office	300 00	234 83	300 00
Labor	59,942 11	11,987 55	8,451 82
Power and water	1,515 07	531 70	6,380 84
Electric lights	250 00	92 57	225 00
Fuel oil	5,227 35	2,510 52	.....
Timbers and spiling	2,651 00	1,000 93	.....
Lumber	1,000 00	4,508 09	.....
Powder	3,425 50	1,400 00	.....
Fuse and caps	590 00	160 25	.....
Candles	1,000 00	200 40	.....
Drill steel	50 00	50 00	.....
Iron and steel	300 00	100 00	.....
Hardware and nails	250 00	125 00	.....
Charcoal and coke	200 00	80 00	40 00
Oils and lubricants	400 00	113 04	180 00
Shoes and dies	.....	.....	2,013 07
Lining and repairs	125 00	.....	780 04
Screens	.....	.....	114 92
Belting and lacing	38 64	.....	550 00
Assaying and chemicals	413 70	.....	813 33
Quicksilver	.....	.....	176 50
Freight and express	400 00	159 89	500 00
Telephone	20 00	5 25	20 00
Miscellaneous supplies	3 10	1 75	4 00
Taxes and insurance	2,000 00	.....	1,908 39
Machinery, pipes, etc.	1,833 28	.....	.....
Machine drills and repairs	560 00	.....	.....
Ropes and cables	500 00	185 26	.....
Totals	$81,694 75	$25,148 03	$24,707 41
Cost of mining, per ton			$1.4858
Cost of development, per ton			.4413
Cost of milling, per ton			.4334
Total cost per ton			$2.3605

Dividends paid during the year $111,559, making, to date, $289,358.95. ——The president's report says the dirrctors have concluded a ten years' contract for olectrical power to run the mill and rock breaker at a rato of $4.50 per horse power per month as against $6.50, the price paid under the old agreement that expired last year. The saving per month in the expense account may be further reduced by taking electrical power to run the hoist if present negotiations are closed. E. B. De Golia is president and W. R. Thomas superintendent.

Sutter Creek, June 7.

At the South Eureka mine, near Sutter Creek, thirty men are at work underground, cleaning out and retimbering the shaft and drifts. The mill is shut down, but work is being done on the equipment.

At the Madrone mine at Pioneer developments are progressing so that the owners have concluded to build a 5 or 10-stamp mill and thus save the expense of hauling the rock to a custom mill. L. Cassinelli, of Volcano, is manager.

G. S. Andrews at Defender is preparing to take the water from the Grand Prize shaft and repair the tunnels.

At the Fremont-Gover mine, near Amador City, the strike situation remains unchanged. Sixteen men are at work putting in the sand flume, says Superintendent Palmer. No definite time has been set for starting up the mine. The union men have two day guards on duty. The company has three men on duty at night looking out for the plant.

Calaveras County.

Twenty of the stamps at the Metropolitan mine, near Angels, were started dropping this week. The other twenty will also be repaired.

The Crown Deep mine, near Shasta, is shipping ore to the smelter. Four-horse teams haul the ore loose to the hill above Middle Creek, and it is then sent down a shoot to an ore bin that feeds direct to cars.——The Wiser Bros. are opening up a mine on the Muchmore claim.——It is reported that J. Sallee has a bond on the Reid mine at Old Diggings, near Redding.

Men are at work grading for a millsite at the What Cheer gravel mine, near Mokelumne hill, under Superintendent H. Birch.

At the Del Monte mine, near Jesus Maria, the mill is steadily running, with the stamps dropping on ore from the upper tunnel. In the lower tunnel the ledge has been followed on both sides.

El Dorado County.

At the Karolyi mine (the Lady Emma), near Kelsey, work is progressing under B. Peters as superintendent. Last month a pocket was taken from the Heyden shoot. A shaft has been sunk to 100 feet, a crosscut 25 feet and a drift north to catch the old workings. A 2-stamp mill for testing has been placed below the new shaft, with a concentrator, to save the sulphurets.

El Dorado reports say the Noon Day copper mine will resume work.

Fresno County.

Work on the Coalinga Oil & Transportation Co. pipe line from Coalinga to Monterey has begun. The survey having been completed, the poles and wire for the telephone line are on the ground, while the 6-inch pipe for the main line is being hauled to the line. Twenty-five miles of 6-inch line and material and machinery for three brick pumping stations will be hauled from the Coalinga end of the line. The receiving station will be built on section 18, on the property of the Pleasant Valley Farming Co. From that point a 6-inch line will be run to the Commercial, with a 4-inch extension to the Caribou. It is expected to have the 110 miles of pipe line in full working order by the end of the year.

Kern County.

W. F. Brizius and H. Hatch have bought the Star mine in the Democrat mining district, near Bakersfield, for $3000. A roller mill and concentrator are in place and development work will start this week. Additional machinery will be put in.

Nevada County.

L. A. Sutherland, superintendent of the Federal Loan quartz mine in Willow valley, near Novada City, is overhauling the machinery and putting in a thousand feet of pipe from the South Yuba ditch to insure steady supply of water for power.

The Shady Creek Dredging Co., near the Cherokee diggings in Bridgeport township, near Grass Valley, is increasing development work. The centrifugal pump with which the gravel is elevated 35 feet to the sluice boxes handles 1000 cubic yards of material a day. It is claimed the ground worked so far demonstrates that the original gravel in place up to 8 feet in depth yields $2 per cubic yard. The material, from surface to bedrock, produces an average of 30 cents per cubic yard. The work so far has been largely experimental, and it is now planned to substitute for the present pump another of the same character, but having greater capacity. Where the company is working the creek is 500 feet in width, its grade beiug about 3%.

Placer County.

(Special Correspondence).—La Rita M. Co., J. H. Meyers, superintendent, has six men working on the Old Spanish ledge near Forest Hill. A shaft is being cleaned out, which was last worked forty-nine years ago. Spokane, Wash., and Boston, Mass., men are interested.

Forest Hill, June 8.

Santa Barbara County.

W. H. Sutherland and C. Bradley have leased the Allen property in Shepard's canyon, Carpinteria, and will prospect it for oil. This tract, consisting of 400 acres, is said to show surface indications of oil formations.

Shasta County.

The mining dredger of the Port Huron Submarine Con. Co. is again at anchor in the Sacramento river, near Middle Creek station, near Redding. The boat was carried 3 miles down stream during the flood of last winter. Improvements and repairs have been made on the dredger. A new 20 H. P. boiler and a horizontal engine have been put in.

The Hazel G. M. Co., operating the Gladstone mine at French Gulch, will have its machine shop in operation this month. A drill press, together with counter shafting and attachments and a steel planing machine, are being added.

The Mount Lassen Water & Power Co. has been incorporated at Redding for creating electrical power in Shasta county. The company proposes to put up a 10,000 H. P. plant on Battle creek, 35 miles southwest of Redding, and will furnish power and light to Redding, Red Bluff, Corning and Chico.

Sierra County.

Nineteen men are working at the Keystone mine at Sierra City. They are grading for the mill and the electric plant.

Siskiyou County.

In the Salmon river country the Yreka M. & M. Co.'s plant is idle on account of litigation, says the Journal.——H. Brokaw of Yreka is making preparations to develop the Advance quartz mine and other ledges in the Salmon river section. He is also putting up a quartz mill at his mine on Hull gulch, near Oro Fino, and intends putting up another at Indian creek, near the Golden Eagle mine, near Fort Jones.

The Maplesden Bros. & Hammer of Hamburg are operating the Thomas Quigley mine, below the mouth of Beaver creek, in the Oak Bar mining district. They are equipping the mine to reach bedrock this season.——Johnson Bros. of Yreka are opening up their placer mine on Horse creek, in Oak Bar district.——A. Montgomery of Oakland is opening up the White Cloud group of mines on Horse creek, near Oak Bar. ——The Horse Creek mine, near Oak Bar, has been sold to the Ethelyn G. M. Co. of San Francisco. They have started work cleaning out the ditch preparatory to developing the mine and intend putting in a sawmill. ——The M. Mott placer mine is operating above Oak Bar. The company has been delayed in getting the mine equipped, owing to high waters in the Klamath river.

The Ethelyn G. M. Co. will put up a sawmill at its Horse Creek mine, near Yreka.

The Etna Advanee says machinery for the Morrison & Carlock mine at Quartz valley, near Etna, is on the ground and being placed. Superintendent J. M. Morrison has put in an assay outfit.

Tehama County.

(Special Correspondence).—The Basler M. & Dev. Co. has been incorporated at Saeramento, with L. A. McClean, H. H. Grau, C. M. Basler and W. L. Rennie as officers. C. M. Basler is manager. The mines of the company are 9 miles from Lowrie and 30 miles west of Red Bluff.

The ore carries values in gold, copper and silver. Manager Basler has men at work in the tunnel, which has been driven in 900 feet. He will increase the number of men.

Lowrie, June 8.

Trinity County.

The Potillo quartz mines on Mt. Bally, 9 miles from Weaverville, have been bonded to a company for $30,000. There are three mines in the group. A tunnel will be started at the foot of the mountain and a shaft will be started at the top to connect with this tunnel. The tunnel will be 3500 feet long and the shaft will be 2000 feet deep. The mine is in the granite and has a 4-foot vein. The company expects to build a 10-stamp mill. The ore carries free gold. The company which will be incorporated is composed of T. O. Jones of Reno, Nev.; B. V. Dolph of New York City; D. C. Dedrick of Junction City, M. G. Womack and W. V. Livesly of Reno, Nev. A road will be built to the mine.

Strode Bros. are working the Strode mine near Carrville. A gasoline hoist is being set up.——At the Yellow Rose of Texas mine the lower tunnel is within 100 feet of the shoot and is expected to cut the same about June 20. The mill will be started this week.

At Trinity Center the Bloss & McCleary mine is being worked steadily.——A large area of placer ground in same section has been bonded to W. H. Christie, including the Vollmers and Haskins ground. It is expected the bond will be taken up and dredgers installed there.——The Unity mine at Minersville is under bond and they are doing developing and prospecting work.

At Trinity Center the Sikes Hydraulic M. Co. expects to make a satisfactory clean-up this season, and much new ground will be prospected in that section for dredge mining. L. McDonald, interested in the Sikes company, is operating the Bloss & McClary mine. Although they have a sufficient supply of water to run throughout the year, the mine will be closed down July 20th for the annual cleanup.——W. H. Christie says he has options for dredging purposes on the lands owned by the Sikes M. Co., L. & T. McDonald, W. Vollmers et al. A driller will be put to work prospecting the ground.——The Cleary, Payne & Keenan mining dredge, which has been operated on Trinity river above Trinity Center, will be run again this summer.

Tuolumne County.

(Special Correspondence).—The Ranch M. Co., R. B. Stanford, manager, having about finished paying for the Doyle property, near Columhia, has put in a 50 H. P. boiler and is building a 60-foot head frame. A plant (including a 3 stamp quadruple discharge mill) to treat 100 tons of gravel daily is on the ground and is expected to be in operation by July 1.

The company owns 2 miles of the Table mountain channel and has opened up bodies of payable gravel both loose and cemented, some of it high grade.

Columhia, June 8.

The Dreisam M. & M. Co. at Arrastraville, near Carters, has started operations again. Men are retimbering the crosscut tunnel that taps the Good Luck vein. After the mine is in working order the lead will be explored.

At the Mt. Jefferson mine at Groveland the cyanide plant has been put in operation. The Huntington mill, equipped with drag shoes instead of rolls, will grind the sulphurets to a sufficient fineness to ensure an extraction, and Metallurgist Leithold expects to treat four tons of sulphurets daily. The output of the mine will be increased. Underground the west drift at the 600-foot level is being driven ahead. The mill is running steadily with twenty stamps dropping on ore from the stopes in the east levels.

The Free Lance mill, near Tuolumne, started up last week on ore. Superintendent Bartlett reports a find of ore showing a ledge 3 feet above the lower vein.

J. B. Scofield has bought the Silken quartz claim, near Big Oak Flat.——H. Williams has hought the Marryatt quartz claim, adjoining the Gagnere, near Tuttletown.——E. A. Jones has bonded the Sievert quartz mine and its northeast extension, on Bald mountain, 2 miles northeast of Sonora.

The double-geared hoist is in operation at the Santa Ysabel mine, near Stent. Arrangements have been made to adopt steam when the electric power is forced out of commission by the fall shortage of water. The shaft has reached a depth of 450 feet and stations are heing cut.

Yuba County.

It is expected the Hammon gold dredgers on the Yuba river east of Marysville will hegin operations the first week in July. They are expected to work 60 feet beneath the surface.

COLORADO.

Boulder County.

(Special Corrcspondence).—The Snow Flake, Monarch, Wheeler, Dewey, Little Eddy and Cyclone claims are being worked hy E. C. Pohle, of Boulder. These claims adjoin the Big Five property. Work is being done by contract hy G. D. Kay. He has the tunnel in 65 feet. The surface shows 4 feet of honeycomhed quartz, carrying free gold.

Frances, June 6.

(Special Correspondence).—Twenty-one leasers are at work on the Big Five group, taking out ore. The Big Five Co., J. J. Willis superintendent, is remodeling its mill, putting in Wilfley tables and an Elspass mill, and expects to have the mill in operation about July 1st.——W. B. Rundle is operating the Boston mill on custom ore.

Frances, June 5.

(Special Correspondence).—The Copper Rock G. M. Co. has a vein 4 feet wide, said to average $12 per ton. They have a tunnel 500 feet in length and a shaft 375 feet deep. The tunnel is heing driven ahead to connect with the shaft. A cyanide plant will he built. R. B. Thurman is manager.

The Sunset G. M. & M. Co. is operating the Marcial group of claims, also the Routt and Ruhy. They have a 10-stamp mill which is kept in operation. They are also running the Ruby mill at Sunnyside. The mines and mills are under management of F. Soper.

Sunset, June 5.

(Special Correspondence).—The Wood Mountain mill is heing overhauled and made ready for operation. Development work continues in the mine. J. B. Annear is superintendent.

The mill of the Wall Street G. Ex. Co. has been remodeled and in future the cyanide process will be used. The mill is ready to hegin operations. It is under control of the Nancy G. M. & T. Co., F. Mitchell general superintendent. The Nancy company has thirteen claims. One crosscut tunnel on this group is 1300 feet in length, which connects with the Gillard shaft. This shaft is 537 feet deep. They are doing all their work through the tunnel. They have put in a 16-drill compressor. The mill will have a capacity of 100 tons a day. An aerial tramway will be put in this summer. W. Mitchell is superintendent of the mine.

Wall Street, June 6.

(Special Correspondence). — The Progressive Con. & M. Co. is operating the Boyd 10-stamp mill on custom ore. In this mill they have jigs, Tetrault concentrators and Tetrault slime tables. E. C. Pohle is president and A. Tetrault is superintendent.

Boulder, June 6.

(Special Correspondence).—On the Colorado & Northwestern Railway, 26 miles northwest from Boulder, is Ward. Mining in this section is improving. One and one-half miles north of Ward the Myrtle M. Co., in Quiglyville gulch, owns thirty acres of mineral land and has 2000 feet of development work. The shaft is down 370 feet and is equipped with an 8x10 hoist. Down the hill is the 50-ton mill. This mill has been remodeled from stamps to crushers. They have put in a roaster 48 feet long and 5 feet in diameter. From the first crushing bin the ore goes on to the dryer, which is practically a smokestack lying horizontally above the roaster with a flat upper surface, over which the ore is dragged and dried. It is then discharged into an elevator, which carries it to the screens and is then delivered to the roaster. From the roaster it is elevated into the vats and prepared for cyanide treatment. The mill is lighted by electricity. The ore is a sulphide carrying gold and silver, with a small amount of copper.

Farther down the gulch is the Quiglyville 10-stamp mill, doing custom work under management of G. A. Kline.

On the St. Vrain river, 2½ miles north of Ward, is the Ward-Struggler property, consisting of 180 acres patented ground. One vertical shaft is 60 feet deep and will be sunk several hundred feet additional. The incline shaft is 310 feet deep. Tunnel No. 1 is 762 feet in length; tunnel No. 2 is 50 feet and tunnel No. 3 is 75 feet long. The past winter they built a 75-ton concentrating mill, which is in operation. The mill contains crusher, stamps, Huntington mill, classifiers, four Wilfley tables, two Frue vanners and one Wilfley slimer. G. M. Mitchell is manager and E. A. Smith superintendent.

Ward, June 6.

The Enterprise mill, near Eldora, began crushing ore last week. The roaster has been fired up. Work at the mine is progressing and Foreman G. Miller says they are breaking twenty tons of ore per day.

The Golden Trail M. Co. has been organized to work the Wilder-Rogers group at Wall Street. The officers are President C. E. Bonnel, H. W. Greene, D. M. Rogers, J. M. Ramsay and W. F. Durell. They will put in a steam plant on the H. & C. shaft, from which all the properties can be developed. D. M. Rogers is in charge.

Chaffee County.

The Coma mine, in Whitehorn district, near Salida, has been taken over hy R. G. Baker et al. of Denver under a $20,000 bond and lease. Baker will increase developments. At the bottom of the shaft is an ore body 4 feet thick averaging $10 gold per ton. The shaft is down 55 feet and the management will explore the vein to a depth of 500 feet.

Clear Creek County.

All litigation over the Stanley mine, near Idaho Springs, having been settled, A. G. Brownlow, the owner, is preparing to resume operations. The Stanley is 1 mile west of Idaho City, on the line of the railroad. It is equipped with a steam hoisting plant, ore-sorting rooms, ore bins, side tracks, etc., a water power compressor plant of 250 H. P. and a concentrating mill. The shaft is down 700 feet. The plant is to have increased capacity.

Cottingham & Reihel have resumed work on the Klondike group of claims at Silver Plume. They are driving a drift on the North West lode that will cut the other veins at depth.——Stevens & McGrath, operating the Mendota mill, shipped 75 tons of lead ore last week, and also several carloads of zinc ore. They report having struck an ore shoot in the lower workings and the output from the mill is heing increased.

This week the Capital mill at Dumont will be running full time on the ores from the Jo Reynolds mine. With tho exception of a few months, this mill was never operated since its erection five years ago, says the Times. The mill was huilt at a cost of $30,000, and an aerial tramway built to connect it with the Senator mine. The mill has been bought by J. G. Roberts and R. B. Morton of Idaho Springs.

At the Consolidated Gem shaft, at Idaho Springs, they are extending the sixteenth, seventeenth, eighteenth, twelfth and fourteenth levels, and in this work are taking out 100 tons of ore a day. This ore is broken with machine drills and the product is not sorted. The ore goes down the Gem shaft to the Newhouse tunnel, thence through the tunnel hy means of trolley cars, thence loaded on Colorado & Southern gondola cars and conveyed to the Newton and Newton annex mills for treatment. A water box has been completed in the manway of the Gem shaft, which renders the ore chute practically dry.

Dolores County.

The Emma group of mines at Dunton, under management of R. Keller, is regularly producing a carload of concentrates per day, says the Rico News.——Manager Larson of the Horlick mine and mill (formerly the Mt. Goram) is getting the mine and mill in working condition and will increase the mill capacity.——J. Shaver says he is developing a 2-foot vein of anthracite coal near the summit of the divide between the east and west forks of the Dolores river, near Rico.

Fremont County.

The oil companies operating in the Florence field report progress. Several wells have been opened in the first five months of the year. There are twenty-two companies doing business in oil. Besides these, five others have heen organized and are arranging to drill. Three companies are in process of formation and expect to he drilling in July or August. A year ago the combined daily expenditures of the operators had reached $1000 a day, and the amount is to-day much heavier. Sixteen wells were under way during month of May. A few of these wells have already gone through small streaks of oil sand, but will send the drills deeper. The best wells, recent developments have shown, were opened at depths varying from 2500 to 3000 feet. Some wells have heen pumping continuously since opened, fifteen or eighteen years ago.

Gilpin County.

It is reported the Gilpin King group of mines in Lump gulch, near Rollinsville, have been leased and bonded to F. P. Davey, and that developments are to be started. Copper and lead ore has been taken out of this group. Shipments to the stamp mills and sampling works have been made and results reported satisfactory.

Decatur, Ill., parties are interested as the Decatur M., M. & T. Co. in a group of claims in the Moon gulch section, near Rollinsville, and they are continuing developments. Good headway is being made in driving the main tunnel. The work is under management of W. M. Bloomer. The company expects to build a mill of at least 50 tons daily capacity.

The Interstate Con. M. Co. has been organized by the owners of the Happy Hollow group, 1 mile south of Rollinsville. Chicago, Ill., parties are interested and O. J. Duffield is local manager. It has been partially developed by tunnel and shaft workings, hut it is intended to concentrate efforts toward development of the entire group through a central shaft and they will put in a steam hoisting plant and top buildings. G. E. Churchill is underground superintendent.

Gunnison County.

Operations have been resumed on the Red Jacket group of six claims, near Pitkin, under management of J. C. Teller of Denver, part owner, and who also holds lease and option on the property. Teller has the Iron Crown and the Iron Cap lodes adjacent to the Red Jacket. An incline has been sunk 90 feet with 100 feet of drifting done, and a vein of carbonate ore is showing. About fifteen cars of mineral have been shipped. A 4-drill compressor is being set up.

Hinsdale County.

The Contention mine, near Lake City, is in steady operation and Superintendent Kazar has thirty men at work in mine and mill.

It is reported work will resume on the World's Fair claim of the Dupre Co.'s group, near Lake City.——Between five and six tons of concentrates are being made daily at the Hidden Treasure mill. The new level started is progressing, says Superintendent McCarthy.

Jefferson County.

J. W. Boyd of Idaho Springs, member of the company which has bought the smelter at Golden, states that the smelter will he blown in about July 15. The company is to he known as the Independent S. & R. Co. Improvements are being made on the plant and they will make a number of changes before starting operations. The plant is to he made automatic.

Tests made a few miles west of Denver have proven the land carries gold values, says H. J. Reiling of Chicago, Ill., who, with others, has organized the Clear Creek Gold Dredging Co. and the National Dredging Co. Over 700 acres of land on Clear creek, 4 miles east of Golden, have been secured hy the companies and preparations to work it are being made. The building of dredgers, with a capacity of 80,000 yards per month, and to cost $85,000 each, have heen started at Placer and Eleanor, and a third will also he built. The hulls of the first two dredging machines are complete and about October 1 it is expected the machines will be in operation. They will employ thirty men. They will be of the "endless chain" elevator type. They rest in 8 feet of water and work the land to bedrock, which, near Golden, is said to be in places 60 feet. The dredgers will have a chain of eighty buckets, each having capacity of 5 cubic feet. Sixty men are at work on the two dredgers heing built at Placer and Elcanor and the third will also be at Eleanor. The land on which the dredgers are heing built is along the line of the Denver & Northwestern electric line. The dredgers will be named Eleanor Nos. 2, 3 and 4.

La Plata County.

(Special Correspondence).—The season has opened and shipments are heing made from prospects and small mines all over the district. The Durango Girl shipped a carload last week, the smelter returns showing $500 gold and 106 ounces silver per ton.——The May Day made a shipment of two carloads and the Chief shipped one car of twenty-five tons. The latter company proposes building a mill, rope tram and compressor plant.——Men are at work driving a tunnel on the Tribune claim to cut the extension of the Comstock vein, a 100-foot coutract having heen let.——The R. G. S. Railroad is putting in a spur on the Mesa, 5 miles west of Hesperus, for the henefit of mines in La Plata river district. It will probably be extended to the May Day this summer.

Mancos, June 5.

The May Day mine, near Durango, is driving its crosscut tunnel with air drills and making daily shipments to Durango from the shaft. They have a 117-foot shaft and 122 feet of drifting.——The Comstock, near the May Day, has resumed operation, the workings having been cleaned out and improved, and the mine will be among the regular shippers hereafter. The Bay City, operated hy Puehlo men, continues its drift into the mountain.——The Bonnie Girl M. Co. continues work at its mines and in construction of the mill which, it is expected, will be in operation next month.——The Empire G. M. Co. is operating the Small Hopes group, driving a tunnel 1450 feet to cut seven known veins. An air compressor is employed.

Montrose County.

N. C. Westerfield of Philadelphia, Pa., has an option on the property of La Salle C. M. Co. in the Paradox mining district, near the Utah line. The property consists of twelve claims, and has been

worked for several years. The tunnel is in a distance of 1132 feet, and above this tunnel level ore containing values in native silver and copper has been taken out. Work is being confined to driving a drift at a point 100 feet below the tunnel level. There is a 35-ton smelter on the ground. Westorfield says he will do a year's development work, sinking and opening up the ore, and will then be in shape to make output and run the smelter.

Ouray County.

It is reported the Camp Bird mine, Ltd., at Ouray continues to improve. Twenty-eight tables are constantly running in the vannor room of the mill. Men are being added daily to the working force. The mill is being enlarged for an addition of ten stamps, and the eyanide plant will also be increased. A saw mill will be added.

San Juan County.

The Astor M. Co., near Eureka, working thirty-three men, says Manager Condit, is grading for a 1600-foot pipe line to convey water from the Animas river to the millsite. The grade will be completed and the pipe laid by July 1. Part of the machinery for the concentration mill is on the ground and it is expected the plant will be running by October 1.

J. Essley and T. Anderson have started work on their Dolliver group on Boulder mountain, near Silverton. The group comprises five claims. Development consists of a 200-foot crosscut which is expected to break into the Republican lead. Next will be the Roberts lead, then the Crogan.

The Dawn of Day group in Dry gulch, near Silverton, will be operated on bond and lease for tungsten this season, says the Silverton Standard.

The Bavarian M. Co. has started operations for the summer on its crosscut tunnel on Tower mountain, near Eureka, which is in 135 feet. At the foot of King Solomon mountain men have been put to work on another crosscut. W. Barkow is in charge.

Summit County.

The vein of the Colorado & Wyoming Dev. Co., near Breckenridge, is being developed. They have opened up bodies of ore at a vertical depth of 400 feet from surface of Mineral hill. The ore is 6 feet across. The management proposes building a concentration plant which will have a daily capacity for handling seventy tons of ore, adapted to the iron-lead-zinc ore of the property.

The Breene property on Elk mountain, near Kokomo, has put on another shift. Ore is being broken daily and large shipments made. P. W. Breene is manager. ——Considerable development is going on at the Milo. The underground workings show bodies of good grade ore, running well in lead, says Manager E. E. Byron. ——The Connors Bonanza property has started work on the tunnel.

The Carr G. M. Co. has been incorporated, to operate near the head of Blue creek, near Breckenridge, by J. P. Howe, F. C. Hamiltion, J. C. Mellor at al.

Teller County.

The output from Cripple Creek district for month of May amounted to $1,901,800; the tonnage was heavier than for April, despite the fact that the snowstorm closed down many of the mines for about a week. This amounted to 1000 tons more than April. The average value of the ore was $32 per ton, or a gain of $2 over the average value of April. Steady increase in the production is noted for several months. This increase, says the Gazette, can be attributed largely to the many lessees operating, and who during the past few months have opened large bodies of ore. Ore to the value of $9,000,000 has been produced in the district since Jan. 1. The figures obtained from the mills and smelters are as follows:

Plants.	Tons.	Total.
Smelters	11,000	$660,000
U. S. R. & R. Co.	22,000	484,000
Portland	8 000	240,000
Telluride	7,000	175,000
Dorcas	2,800	168,000
Economic	2,900	150,800
Homestake	4,000	14,000
Sioux Falls	2,000	10 000
Totals	59,700	$1,901,800

The R. E. A. & A. Co., leasing on the Wild Horse mine, near Cripple Creek, and which is putting up a cyanide mill to treat the Wild Horse dump, has received machinery for the mill, including rolls and crushers. The building is completed and the work of setting up the machinery started. The capacity will be 100 tons daily.

J. J. O'Hara et al., of Denver, have bought the Edwin, Mamie and Lizzie mining claims (formerly the Galesburg, Henshaw and Brooklyn), on Grouse mountain, south of Victor. Development work has been started and a crosscut tunnel several hundred feet will be driven. When they cut the first vein, which has been exposed on the surface, the lode will be followed.

On the morning of the 6th inst., while non-union miners who had come off shift from the nearby mines were waiting for the train at Findley station, near Independence, a quantity of dynamite was exploded beneath the station platform, supposedly by union men. Eleven men were killed and a number of others injured, two of whom died later. Later in the day, during a riot in the streets of Victor near the Miners' Union hall, two men were shot. Several local and county officials (including the sheriff), who were union men, were forced to resign by the Citizens' Alliance, and other men appointed in their stead. The military has again assumed full control of Teller county affairs. A large number of union men have been arrested and on the 7th inst. fifty were deported by special train to Denver and warned not to return. Practically all the mines of the district have been closed down, except the Portland at Independence, which employs union men. Work will be resumed as soon as quiet is restored. Two slight skirmishes occurred between the militia and union men on the 8th inst., and most of the union men were captured.

The Longmont L. & M. Co. has a lease on the Sitting Bull claim of the Keystone M. Co. on Bull hill, Cripple Creek, and has started to sink the shaft an additional 200 feet which will give it a depth of 440 feet. Considerable lateral work will be done during course of sinking. The lessees have plant of machinery on property capable of hoisting rock from depth of 500 feet. A sublease on the east end has been let to P. Burke of Independence. There are several shallow shafts on the sublessee's territory.

Lessee Walsh & Co., operating under lease the Bonanza Queen mine on Ironclad hill, Cripple Creek, north of the W. P. H. mine, have started sinking the main shaft another 200 feet, giving it depth of 1200 feet from surface.

The management of El Paso Gold King on Womac hill up Poverty gulch, near Cripple Creek, will start up work. The El Paso Gold King has been closed down since August, last year. The mine was nearly flooded with water in the lower workings, and it was decided then to quit and allow the El Paso tunnel to drain it. This has now been done, as there is little water in the shaft, which has been sunk to 920 feet.

There are forty-two sets of lessees operating on the Gold Coin mine, in Victor. There are still twenty-five blocks, which will be leased by the Woods Investment Co. Practically all of the lessees have some ore, while a half dozen are making high-grade shipments. F. M. Woods says there were several good blocks to be had on the tenth level, but so far no one would go in there on account of the water.

S. Warren, superintendent of the White City G. M. Co., reports opening up a body of ore on the Friday claim, at Cripple Creek. He put men on an abandoned shaft 75 feet from the main working shaft on this claim. Prospecting they found a 4-foot vein of ore in the bottom of the shaft at 40 feet from surface showing values. A carload shipment is being saved. They are getting out the ore by a windlass and Warren intends after the first shipment to put up a plant of machinery. The Friday claim adjoins the Hoosier on Tenderfoot hill.

The Peggy G. M. Co., working a fraction of ground containing half an acre, on Gold hill, Cripple Creek, has a lease from the Mary McKinney Co. on a block of ground 75x100 feet from the surface down to any depth desired. The block adjoins the Le Claire on the west side and is said to contain the extension of the ore shoot in the Le Claire. The Peggy Co. is required to pay a royalty of 33⅓%. The Le Claire vein strikes across the McKinney block diagonally and 100 feet of the vein will be within the boundaries of the lease.

IDAHO.

The United States Assay office in Boise has issued its annual statistical report, showing the mineral output of Idaho mines for the calendar year 1903. The total production of the precious metals was $20,451,933. This is an increase of $5,000,000 over the previous year. Shoshone county is the leading producer of the State, the total value of all the metals for the year having been $7,235,222. Owyhee county was the leading producer of gold. It is also the second county in silver production and second in total valuation of mineral product. Of the total production of 83,737 fine ounces of gold in the State during the year, 47,506 ounces were of quartz origin and 36,231 ounces came from the placer mines.

Blaine County.

W. Herrick of the Minnie Moore mine at Hailey says the mine will be equipped with heavy pumping machinery and opened to greater depth. The principal work is being done on the 1100-foot level. ——A Scranton, Pa., company, which owns the Hattie group, near J. Q. Packard's Tip Top mine, 10 miles from Hailey, is preparing for operations.——The Argosy mine at Hailey has been sold for $75,000 to L. Cramer et al. of Hailey.

Custer County.

There are 200 men at work in the mine and smelter of the White Knob C. Co. at Mackay.

Idaho County.

Work is progressing on the Atlas mine at Buffalo Hump and they expect to strike the main ore body in the lower levels next week, says G. T. Crane of Spokane, Wash., secretary of the company. The shaft is down 248 feet, or 100 feet below the upper level, and a station has been made. They are working sixteen men in three shifts and are drifting toward the ledge. If the ore body holds out in the lower level as it was in the 148-foot level they will put a 10-stamp mill on the property this summer. They have a hoist and pump with water power. The ore is free milling and went $16 in gold on the upper level. H. W. Peel is president.

At Hump work has been temporarily stopped on the Rob Roy, owing to water due to melting snow. They have cut the ore body in the tunnel, which is in 50 feet. —— The Lucky Lad M. Co. has put the Rob Roy men to driving a tunnel from the north end of its property and expects to tap the old workings in 300 feet. —— The Colonel mine is reported to show 18 feet of ore, which averages $42, with silver.—— Progress is being made at the Mother Lode No. 2. H. McFadden reports everything satisfactory at the Moonbeam and work in progress.

The Florence Electric M. & M. Co., Ltd., J. C. Northrup of Palouse, Wash., president, has resumed work of developing the company's mines at Florence.

The management of the Snow Storm copper mine, in the Cœur d'Alenes, is preparing to put in a leaching plant with a capacity of 200 tons a day, says W. Graham of Wallace, president of the Humming Bird M. Co. The Snow Storm is shipping 50 tons a day to the Tacoma smelter, so that the leaching plant will increase the output. —— The Springfield mine, 5 miles east of Milan, will let a contract for 400 feet of tunnel work. This tunnel is expected to tap the ledge 375 feet below the present workings, but will have to be driven about 1000 feet. The company has two tunnels in 300 and 400 feet.——They are working four men on the Humming Bird, at Burke, and expect to put additional machinery on the property during the latter part of the year. ——The Tiger-Poorman is working ninety men.

The Thunder Mountain H. Y. M. Co., D. Hiseok of Patchogue, N. Y., president, and C. J. Perkins of Roosevelt manager, is arranging to equip its Thunder Mountain property with a stamp mill and cyanide works.

Kootenai County.

M. O'Donnell, secretary of the Tyson Con. M. Co., operating at Tyson, says they propose putting in a hydraulic system to work the company's placer mines, the 16 to 1 and the Gold Nugget. It is proposed to take water from the St. Maries river at a distance of 21 miles from Tyson, which will give a 600-foot head.

Shoshone County.

Ore shipments are being made to the smelter from the Stewart mine, near Wardner, the 300-foot spur on the Sierra Nevada branch of the O. R. & N. having been completed. The ore is being sent to Colorado. The Stewart group consists of five claims on Grouse gulch, between Deadwood and Government gulches. H. F. Samuels is president and manager.

Operations will be started at the New Jersey mine, at Wardner, this week. The tunnel will be driven ahead and a two-drill compressor put in. G. Coleman is interested.

Arrangements have been completed whereby the Morning M. Co. will develop the Fanny Gremm claim through No. 5 tunnel of the You Like mine, near Wallace. The drift which will be extended into Fanny Gremm ground will reach the latter by running on the ledge about 200 feet. The depth will be 800 feet. J. H. Newbury is principal owner of the Fanny Gremm.

KANSAS.

Cherokee County.

The Sunnyside Co. started its concentrating plant at Baxter Springs last week and it is turning out jack.——The Mission mine in opening the drifts has cut payable ore, and Ford & Troupe, the owners, are rushing completion of the concentrating plant.

W. S. Norton and O. W. Sparks of Columbus have arranged to start mining on the Haskett lease south of Baxter Springs.

S. Cooper reports opening up a jack prospect on the Black Hills M. Co.'s lease south of Galena. He is working at a depth of 50 feet and is using a horse whim. —— The work on the pond at the Gay & Gardner mill, on the Battlefield mine, is proceeding slowly.——The mine operated by P. Wineman, H. Mack, W. Balch et al., west of the Frisco depot, is reported improving. A steam hoister is in operation and they expect to take out 300 tons of ore weekly.

E. C. Crawford reports a steam hoister in operation at the mine operated by him and A. Louderbach at Galena. This will enable them to take out twenty-five tons of ore daily. The ore from the shaft is said to run 20% zinc. They are working at a depth of 32 feet and have gone into the ore 14 feet. —— The Cousin Jack M. Co., operating the Duck Pond mine, is rigging up the Cousin mill and will use the rolls and breakers to handle its dirt. The hand jig will be set up and no steam jigs used. A new drift will be cut to make room for more men underground.

P. B. White, C. M. Jones, J. A. Grantham, R. Harvey, G. E. Rucker and E. W. Dawe have formed the Grace M. Co., and have leased sixty acres of the Lahadie land south of Baxter for mining purposes.

MISSOURI.

The output of zinc ores from Joplin district for the first five months of 1904 reached value of $3,765,635, and that of lead ores a value of $788,885, giving a total for the district of $4,554,520. The slump in the spelter market last week has effected the local zinc ore market. The highest price was $38.50 per ton, or 50 cents lower, and the assay basis was lowered in instances $1 per ton. The ores above 60% are commanding a basis of $35 to $36, and lower grade ores are selling at $33 to $34 per ton. The Missouri and Kansas Zinc Miners' Association again proposes to prevent accumulation of reserve stock (which the light buying of the past two weeks would indicate might be allowed to accumulate) by restriction of output. Lead ore sold at $56 per ton.

Jasper County.

R. E. Bruner of Kansas City, manager of the Tennessee, the Anderson and the Starr mills and mines of the B. & H. M. Co., says the company holds a 30-acre tract in Chitwood. The B. & H. mill is running double shifts.——The A. & R. M. Co., composed of A. H. Munger, R. R. Miner and J. D. Davison of Kansas City, has subleased from the B. & H. M. Co. the Anderson and the R. A. Starr mills and will operate them. L. Z. Lyman is manager. It is expected by June 15th both the A. & R. mills will be running double shifts, which will make three mills on the B. & H. tract.

This month three new mills will be put in operation on the Porto Rico lease, 3 miles southeast of Carterville. A plant is under construction by the Miami M. Co. and the Square M. Co. has bought a plant and is moving the same to its lots. Manager Millard of a company operating on the Porto Rico, has bought a mill and will have the same moved to their prospect. —— King & Co., composed of F. M. King, J. Ball, W. Owings, W. McAboy and A. H. Redding are developing a prospect on the Missouri Zinc Fields grounds near the plant being built by J. F. Coyne, near the Missouri Pacific railroad. They have a 14-foot face of ore opened. It is being found on a level of 141 feet. They have been hoisting there and have milled a part of their dirt. A concentrating plant will be built as soon as the drifts can be opened out sufficiently to provide room for operators to furnish the mill with ore.

The Mary Louise mill of T. F. Coyne on the Zinc Fields ground, near Carterville, is nearing completion. The plant is built on a self-feeder plan and is equipped with electrical power. The machinery included a sludge table. He expects to have the mill ready for operation this week. The ore is found on the 170-foot level and a face of 35 feet is opened up. —— J. M. Stewart & Co. have been developing the McCorkle hill property by surface drilling and carrying on development work in the old workings. Preparations are being made to build an electrically operated mill. Stewart will not only operate his mill and hoisters with electric motors, but will operate his pump and drilling machines with the same power, and is figuring on a hoisting and carrying system to be operated by motor. The Missouri Zinc Fields power plant will furnish the current.

Manager G. L. Cole says a drill hole on the Calumet mining land, near Neck City, went through 20 feet of lead ore at a depth of 114 feet last week. This drill hole is 200 feet from the Katherine shaft, at whose 200-foot level jack has been mined. —— Six lots, including the Sunflower mill and mine on the Eclipse lease at Neck City, were sold last week for $60,000 to Wolf, Snow & Coddell of New York and A. M. Wagner of Webb City.

There are three shafts on the ground, all in the ore body, and showing a 60-foot face of ore.

Newton County.

At Granby several of the producing mines of the district were shut down last week on account of a shortage of water for concentration mills. The Mascot and Prairie are among those shut down, and if no rain visits the section in a few days the Homestake will join them.——A good run of blende is reported opened up at the Blue Jacket mine 12 feet below the level of the drift, but cannot be successfully worked until a new shaft is sunk, which is being done. The shaft is 200 feet west of Blue Jacket No. 2 mine.

The pump at the Fortune Teller mine at Granby has been started up, and as soon as the water is out of the shaft work of driving a crosscut 30 feet to catch the run of ore will be begun.

MONTANA.

Deer Lodge County.

J. J. Wagener of Anaconda, part owner of the Golden Eagle group in the Flint Creek district, says a strike has been made in the tunnel and he will arrange to put in a roll mill and blast furnaces. The tunnel has been run 1000 feet and has attained depth of 600 feet. In driving the tunnel three ledges have been crosscut, the last one being 40 feet wide. He will put in an air compressor before the tunnel is driven farther.——The Flint Creek M. Co., of which J. C. Keppler of Anaconda is president, owns the adjoining property and has men at work.

Fergus County.

J. K. McKenzie of Chicago, Ill., general superintendent of the Gold Reef M. Co., operating at Gilt Edge, says progress is being made on the Drake mine. Two diamond drills are at work developing the property. It is proposed to add another roaster to the reduction plant during the coming summer.

W. G. Moore of Lewistown is preparing to put a diamond drill in operation on his mine near Kendall.

Flathead County.

The Libby Placer M. Co., composed principally of Butte men, intends to operate its mines on Libby creek, near Libby, this summer, says S. D. McCarthy, manager. The company owns most of the ground in the canyon, 2000 acres in all.

It is reported that additional machinery will be put in at the Snow Shoe lead and silver mine, near Libby, owned by the Rustler M. & M. Co. W. D. Wrighter is manager.

Silver Bow County.

The Washington M. Co. is working two claims at the head of Chaucer street, Butte. The shaft is 50 feet deep, at which depth has been cut a vein of copper and silver, with a paystreak of 14 inches, which is said to run 20% copper and 33 ounces of silver. In the Washington No. 2 another vein was cut at a depth of 12 feet, carrying gold and copper. A crosscut is being driven.——A strike has been made in the Liverpool mine, Lump gulch. Shipments are being made of a high-grade ore at the rate of two cars a week.

NEVADA.

Elko County.

High-grade gold and silver ore is reported struck at Mountain City, 20 miles north of Tuscarora. But little work has been done in the camp for several years.

G. L. Moats of Salt Lake City, Utah, manager of the Latham mine, in the Spruce Mountain district, says the Black Forest smelter will be blown in again. The Black Forest mine and plant are owned by C. M. Spence of Wells. About 1100 tons of ore are in the bins ready for treatment, while in the mine ore is blocked out. Manager Moats has arranged with Spence to deliver ten tons daily from the Latham mine.

Humboldt County.

An air compressor and power drills will be placed at the Sheba mines, south of Mill City, and they will resume driving the main tunnel. W. H. Childs of Salt Lake City, Utah, is treasurer.

Lander County.

G. D. Wheeler, who has bonded the Commonwealth group for $12,000, also has an option on the Grand Prize group of mines, near Battle Mountain, for $11,000. The group comprises three claims and a fraction. Wheeler has put men to work to explore the whole workings.

Lincoln County.

The Columbia group at Good Springs and the Boss group at Sandy have been taken by G. Gunn on an option and are being prospected.

W. Fiske and B. Hewitt of Cripple Creek, Colo., interested in a group of mines near Caliente, report that they propose to build a mill at Caliente, to handle gold-silver-copper ore.

Nye County.

The Johnnie Con. G. M. Co. has been formed exploiting two groups of mining claims, making fourteen claims and two mill sites, in all, in the Montgomery mining district. The claims are at the base of Timber mountain, at the head of Pahrump valley, 60 miles north of the Nevada Keystone mines, near Searchlight, and 80 miles from Ivanpah, Cal., which is the nearest railroad point. There are several shafts, the deepest of which is 400 feet. The ore is free milling and assays $10 in gold. The sinking of working shafts will be resumed. Two artesian springs, the water of which is piped to the company's camp site, are included in the company's holdings.

Washoe County.

E. Olinghouse reports development of Butte and Gold Center mines at Olinghouse progressing. A raise is being made with two shifts to tap the shoot on its dip to north on trend of vein.

NEW MEXICO.

Colfax County.

Near Baldy the 3000-foot tunnel of the Baldy Deep Tunnel M. Co. is in Baldy mountain 1250 feet and work is progressing. This tunnel will gain a depth of 2000 feet.

Lincoln County.

The Jicarilla M. & R. Co. has started excavating ground for its concentrator at Jicarilla. The mill will have a capacity of fifty tons per day. The engines will be 80 H. P. and boiler 125 H. P. Shafting will be equipped for a 100-ton plant, so as to be in shape to enlarge when necessary.——The Free Milling Co. is running its placer machine and reports satisfactory results.

Santa Fe County.

J. Martin reports opening up a mine of turquoise near Cerrillos.

Taos County.

Near Raton the South Fork M. Co. will build a 100-ton mill on its mine. Excavation for the site has begun. J. Morris is superintendent.

OREGON.

Douglas County.

F. P. Hogan and C. H. Fisher, of Spokane, Wash., have a year's option for $30,000 on a group of eleven claims on West Fork creek, in Douglas county. It is a sulphide ore carrying gold.

There is little snow left on the ground in Bohemia mining district, says A. Johnson, president of the Hiawatha M. Co., and the Grizzly group in Champion canyon, near Bohemia. He reports the Crystal Con., North Fairview, Vesuvius, Oregon-Colorado, Riverside and other properties in Bohemia district have kept up continuous development during the winter and have increased ore bodies. The Oregon Securities Co. is resuming work throughout its holdings. The power plant is working successfully transmitting electric energy over 6 miles of pole line to the air compressor plant at the 30-stamp mill at head of Champion basin. It is operating two drills in the tunnel being driven through the saddle of Grouse mountain, to make connection with the Musick mine. The Oregon & Southeastern Railway Co. has men at the end of its track laying rails on the section of grade completed last fall.

Grant County.

J. Shipp and E. E. Gibbs of Ukiah, Or., have bought the Oriental placer mine on John Day river, in Grant county, for $48,000. The claim is operated by dredger, but has been idle for two years. Additional machinery will be placed and work resumed.

Josephine County.

For $45,000 the Kirkland placer mines have been sold to McNicholas Bros. of Portland. The land is near Leland. J. H. McNicholas will have charge of the operations. A flume will be built and giants set up.

F. P. Hogan of Spokane, Wash., reports he has, with other Spokane men, taken bonds on two groups of claims, and expects to start work this month. A sixty-day option for $40,000 has been secured by Hogan and J. M. Allen on a group of seven or eight claims on Rogue river, about 20 miles south of Glendale. It is a free milling gold property.

The Waldo S. & R. Co. at Waldo reports work on the smelter well under way and when completed will have a capacity of 100 tons daily. Besides treating the ore of its own mine custom work will be done. The company has bodies of ore blocked out in the mine and has men increasing the ore reserves.

Lane County.

H. A. Troup, superintendent of the Uncle Sam mine at Blue River, says that the mill will be moved to the south side of the hill and will be in operation in September.

Wallowa County.

It is reported only a few men are being worked by the Fargo M. Co. at the mouth of Imnaha river, near Imnaha, as supplies of rails and powder have run short, and the company has discontinued the use of its electric drills until such time as the new boat has been put on the river and supplies can be received. The Fargo Co. is in on the lower tunnel 170 feet, and it is expected the ore body will be struck within the next few feet. In the upper tunnel, which was run in on the ore a distance of 260 feet, the vein was 6 feet in width. The crosscut tunnel being run will cut all the veins of the group.——At the Big Four claim on Salmon river, 2 miles above the mouth, E. E. Ellertson of Mayville, N. D., principal stockholder, says the company has a crosscut tunnel in 130 feet, and has let a contract for 150 feet more. It is expected the ore body will be struck within the next 100 feet. The Big Four, as well as the Fargo properties, are gold-copper propositions. The ore body in Big Four is said to be 50 feet in width, the copper values ranging 10%, with $12 in gold and silver. In the Fargo, ore from the upper tunnel, which is 260 feet in length, samples 11% copper.

SOUTH DAKOTA.

Custer County.

The Clara Belle M. Co. has started its Tremaine mill, near Custer, after an idleness of two years. During that time the shaft has been put down to depth of 225 feet and lateral work has opened a body of ore.

Lawrence County.

The Clover Leaf G. M. Co. at Roubaix is running its mill with sixty stamps dropping. For several months past but forty of the stamps have been in use. The shaft of the company is being deepened and the eighth working level will be established. In the meantime sinking will continue, and it is intended to go to 1000 feet. Provision has been made for sinking by the putting in an independent hoisting plant.

The Benedict M. Co. is preparing for development work at its mines near Deadwood. Men are steadily at work at the saw mill turning out lumber to be used in building a flume to the company's plant. The flume will be 2 miles in length, and the company expects to use water power for the plant.

As a result of heavy rains for several days in the Black Hills, Whitewood, Deadwood and City creeks overflowed their banks and did considerable damage in the mining towns of Deadwood and Central City.

The Lexington Hill G. M. Co. has resumed operations in its mill, near Deadwood. Experiments will be made on the ore found in its mine. A new style amalgamator will be put in. The company is running a tunnel 800 feet to strike three ledges of quartzite ore. It averages $10 and is said to be partly free milling, the remainder being a cyaniding ore. The company will build a 300-ton mill this summer. H. Bischoff is manager.

UTAH.

In the open market the settlements on ores and bullion during the month of May aggregated $2,004,700, says the Salt Lake Tribune. During same period there was forwarded by the copper smelters copper bullion, containing gold and silver, $4,000,000 pounds, for which the producers received approximately $1,000,000. Including the copper produced during the month at the furnaces of the American smelter the copper output in the State during the month amounted to 4,326,000 pounds. The enlargements at the Utah Con.'s plant at Bingham will go into commission about June 20. The Bingham Con. also promises a new record the present month with its battery of four furnaces in operation, while at the U. S. smelter a material increase is assured. The May record was as follows:

	Pounds.
Bingham Con.	1,080,000
Utah Con.	1,257,000
United States	1,051,000
American	938,000
Total	4,326,000

The output of lead bullion at the furnaces at Murray of the American S. & R. Co. during May attained a total of 8,400,000 pounds. The supply of ore is exceeding capacity of present equipment and is pledged under existing contracts to supply the company with sufficient to justify it in installation of at least two more furnaces, says Manager Whitley. Park City is the principal source of Utah's supply of lead.

Iron County.

The heavier pump added to the equipment at the Johnny mine at Stateline is in operation, and opening up the ledge on the lower level will be resumed. Meantime, the stamps continue dropping on ores from the upper workings.

Juab County.

At a depth of 1400 feet in the Centennial-Eureka mine, Tintic district, at Eureka, the management reports they are again in the main ore body on the west, the level having penetrated it for 36 feet, the ore as an average running well in copper and gold with normal values in silver. They have opened into it 200 feet vertically below the point at which it was cut on the 1200-foot level. The ore between this level and the 700 above has been practically untouched. No crosscutting has yet been done on the 1400-foot level. Meanwhile 300 tons of ore from the Centennial-Eureka is going out daily.

Piute County.

J. Long, Jr., manager of the Mammoth mine in Gold Mountain district, near Marysvale, says he has ordered a resumption of work at the mine.

Salt Lake County.

The United States tramway at Bingham is said to be moving an average of 600 tons of ore per day from the company's mines up the canyon to its smelter in the valley. In addition to this, there is tonnage coming from the Centennial-Eureka mine at Tintic, which is also a United States property, as well as some custom ore.

The Davis & Gebhardt group at Bingham has been sold to a Massachusetts company headed by E. B. Mullen, of Cambridge, Mass., for $100,000.

The Utah C. Co. has made arrangements with the Bingham Con. C. Co. for use of the water flowing from the Mascot tunnel of the Dalton & Lark group. With this source to draw from Superintendent Janney says his company will have a supply sufficient for treatment of a tonnage of ore reaching 4000 per day. The present flow consists of 1800 gallons per minute, while the management expects it will hold up to 1200 gallons at low water.

Summit County.

Both of the mills at the Daly West M. Co. of Park City, with which second-class ores and the slimes therefrom are treated, are in steady commission, says E. Bamberger, assistant manager. The ores that went down in collapse of the bins are being fed to the plant and will have all been cleaned up by next week, while reconstruction of the bins will follow a week later.

The tailings from the mills that have collected on ground between the Daly and Daly-Judge offices at Park City, and that were brought down by the high waters, will be worked, says the Miner. A trough 1 foot square and 12 feet long is placed on the bank, one end about 2 inches lower than the other. In the upper end is a set of screens pointing up stream at an angle of about 60°. A small stream of water is carried into the trough by another trough, and into the upper trough the tailings are slowly shoveled. The screen takes out the coarse gravel, while the ore settles in the bottom of the lower trough. The best and heaviest particles of ore settle in the upper end of the trough, while the slimes and sand run off. The concentrated ore is then shoveled out. If it is desired to make a closer handling the middlings which have settled along the center of the box are run through again. The tailings are concentrated in the proportion of about five tons into one. The richest of the tailings are said to carry about fifteen ounces of silver per ton and a little lead. At the Daly West is a pond containing several thousand tons of tailings which carry up to twenty ounces of silver, and these will in time all be worked over in the new tailings mill. There will then be but small values running away in the creek.

Tooele County.

E. W. Clarke, receiver for the Overland M. Co., will resume work on its properties at Sunshine, Camp Floyd mining district, the interests of all parties under the agreement to continue under the general supervision of the District Court. Machinery will be added.

The Peoria M. & M. Co. has been incorporated to operate in Tooele county by E. Clarey, J. G. Brown and W. M. Gundy of Salt Lake City.

Washington County.

A 65,000-pound consignment of copper bullion from the Dixie smelter, near St. George, was shipped last week. The shipment is the first to be sent over the new wagon road from Shem to the San Pedro station at Acoma. The additional furnace with which the smelter has been equipped will be blown in by the 15th inst. and the output of the plant increased.

WASHINGTON.

Ferry County.

R. Angus, superintendent of the Quilp mine at Republic, has bonded the Copper Key claim for $10,000. The Copper Key is south of the Belcher mine.——E. R. Delbridge says he will develop the Oversight group, on the Belcher vein.

Contracts have been let to build the railroad extensions to the Granby smelter, Phœnix and Midway, B. C., which is caus-

ing revival in Republic and other mining districts in Ferry county, as also in those adjoining in Stevens county, particularly those near Orient, on Kettle river, in Ferry county. As soon as the branch from Grand Forks to Phœnix is completed, it is expected the First Thought mine, near Orient, will resume operation and begin shipping ore.

Work has been resumed at the Knob Hill mine at Republic after several weeks' cessation.

Machinery will be put in and work started on the Insurgent mine, in Republic, this summer, says G. B. Dennis, president of the Insurgent G. M. Co., of Spokane, last evening. The property has been idle for two years. The shaft is down 135 feet and in 15 feet of $12 ore. The new work will be in this shaft. The company owns the Insurgent and the V fraction.

Okanogan County.

Mining development is reported progressing in Moses district on the Columbia river, near Nespelem. The ledges carry values in gold, silver and copper. This summer operations will be resumed on the Apacho. The Hattie E. group, bonded by the Moses M. & D. Co. of Vermont, consists of the Hattie E., Campaigner, Sulphide and Bruno claims. The Hattie E. has a 100-foot shaft and a crosscut. The Campaigner adjoins the Hattie E. and has a 120-foot tunnel. This coming season a regular line of boats will run on the Columbia river, connecting with the railroad at Wenatchee, giving outlet for the production of the camp.——The Muttuonah M., M. & D. Co. is running a 1000-foot tunnel to tap the main ledge on Squaw mountain. It is in 500 feet and has cut several veins of ore. The claims are on apex of the mountain. Besides quartz properties, the company owns a tract of placer ground in the angle formed by the Columbia and Nespelem rivers.——The Pacific G. M. Co. of Alleghany, Pa., has a group of five claims in Kaiser camp. It has fifteen men at work. A whim has been set up.——The Nespelem river has a fall of 800 feet in a distance of 2 miles, giving available water supply for power.

WYOMING.

Carbon County.

Near Grand Encampment the El Rey gold mine on Purgatory gulch is being prospected. The work is being done on the ore shoot opened last winter. The management expects to open up the ore by sinking and drifting. A stamp mill will be figured upon, says Superintendent Watson. The El Rey is owned by the Con. G., C. & C. Co., Pennsylvania men. The property is 5 miles from Grand Encampment.

Fremont County.

The Dexter M. & D. Co., operating at Atlantic City, is arranging for a 100-ton cyanide mill and plant. D. G. Cahoun is president. The property of the company comprises fifty quartz claims, 5000 acres of placer ground and 20 miles of canals.

FOREIGN.

AFRICA.

Rhodesia.

The Rhodesian Chamber of Mines at Bulawayo reports gold output for month of April at 17,862 ounces (Matabeleland, 14,811 ounces; Mashonaland 3051 ounces), as compared with 1903, the monthly returns of gold and silver since January 1 have been as follows:

	Gold.		Silver.
	1904.	1903.	1904.
	Ozs.	Ozs.	Ozs.
January	19,359	16,245	3,521
February	18,673	17,090	3,461
March	17,756	19,626	5,453
April	17,862	20,727	4,275

The following analysis of gold production for March, 1904, is also given: Matabeleland, 19 mines (313 stamps); Mashonaland, 6 mines (78 stamps); total, 25 mines (391 stamps).

	From Mill.		Tailings.		Concentrates.	
	Ozs.	dwts.	Ozs.	dwts	Ozs	dwts.
Matabeleland	12,861	17.50	1,536	2.79	221	9.00
Mashonaland	2,328	12.87	250	0.00	565	15.50
	15,180	10.37	1,786	2.79	787	4.50

	Other Sources.		Total	
	Ozs.	dwts.	Ozs.	dwts.
Matabeleland	18	6.87	14,627	16.16
Mashonaland	4	0.00	3,148	8.37
	22	6.87	17,776	4.53

AUSTRALIA.

New South Wales.

The management of the British mine at Broken Hill proposes increasing the productive work and also resuming sinking either the Blackwood or Howell shafts. These shafts have not gone below the 600-foot level. Improvements will also be made at the concentrating plant.

Queensland.

J. Williams, of the Young Cumberland mill at Etheridge, is putting in an additional ten stamps for use of the Jubilee mine and Hawkins' Hill Co., whose residues, after passing through the boxes, will be cyanided.

Victoria.

During the half year ended April 15, the Victoria United Co.. at Ballarat, reports 13,307 tons of stone were crushed for 4157 ounces gold, including 241½ ounces from 162 tons pyrites. This yield shows an improvement of 14 grains per ton, equal to £1611 on that of the previous half year.

Western Australia.

Work is progressing on the additional 50-stamp mill at the Golden Horseshoe mine at Kalgoorlie and it is expected to be completed in July. The addition of these stamps will bring the reduction plant to 150 head.

BRITISH COLUMBIA.

Boundary District.

Operations will be resumed on the Last Chance mine, in Sky Lark camp, in August. The Last Chance is owned by the Spokane-Boundary M. Co., of which J. W. Graham of Spokane, Wash., is president. The property is 1½ mile from Greenwood, on the road to Phœnix, and has been idle for six years. There are 600 feet of shaft work, crosscuts and drifts on the property and it is intended to sink 150 feet farther on the main double compartment shaft, which is down 120 feet; then crosscut from 175 to 200 feet to the ledge. The ore carries gold and silver. They have a pump, a boiler, an engine, a hoist and a shaft house there now, and will put in other machinery.

M. M. Walsh of Rosalia, Wash., president of the Monterey G. M. Co., says the company will resume operations. The mine, which carries gold, copper, lead and silver, is 10 miles southwest from Greenwood, and has been closed for two years, due to litigation. The Monterey Co. has been granted a judgment in the courts giving it clear title.

H. G. Pemberton, business manager for the Montreal & Boston C. Co., is arranging for resumption of work at the company's plant at Greenwood. He reports the deal for consolidation completed. The two furnaces will be put in commission as soon as stores of ore and fuel can be assembled, and following that two additional furnaces and connecting works will be added.

The deal for purchase of mines in the Boundary country by the Montreal & Boston Con. M. Co. has been practically closed, says F. H. Oliver, manager of the Morrison mine, near Phœnix. The Montreal & Boston Co., which is controlled principally by New York men, has 70% of the Morrison stock. The company gets all the Dominion C. Co.'s properties, amounting to five claims, three-fourths of the Emma group, the other one-fourth being owned by the Hall's mines. The company already owns the Sunset, which will make four copper mines that will all be operated. In addition to this the company gets all the Athelstan gold and silver property. The 1 mile spur to the Morrison mill will be started this week. The smelter at Boundary Falls has two furnaces. One additional furnace is on the ground ready to be set up and another will be bought. In addition to this a converter plant will be put in this summer.

East Kootenay District.

The Blue River M. Co. has bought 1½ miles of river diggings on Bull river, near Fort Steele, portions of which are said to be rich in placer gold. About twenty men were employed by the company last year in cutting roads and building a flume. Operations will be resumed this week.

The Fort Steele Prospector gives the following statistics in connection with the mineral development of the Fort Steele mining division, which is waiting construction of the Kootenay Central Railway to provide adequate transportation facilities. Since July 1, 1903, there have been 200 mineral claims staked and recorded in the district, which represents $1100 in recording fees. There are 678 operating claims in this district. Of these 678 claims, 143 have been crown granted at an approximate cost of $542 each. Two hundred claims were staked in 1903, on which no work has been recorded as yet. This leaves a balance of 335 claims, on which $33,500 has been recorded in assessment work alone.——During 1903, 193 coal licenses were issued in the Elk river valley, on unreserved crown land. Under the new act the yearly rental of these claims will amount to $19,300. There were 231 timber licenses issued with an approximate cost of $100 each, and seventy-five renewals costing $115 each. Four hundred and sixty-five free miner's certificates were issued at $5 each.——The output of coal at the Crow's Nest collieries was 661,118 tons, valued at $2 per ton at the pit mouth. The coke output amounted to 167,739 tons, worth $5 per ton. During the past year, 697 applications have been made for coal prospecting licenses in the Flathead valley; under the new act, these licenses will cost $100 each.

Nelson District.

At Ymir, the Ymir, Hunter V., Wilcox, Queen, Arlington and Second Relief mines are reported making monthly output of 10,000 tons, of an approximate value, including low-grade milling and higher-grade shipping ore, of $10,000. There are five stamp mills in daily operation, viz., those of the Ymir, Wilcox, Fern, Queen and Second Relief mines. Besides these, the Hunter V. is shipping from 100 to 150 tons per day of ore and the Arlington a smaller tonnage of high-grade stuff, making seven producing mines. This is expected to be further improved later in the summer when the Dundee, Keystone and Canadian King will resume shipping.

The third gold brick for month of May from the Queen mine near Salmo was valued at $1400. The others were $1150 and $350, or a total of $2900, for less than a month's run. J. A. Turner & Co., who own the mine, have leased the Yellowstone stamp mill for two years. The ore which is being taken out runs $8 per ton. The vein is 14 feet wide. Last year the richer portions were taken out and sent to the smelter and averaged $45 to the ton. The remainder of the vein is being sent through the mill.

Rossland District.

The lessees of the I. X. L. mine and O. K. mill have suspended operations under their lease, having made an assignment of the lease on the O. K. mill to Le Roi C. Co. of Rossland, which will utilize the plant for experiments in concentration. The last run of four days netted the lessees $150 per day.

Rossland reports say negotiations are in progress for the amalgamation of the Centre Star, War Eagle and Le Roi mines at Rossland. Le Roi C. Co. smelter at Northport, Wash., would probably be included in the deal, but it is said these reduction works would be of little value if custom ore from other mines in the surrounding country is not available. With the product of the Centre Star and War Eagle mines the Northport plant would be of value if the Canadian Pacific railway refused to give Rossland mines a satisfactory freight and treatment rate at the Trail smelter. The Centre Star and War Eagle mines are said to control the situation at Rossland as regards water for concentration.

The Velvet mine, on Sophia mountain, near Northport, has resumed operations and shipments to the Northport smelter are again going out.

Slocan District.

The Slocan Star concentrator at Sandon was started up last week. The machinery has been remodeled. The Slocan Star mine has added twenty men to the payroll and will have a further increase as soon as the mill is in full running order.

H. McLellan and J. Louden have a lease on the Dorothy mineral claim (Ruth No. 2), near Sandon, and work was started last week.

Work will be resumed on the Utica group this month, says P. McCue of Kaslo. The mine is between Kaslo and Sandon and has been idle for four months. It is a silver and lead producer.

Erie reports say mining interests on the north fork of the Salmon river are looking up and prospects are good for the summer. The Relief M. Co. has started up its stamp mill and concentrator. They have men at work opening up the road and will take in supplies on pack trains.——The Lucky Boy M. Co. will start work on the Waffer mine, adjoining the Relief. The bond held by S. S. Myers on the Good Hope group of three claims at the head of Copper creek, and adjoining the Waffer mine, has been taken up by Eastern men. They have begun preliminary work. S. S. Myers is in charge.

Vancouver Island.

Coal has been struck in the new shaft being sunk at the Northfield No. 4—the mine which is being opened up by the Western Fuel Co. at Departure Bay, near Nanaimo. The first shaft had to be abandoned because a fissure which communicated with the sea let the water in in quantities which the pumps could not handle. The second shaft has been more successful, the coal being reached at a depth of 67 feet. The pithead machinery will be set up.

West Kootenay District.

W. B. Pool has bought the Horseshoe property near Trout Lake.——Crushing is under way on ore from the Nettie L. mine at the Great Western Co. concentration plant at Five Mile, near Ferguson.——In the Old Gold camp, over the divide from Ferguson, there has been a consolidation of properties under the name of the Con. M. & S. Co. J. Miller is manager for Michigan and other Eastern men.

CANADA.

Alberta.

L. K. Kean of Edmonton, Alberta, reports an oil discovery made by the Rocky Mountain Dev. Co. in the southwestern part of Alberta, 5 miles north of the international boundary and 45 miles south of Pincher station, on the Canadian Pacific Railroad Co.'s main line. It is on Oil creek. The well is down 1020 feet and the flow is yielding 200 barrels a day. The oil from this well is being used for fuel to further develop the property. Work is started on three more wells ½ mile above the present well. These wells are to be 6, 7 and 8 inches, respectively. One 35 H. P. engine, two 25 H. P. engines and three drills are on the ground. The Canadian Pacific will build a spur to the oil fields. The company is composed of J. Lineham of Okotoks, Alberta, president; G. K. Leeson, H. E. Hyde, W. Gillis, A. P. Patrick and E. R. Exham.

Yukon Territory.

The Yukon Government is preparing to build a wagon road from White Horse to the Alsek mining district. Territorial Engineer Thibeaudeau, after a trip of inspection through the mining fields, including Ruby, Bullion, Fourth of July and other creeks, reports the region can be easily and cheaply supplied with a good road. White Horse reports of results on Bullion creek show on No. 5, above Discovery, pans taken from the bedrock are running $2 each. From No. 8 to 46 below, ground is yielding 5 to 60 cents per pan.

Dawson reports of June 3 say that since sluicing began in the Klondike on May 8 a royalty has been paid on 55,753 ounces of gold, and that this is the largest amount ever produced up to June 1 in that district. Last year 11,000 ounces were taken out in the same period.

MEXICO.

Chihuahua.

G. M. Holmes is operating his Esmoralda gold mine, in El Cumbre district, west from Guadalupe y Calvo. He has a 10-stamp mill and the mine is a regular producer. Holmes is also manager for the Bazanopa M. Co. and the Galanista M. Co. of New York, both of which are engaged in development work.

T. H. Hecker et al. of Butte, Mont., are preparing to work a group of properties near Santa Barbara.

Coahuila.

A new coal field is reported found near Sabinas, about 7 miles from the International railway. The vein is said to be 7 feet in thickness.

The Compania Minera Penon, organized at Sierra Mojada, reports opening up ore carrying values in gold, silver and lead.

Durango.

The Compania Minera de Penoles, of Mapimi, is preparing to put in an electric storage battery equipment for its smelting plant at Mapimi.

C. G. Codman has a concession to build a smelter at Durango.

Guanajuato.

The Guanajuato R. & M. Co. has been organized by H. Hine, L. E. Curtis et al., of Colorado Springs, Colo. Additional machinery will be put in at the mines, near Guanajuato, which the company has taken over. A 500-ton mill will be built.

Jalisco.

Preparations are being made to put in machinery by the Amparo M. Co. from the United States for its Santo Domingo group, near Ezatlan. The Santo Domingo is shipping 1000 tons per month of first-class ores to the Mapimi smelter, and will double this output as soon as more cars can be secured. The wagon road connecting the mines with the Mexican Central station is in daily use.

G. E. McCormick & Co. have completed a wagon road from Ameca to the Solodad mine and are putting up a 3-stamp, quadruple-discharge mill, with amalgamating mill and concentrator. The Soledad mine is developed by shafts and tunnels. The values are in copper and gold, of which the gold is free milling.

Considerable mining activity is reported in the Palmarejo district, near Ameca. The Atravida mine, under the management of G. Hart, is being developed. The veins are large and the values entirely of free gold. It is equipped with a 3-stamp mill and concentrator. The mill is being overhauled and will start this week. Other properties in the district are under development, among them the Verdiana mine.

E. Cabrera is preparing to develop a copper property in the Guachinango district, near Ameca.—— T. Purcell has bought La Perla mine, near Guachinango, which he will develop.

Michoacan.

R. J. Decker of Salt Lake City, Utah, of the Carrizal G. M. Co., is preparing to

put in an electric plant at its mines, near Tlalpujahua.

Sinaloa.

It is reported New York men will reopen the Guadupana mines at Rosario.

Sonora.

At the Moctezuma mine, 12 miles from Cumpas, and 7 miles from Nacozari, it is reported additional bodies of chalcopyrite have been opened up. A 500-ton smelter and a concentrator will be huilt, also a branch railroad to Nacozari.

W. E. Defty of Phœnix, Ariz., manager of the Arizona Mexican C. Co., is preparing to put in machinery for the company's mine at La Gran Proveedora in Altar district. It includes hoisting machinery, gallows frames, boilers, pump, pipe line, etc., to be placed on the mine by July 1. The lowest working is 540 feet helow apex of the ore body which carries values in gold, copper and silver. A smelter will be placed on the property next fall.

Tepic.

The Barranca del Oro mining property, south of Ixtlan, having been sold to C. Fenelon, B. W. Wallace and J. S. Ickis, is reported showing progress. They have struck two new veins on the fifty pertenencias denounced by them, and all the workings said to show ore. It is a free milling gold proposition, averaging twenty-four grams gold per ton. The 6-stamp mill is operated by a turbine water wheel and is crushing fifteen tons of ore per day. The owners propose putting in an electric power plant and tramway to avoid the heavy freight expense, as all the ore is transported to the mill on mule back.

Vera Cruz.

N. S. Plaisant of Mexico City has a concession to explore for petroleum in the canyon of Jalacingo. The striking of oil at Ebano has caused activity among oil prospectors.

NEW ZEALAND.

The Keep-it-Dark quartz mine at Reefton milled 12,372 tons of quartz during the year, the yield being 3714 ounces of retorted gold, or an average of about 6 dwt. per ton. Profit was also made from 9000 tons of tailings treated by cyanide. The working costs have been kept at 14s 9d per ton for mining, raising and milling the ore, leaving a profit of about 10s per ton. While the tailings yielded over 9s per ton, the working costs only absorbed 3s 8½d per ton.

TASMANIA.

The Mount Lyell and North Lyell mines, at Mount Lyell, are maintaining the usual outputs. Five furnaces are in operation at the reduction works, three of these being at No. 2 plant, with six blowers providing the blast. At the Lyell Blocks the halance shaft has heen sunk 180 feet, the last 8 feet for a sump. Opening out to drive east under the office tunnel is in 100 feet, and a crosscut from the end of it started. The driving of the office tunnel is temporarily stopped. The main tunnel is in 287 feet, and a crosscut from this point has been started east, to increase the southern extension of the ore hody, and providing material for the mill until the main tunnel is through. The mill made a trial run May 7.

Trade Treatises.

A neat folder from the Union Gas Engine Co., San Francisco, Cal., is descriptive of the 1904 type of Union, three-cylinder, marine engine, built in sizes from 30 to 125 H. P.

"South African Rock Drill Tests" is a leaflet just puhlished by the Rand Drill Co. of 128 Broadway, New York City. It is a facsimile reproduction of a page taken from the Johannesburg, S. A., Star, and contains an account of the drill tests carried on hy the Engineers' Association of the Witwatersrand. The circular will be mailed to all mine owners requesting it. The verbatim report of the engineers finds for the drills of American make.

"Cyanide Plants and Accessories," is the title of a neat catalogue just issued by the Redwood Manufacturing Co. of 8 California street, San Francisco, Cal. The catalogue is well illustrated, showing the various tanks and other equipment used in the cyanide process, heside which it contains tables of value to others using tanks, as well as cyanide men, together with many valuable hints on testing and working ores by the cyanide process, written by R. Stuart Brown, an experienced cyanide operator. Considerable space is given to slimes treatment and arrangement of cyanide plants. This valuable book of reference will be sent upon application of those desiring it.

Personal.

EBEN SMITH of Los Angeles, Cal., is in Denver, Colo.

D. R. REED has returned to Ouray, Colo., from Denver, Colo.

J. B. HUNTER has been appointed city engineer of Denver, Colo.

H. G. SHUCK of Central City, Colo., is examining mines in Oregon.

E. A. LEE has been at Ouray, Colo., on mining husiness from Denver, Colo.

J. N. GILLIS of Sonora, Cal., is in San Francisco, Cal., on mining business.

J. H. MACKENZIE has returned to San Francisco, Cal., from Rossland, B. C.

W. E. DUNCAN of Oroville, Cal., is in San Francisco, Cal., on mining business.

P. SEVERANCE of Harrisburg, Pa., is in Los Angeles, Cal., on mining business.

H. E. PICKETT of Placerville, Cal., is in San Francisco, Cal., on mining business.

J. S. & R. J. CARY have returned to Denver, Colo., from Routt county, Colo.

S. R. SWAIN of Denver, Colo., is engineer for the Guggenheim Exploration Co.

J. A. CUNNINGHAM, a mine owner of Salt Lake City, Utah, is in San Francisco, Cal.

J. B. WEIMER of Salt Lake City, Utah, is in Philadelphia, Pa., on mining business.

F. BAKER, president of the Venture Co. of London, England, is in Denver, Colo.

L. A. SUTHERLAND is superintendent of the Federal Loan mine, near Nevada City, Cal.

G. F. BADGETT, a mine owner of Tonopah, Nev., is in San Francisco, Cal., on husiness.

S. A. HARSH of Denver, Colo., has returned from Arizona, and is in Milwaukee, Wis.

N. C. BONNEVIE has returned to Denver, Colo., from a professional trip to Wyoming.

L. Z. LYMAN is manager of the A. & R. M. Co., operating at Chitwood, Jasper county, Mo.

S. C. WIEL of San Francisco, Cal., is making mine examinations in Trinity county, Cal.

R. COX, manager of the Silver Lake mines, of Silverton, Colo., has returned to Denver, Colo.

L. KING, formerly manager of the Ruby mine, near Sunset, Colo., is examining mines in Nevada.

F. D. FULLER is manager of the Sumpter smelter at Sumpter, Or., vice E. W. Mueller, resigned.

W. E. THORNE has returned to Denver, Colo., from mine examinations at Breckenridge, Colo.

J. P. WOODBURY is superintendent of the Con. New York mine at Virginia City, Nev., vice R. C. Kyle.

W. F. DETERT, president and manager of the Argonaut M. Co. at Jackson, Cal., is in San Francisco, Cal.

J. C. CARRERA of Mesilla Park, N. M., has gone to Europe on mining business for properties in Mexico.

G. WILSON of Salt Lake City, Utah, is in Humboldt county, Nevada, on examination of mining properties.

W. F. DEANER, manager of the La Plata mine, Leadville, Colo., has returned from a trip to Chicago, Ill.

W. A. FRANKLIN, president of the Jicarilla M. &. R. Co., is in Chicago, Ill., from Jicarilla, New Mexico.

A. A. TALMAGE, manager of The Blaisdell Company of Los Angeles, Cal., is on a business trip through Mexico.

C. A. GEHRMANN of Denver, Colo., is manager of the Stanley M. Co., with mines near Idaho Springs, Colo.

E. J. ROBERTS is manager of the Sullivan Group M. Co. of Spokane, Wash., operating near Fort Steele, B. C.

F. A. THOMSON has heen appointed superintendent of the New Western Reduction Co. at Forks creek, Colo.

J. G. KIRCHEN, formerly of Salt Lake City, Utah, is superintendent of the Sumpter smelter at Sumpter, Or.

H. E. FISKE, secretary of the Mine & Smelter Supply Co., of Denver, Colo., is at Galveston, Texas, for a few weeks.

J. W. BLAIR of Ipswich, Queensland, Australia, is Minister for Mines for Queensland, vice W. H. Browne, deceased.

J. BROCK of Salt Lake City, Utah, president of the Tonopah M. Co., is in Philadelphia, Pa., on company business.

E. K. HUM, superintendent of the North American C. Co., at Encampment, Wyo., has returned there from the East.

T. A. TURNBULL is manager of the Mineral Belt C. M. Co., operating in Upper Aniseed valley at Nelson, New Zealand.

B. OWEN, superintendent of the Gum Tree M. & M. Co., of Idaho Springs, Colo., has returned there from Detroit, Mich.

P. J. HICKEY, manager of the Ivanhoe mine at Sandon, B. C., returned there last week from a business trip to Spokane, Wash.

G. L. MOATS of Salt Lake City, Utah, manager of the Four Metals Co., is in Omaha, Neb., to attend a stockholders' meeting.

H. H. NICHOLSON of the University of Nebraska at Lincoln, Neb., is examining copper properties near Rawhide Buttes, Wyoming.

J. A. FARWELL, vice-president of the J. Geo. Leyner Engineering Works, of Denver, Colo., has returned there from Chicago, Ill.

J. R. RYAN has been appointed superintendent of the Andes and Mexican mines at Virginia City, Nev., vice G. McM. Ross, resigned.

ARTHUR GOODALL, manager of the Fremont Con. M. Co. at Amador City, Cal., is in San Francisco, Cal., on company business.

E. R. ARGERSINGER, superintendent of the Western mine at Rich Gulch, Calaveras county, Cal., has gone East on company business.

H. W. TURNER has returned to San Francisco, Cal., from mine examinations in the Seven Devils district, Washington county, Idaho.

J. MORRIS, till recently with the American G. M. Co., is superintendent of the mill of the South Fork M. Co., near Raton, New Mexico.

O. H. FAIRCHILD of the firm of Fairchild & Brainard, Denver, Colo., is in Chicago, Ill., on business connected with Prescott, Ariz., M. Co.

O. H. SONNE, recently assayer at the Ophir Hill mine, at Ophir, Utah, has been appointed superintendent of the Overland mine at Sunshine, Utah.

J. R. WILLIAMS, manager of the Amparo M. Co., has returned to Philadelphia, Pa., from the company's mines at Ezatlan, Jalisco, Mexico.

J. K. MCKENZIE, general superintendent of the Gold Reef M. Co., has returned to Chicago, Ill., from the company's mines at Gilt Edge, Mont.

S. S. CAMPBELL, manager of the Chase Creek C. Co., after five months at the mines of the company near Clifton, Ariz., has returned to Brookline, Mass.

C. M. BASLER, manager of the Basler M. & Dev. Co., has returned from San Francisco, Cal., to the company's mines near Lowrie, Tehama county, Cal.

MANAGER H. JOSEPH, of the Carisa and other Utah mines, has returned to Salt Lake City, Utah, after an examination of the Greenback mines in Oregon.

F. L. BOSQUI of San Francisco, Cal., has gone to Deadwood, S. D., to conduct cyaniding investigations at the plant of the Horseshoe M. Co., near Terry, S. D.

A. GROTHE, manager of the Hacienda de San Francisco M. Co. at Pachuca, Pachuca, Mex., has returned there from Virginia City, Nev., and San Francisco, Cal.

C. J. BUSH, manager of the Denver, Colo., branch of the Canton Steel Co., has resigned to accept a position with the Vulcan Crucible Steel Co., Denver branch.

A. A. BLOW, formerly of Leadville, Colo., and now manager of the Illawarra Smelting Works, at Dapto, New South Wales, is in San Francisco en route to Denver, Colo.

H. HERMAN, geologist of the Victorian Mines Department, Australia, has accepted the position of assistant manager of the Mount Bischoff M. Co. at Mount Bischoff, Tasmania.

M. M. GREEN of the mechanical and engineering department at the University of Colorado at Boulder, Colo., has resigned to accept a position with the International Graphite Co. at Niagara Falls, N. Y.

L. H. HALL of San Francisco, Cal., consulting engineer for the Comstock Pumping Association at Virginia City, Nev., has heen retained hy the Washoe Power & Dev. Co. of Nevada as consulting engineer.

PROF. H. S. MONROE of Columbia College, New York City, is in Colorado, and will have charge of ninety students from Columbia, Boston Technical, Yale, Harvard and School of Mines of Golden, Colo. Operations will be carried on at the Dives Pelican mine at Georgetown, Colo.

PAUL M. MOWREY, who for the last three years has heen connected with the Merchants' Trust Co. as adviser on industrial investments, has assumed the office of vice-president of the Engineering Co. of America, 74 Broadway. Mr. Mowrey has been prominently identified with the engineering and contracting business since 1888, when he became connected with the Edison Illuminating Co.

Commercial Paragraphs.

THE Davis Calyx Drill Co. of New York has opened an office in the Johnston Building, Cincinnati, Ohio, in charge of J. F. Munn.

HENSHAW, BULKLEY & CO. of San Francisco, Cal., report the sale of four Kinkead mills to a Pachuca, Mexico, milling company.

THE Preston S. & R. Machinery Co. is preparing to build a plant at Boulder, Colo., for the manufacture of machinery of the Preston type.

MACHINERY HALL, unlike the other huildings at the St. Louis World's Fair, is not closed in the evening. It is open until 11 P. M., and visitors in the evening will find at work there, among other ohjects of interest, the 5000 H. P. Allis-Chalmers-Bullock engine and generator producing the electric current for the 120,000 or more decorative lights.

C. C. TYLER has resigned as superintendent of the works of the Westinghouse Electric & Manufacturing Co. at East Pittsburg, Pa., and has been appointed general superintendent of all the works of the Allis-Chalmers-Bullock interests in the United States. Mr. Tyler will enter on his new duties on June 15th and will make his headquarters at Milwaukee, Wis.

A SUIT for infringement has been commenced in the United States Circuit Court against the Standard Gas Engine Co. by the Union Gas Engine Co. of San Francisco, Cal., for an infringement of the Union Gas Engine Co.'s vaporizer patents. On account of the alleged infringement, the Union Gas Engine Co. asks for an injunction and damages against the Standard Co.

GEORGE MOORE of the General Metals Co., 11 Broadway, N. Y., returned last week from a three months' business trip to South Africa and Australia. While in the latter country he superintended erection of a Moore slimes process plant for the treatment of gold ores at Kalgoorlie, Western Australia, and also installed a 100-ton plant in the Rand, near Johannesburg, South Africa. Mr. Moore is now in Colorado Springs, Colo., to supervise construction of a demonstration plant at that place for the company.

THE Barberton City Water Works of Barberton, 5 miles from Akron, Ohio, has placed an order with the Pneumatic Engineering Co., through the Pittsburg, Pa., office of the Rand Drill Co., for a complete air lift plant for their new group of twelve wells. It is proposed to set up the air compressor in the pumping station, 1500 feet from the wells, and carry the air through a 5-inch main, with branches to the several wells. The compressor will be a Rand compound condensing, type 10, having steam cylinders 10x18x14 inches and duplex air cylinders 14x14 inches. The equipment includes a surface condenser, air receiver, piping, etc. The capacity will be 3,000,000 gallons of water per day. It is expected to have the plant in running order by August 15th.

Obituary.

GEORGE RICHMOND, engineer, author and translator of technical books, died in New York City, June 4.

J. A. VALENTINE, a mining engineer of Los Angeles, Cal., died on the 4th inst. while on a trip in Kern county, Cal., examining mines.

Latest Market Reports.

SAN FRANCISCO, June 10, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25½d (standard ounce, 925 fine); New York, bar silver, 55½c, refined (1000 fine); San Francisco, 55½c; Mexican dollars, 45½c San Francisco, 44½c New York.

COPPER. — New York: Standard, $12.87½; Lake, 1 to 3 casks, $12.87½; Electrolytic, 1 to 3 casks, $12.62½; Casting, 1 to 3 casks, $12.37½; San Francisco: $15.00. Mill coppor plates, $17.00; bars, 18@24c. London: £56 10s spot per ton.

Copper has shown a downward tendoncy the past two weeks, and the present quotation is lower than it has been for somo timo past. In view of the relativo production and consumption of the motal, this fall in price is difficult to undorstand. It is thought that the lower prices will stimulate buying and that a somowhat better price may be anticipated.

LEAD. — New York, $4.35; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5½c; pig, $4.85. London: £11 13s 9d ₱ long ton.

SPELTER.—New York, $4.75; St. Louis, $5.00; London, £21 15s ₱ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

The ore market at Joplin has a downward tendency, a cut-off of $2 on the ton being reported on this week's sales. This brings tho assay basis down to $34. It is said that the output is beyond tbe demand of tho purchasing agents, and it is said the smelters have eased off in thoir weekly purcbases in ordor to force down prices. For the past two weeks an aggregate of 800 tons is said to have been added to the surplus, which, although not so alarmingly large at tbis time, will increase rapidly at that rate. There is some talk of the producers combining to restrict ore output, as they have successfully done berotofore.

TIN.—New York, pig, $27.00@27.20; San Francisco, ton lots, 28c; 500 lbs., 28½c; 200 lbs., 29c; less, 29½c; bar tin, ₱ lb., 30@32½c. London, £121 17s 6d spot.

PLATINUM. — San Francisco, crude, $18.50 ₱ oz.; New York, ingot, $19.00 ₱ Troy oz. Platinum ware, 75@82c ₱ gram.

QUICKSILVER. — New York, $44.50@45.50, large lots; London, £8 2s 6d; San Francisco, local, $43@43.50 ₱ flask of 76½ lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-lb. lots, 18.50c; San Francisco, Plumbers', 100-lb. lots, 16c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb., .04c.

NICKEL.—New York, 40@47c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.35@13.60; gray forge, $12.50; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL. — Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6¼c; loss than 500 lbs., per lb., 7c; in 25-lb. tin pails, ¼c ₱ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwbile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.15@2.65 ₱ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ₱ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¾c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8½c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than ono ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c: less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than ono ton, 12c. No. 2, 35%, carload lots, 9½c; less than ono ton, 11½c. No. 2** 30%, carload lots, 9c; less than ono ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, ln lots not less than 1000.

FUSE. —Triplo tape, $3.60 por 1000 feet; double tape, $3.00; singlo tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ₱ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda asb, $2.00 ₱ 100 lbs.; hyposulpbite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.20@1.40 ₱ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrato of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulpbide of iron, 8c ₱ lb.; copper sulphato, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, bd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

BONE ASH.—Extra No. 1, 5@6c ₱ lb. No. 1, 4@5c.

OILS.—Linseed, boiled, bbl., 49c; cs., 54c; raw, bbl., 47c; cs., 52c; Lucol oil boiled, bbl., 44c; cs., 49c; raw, bbl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 23c; Elaine, 26c; Water White, in bulk, 13½c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural Wbite, 70c; Bleached, do., 80c; Whale Oil, cs., 52@57c.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb., 7c; less than 500 lbs., 7¼c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ₱ lb.

BORAX.—Concentrated, 6@7c ₱ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ₱ lb., 60c.

SODIUM.—Metal, ₱ lb., 50c.

BISMUTH.—Subnitrate, ₱ lb., $2.10.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—Best, $2.00 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., $1.00.

PHOSPHORUS.—American, ₱ lb., 70c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ₱ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ₱ lb., $3.50.

(Tbese prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CORE DRILL.—No. 761,332. May 31, 1904. F. Stone, Spokane, Wash. Assigned to Diamond Drill Contracting Co. of Spokane, Wash., a corporation. This invention relates to improvements in drilling apparatus of the type employed usually in prospecting for precious metals, coal and the like and which is adapted in penetrating into the earth to remove a solid section or "core" of all strata passed through for the purpose of determining their depth and character.

CURTAIN OR DRAPERY PROTECTOR.—No. 761,293. May 31, 1904. Maggie Goldsmith, San Fancisco, Cal. This invention relates to an improved device for gathering up and protecting curtains or draperies when the room in which they are hung is to remain unused for any considerable length of time or when it is desired to sweep the room. The dimensions of the device or bar and its shape will depend upon the shape of the window or the arrangement of the curtain or drapery

AUTOMATIC WEIGHING MACHINE.—No. 761,587. May 31, 1904. G. Hoepner, San Francisco, Cal. Assigned to Union Scale & Manufacturing Co. of San Francisco, Cal., a corporation of California. This invention relates to an apparatus for automatically weighing substances which will flow by gravitation. It consists of a weighing bucket suspended from a scale beam, which beam has the desired counterweights, adjustably attached to the end, and the poise weight, by which the parts are properly balanced. The feed hopper is located above the beam and adapted to discharge the load into the bucket, first, in a large primary flow until the weight is nearly complete, and thereafter by a smaller flow the bucket is filled until it counterbalances the weight. This flow is accomplished by means of two gates, both of which are open during the primary and larger flow, when one is closed, but has a small opening through it for the completion of the load, after which the other is closed and the flow entirely cut off. At the same instant a discharge-gate at the bottom of the bucket is opened and the contents discharged, after which the parts are returned to the first position and another load delivered into the bucket. There are also other details of construction.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 31, 1904.

761,624.—FURNACE—W. N. Best, Los Angeles, Cal.
761,195.—FLEA TRAP—R. Bosshard, Los Angeles, Cal.
761,212.—MANIFOLD BOOK—H. P. Brown, S. F.
761,442.—BOTTLE WASHER — W. E. Brown, Los Angeles, Cal.
761,443.—BED AND BATH—F. R. Buck, S. F.
761,579.—ORE BREAKER—A. E. Calkins, Los Angeles, Cal.
761,357.—ENVELOP — W. J. Carpenter, Spokane, Wash.
761,151.—CLAMPING HOSE BANDS — W. A. Cummings, Spokane, Wash.
761,065.—PUMP—R. W. Elliott, S. F.
761,290.—DOOR RELEASER—W. A. Fagan, S. F.
761,216.—AIR BRAKE — F. B. Flanders, Seattle, Wash.
761,371.—PHONOGRAPH—E. Gilbert, Portland, Or.
761,293.—CURTAIN PROTECTOR—Maggie Goldsmith, S. F.
761,219.—LEVEL—B. A. Goodwin, Lathrop, Cal.
761,375.—FIRE PROOF FLOOR—O. Hanson, Seattle, Wash.
761,486.—PIPE BAND—A. W. Hight, Ballard, Wash.
761,587.—WEIGHING MACHINE—G. Hoepner, S. F.
761,074.—CATTLE GUARD — W. Houghton, North Bend, Wash.
761,382.—EXCAVATOR — Jackson & Adkins, Portland, Or.
761,231.—BALE TIE—R. L. Johansen, Los Angeles, Cal.
761,504. — SURGICAL APPARATUS — J. Kleinbach, Spokane, Wash
761,595.—FENCE CLAMP—W. C. Matteson, Stockton, Cal.
761,525.—SLAG CAR—G. Mitchell, Naco, Ariz.
761,596.—SOLAR HEATER—E. Moss, Kingsburg, Cal.
761,091.—OIL SUPPLY PIPES—D. H. Mostoller, S. F.
761,248.—SHOW CASE—C. F. Murray, Los Angeles, Cal.
761,601.—HAT CREASE RETAINER—O. P. Oliver, Seattle, Wash.
761,097.—ROUTER PLANE—M. H. Parker, Los Angeles, Cal.
761,397.—BUNGHOLE BORER—Pfluger & Christensen, Portland, Or.
761,609.—BUCKET LATCH—B. C. Riblet, Spokane, Wash.
761,610.—TRAMWAY—B. C. Riblet, Spokane, Wash.
761,258.—WAVE RECEIVER—Shoemaker & Giddings, Pasadena, Cal.
761,418.—FIREBRICK—Shupert & Wormald, Hillyard, Wash.
761,814.—WEIGHT TESTER—E. A. Smith, Seattle, Wash.
761,332.—CORE DRILL—F. Stone, Spokane, Wash.
761,266.—ORE MILL—W. Taylor, Los Angeles, Cal.
761,272.—COMBINATION TOOL—Waguiere & Van Alstyne, Los Angeles, Cal.

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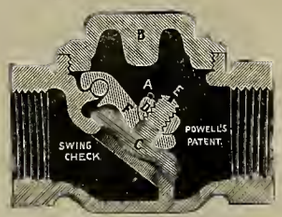

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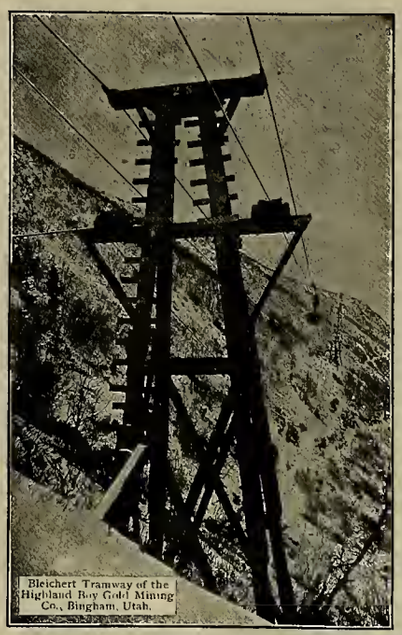

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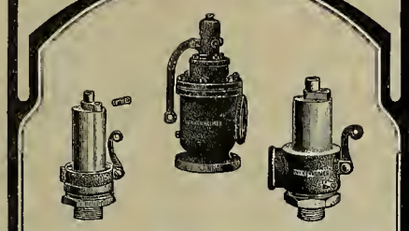

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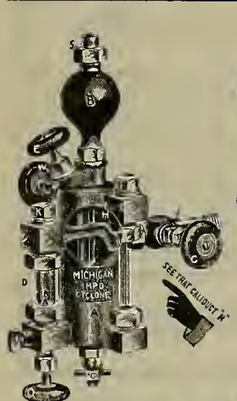

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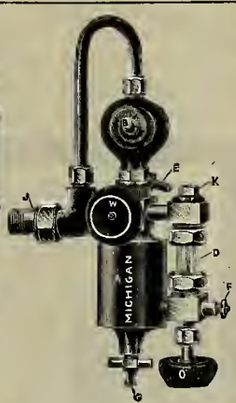

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Whole No. 2291.—VOLUME LXXXVIII. Number 25. SAN FRANCISCO, CAL., SATURDAY, JUNE 18, 1904. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Ancient and Modern Mining.

Mining is an industry which has been carried into almost every country in the world. Scarcely a country exists which has not valuable mineral deposits. Mining is one of the earliest industries known to history, as it is today the most important. From the dawn of civilization, mines of iron, copper, gold and silver have been known and worked. When unknown countries have been explored it has been found that the savage peoples inhabiting the land were mining, in some manner, the ores and metals most necessary to their comfort if not their existence, and in these same countries are often discovered the evidences of an earlier and far distant civilization in the extensive workings made by a people who antedate all knowledge of the country. Particularly is this the case with the old world. In the heart of Africa are found extensive workings of ancient gold, iron and copper mines. The whereabouts of Solomon's mines of Ophir still remains a disputed question, unless the ancient workings of Rhodesia are, as claimed by some, those famed producers of the gold of the Temple. Wherever the modern civilization penetrates there are found mineral deposits and ofteu evidences of ancient workings, several of which are claimed by various writers to be the ancient land of Ophir.

Stamp Mill and Cyanide Plant in Annam, Indo-China.—See Page 409.

The accompanying engraving is that of a modern gold mill and cyanide plant in Annam (Indo-China). Here are old mines, recently taken over by a French company, and equipped with modern American machinery, a description of which appears elsewhere herein. These mines, operated years ago in a primitive manner, were abandoned upon the appearance of sulphide ores. which the ancient workers were unable to successfully treat. By the introduction of modern methods these mines are again active and promise to become largely remunerative. So it is in many other regions which we have considered as prolific of nothing more important than strange people, with strange customs, but the idea of valuable mines being among the resources of the country has occurred to but few. Egypt is one of the oldest countries of the world aud travelers have been visiting that region for centuries, but it is only of late that the world at large became acquainted with the fact that there are ancient miues in the land of the Pharoes. These old workings are now being explored and ere long it is probable American stamp mills will be built on the hills overlooking the valley of the Nile, and a stream of gold will once more come out of the land of Egypt. The march of civilization goes irresistibly onward, and in a few years more it seems probable that there will remain no new unexplored land unless it be within the Antarctic circle, a region which thus far has resisted all attempt at encroachment, but should there be found rich gold deposits in the region of the South Pole, it is a safe assertion that metropolitan cities, having every modern convenience will quickly spring into existence there under the magic influence. Only a few years since Alaska was a terra incognito—to-day it is almost as well known as British Columbia. Railroads are penetrating the country and the prospector is pushing into the most remote sections of the most northern portion of it, which lies largely beyond the Arctic circle.

The Old Dominion Mine, Globe, Ariz.

The Old Dominion mine was formerly known as the Globe mine. It comprises a group of nine claims. The original Globe and Globe Ledge claims are located on a fault fissure, and have produced the bulk of the ore. The consolidated mines have produced considerably over 140,000,000 pounds of copper besides a large amount of gold and silver. The present annual production of copper is about 18,500,000 pounds. The company owns an extensive plant, which is illustrated in the accompanying engraving. The principal opening on the mine is a 3-compartmeut vertical shaft. The mines are extensively developed by various shafts and tunnels. The workings are nearly 4000 feet long and 1000 feet deep. The Old Dominion ore is much mixed and requires sorting both underground and on the surface. The rocks associated with the ore deposits are quartzite, limestone, diabase and dacite. The ore occurs in both limestone and quartzite. The occurrence of copper glance in the transition zone of these mines as a characteristic mineral resulting from secondary enrichment is interesting. This feature is more strongly brought out by the structure of the ore itself, which is often found formed in concentric shells around a nucleus of small grains of pyrite. The geology of the district is very interesting and has been described in detail in Professional Paper No. 12 of the U. S. Geological Survey by F. T. Ransome.

Old Dominion Mine, Globe, Arizona—Buffalo Hill on Right.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

Entered at the San Francisco Postoffice as second-class mail matter.

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J. F. HALLORAN.....Publisher

SAN FRANCISCO, JUNE 18, 1904.

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WHEN testing machine drills to determiue relative air consumption, it is necessary to take into consideration the progress of peuetration of the drill, as well as the cubic measure of the drill hole. In the recent tests made at Johannesburg, S. A., this was done, under the direction of a committee of mechanical engineers. The factors observed and noted in those tests comprised the air (gauge) pressure, size of bit employed, net time of drilling, depth drilled in inches, depth drilled per minute, capacity of the hole drilled in cubic inches, equivaleut free air used at 70° F., 24.8 inches barometer, equivalent free air used per inch drilled, equivalent free air used per minute run, and equivalent free air per cubic inch of hole drilled. An abstract of results obtained will be found elsewhere herein.

ELSEWHERE herein is published in full another important decision of the United States Circuit Court of Appeals for the Ninth Circuit. This is another of the numerous cases growing out of the long-continued contest over extralateral rights in Shoshone county, Idaho. Heretofore, the privilege of taking up an intercepted extralateral right beyond the limits of the conflicting rights has only been assumed, but in this decision the court distinctly interprets the law, and has decided that the junior apex proprietor may take up his intercepted right beyond the zone of intersection. "The first in point of time is also first in point of right," declared the court in the Bunker Hill-Last Chance case. The peculiar geological conditions under which these ore deposits occur aud a misinterpretation of the direction of the strike of the vein by the miners who located the several claims has resulted in an entanglement which has only recently been unraveled by the Supreme Court, and for the first time the relative rights of the conflicting interests have beeu determined. The decision herein published and that appeariug iu the issue of Juue 11 are among the most important decisions of the court in several years, as they decide points at law which were previously without precedent.

Let There Be an Investigation.

Throughout the week the deportation of Western Federatiou miners from Teller county, Colo., has continued, and much has been said in the press throughout the country both for and against the miners. While the measure is an extraordinary one, it is the direct outcome of a condition in that State for which the Western Federation is largely, if not wholly, responsible. A number of men are held under military guards, and these, it is understood, are to be formally charged with criminal knowledge of the murder of the non-uniou miners last week at Independence station. A great many mines in the Cripple Creek district have resumed, the Portland being au important exception, and quiet has once more been restored. It is thought that, as what is considered the dangerous element is uuder arrest, or has been deported from the district and State, mining may now be carried on without further trouble. The unfortunate conditions existing in Colorado is having a decided and restraining influence upon the mining industry throughout the West, and it is a well-known fact that it has already driven capital seeking investmeut in mines into Mexico. The county of Teller is under military rule; but in San Miguel, after mouths of martial law, the troops have been withdrawn, and President Moyer of the Westeru Federation of Miners, who has beeu a military prisoner for months, has been turned over to the civil authorities. The United States Circuit Court at St. Louis, Mo., has issued a writ of habeas corpus, commauding that cause be shown why Moyer is restrained of his liberty. These unusual occurreuces in Colorado have resulted in several large bodies of organized labor, among them the Butte, Mont., Miners' Union, numbering 15,000 members, aud United Mine Workers of Illinois, numberiug 50,000, petitiouing President Roosevelt to interfere and to make au investigation of labor conditions in Colorado. The President of the United States is powerless to do anything in this matter, as far as interfering with the action of the authorities of that State. The Federal Government can not interfere with the affairs of a sovereign State unless requested to do so by the Goveruor of such State. He may, however, in a private capacity, investigate the condition of labor in Colorado or in any other State, and request a number of gentlemen to act as a committee to carry on such investigation, as in the case of the Pennsylvania coal strike. If such investigation is made by the President there is little doubt that it would bring to light much desired information as to the true purpose of the Western Federation of Miners and the methods employed by it to accomplish desired ends. When such things as have occurred in Colorado within the past year—the destructiou of property, the murder of peaceable citizens, and the declaration of martial law in three separate counties of the State—there must be something radically wrong. That miners can organize a union and maintain it, and become numerically and financially strong, and still pursue an even course, working peacefully for many years, is evidenced in numerous instances. A notable example is the Lead City Miners' Union of South Dakota, numbering over 2000 men. It was organized in 1877, and for twenty-seven years has grown stronger year by year, and yet the first strike has to be reported. During all these years the members of this, one of the strongest unions in America, as it includes almost all, if not every one, of the men employed in the Homestake and neighboring properties, have worked steadily and peacefully. Another instance is found in the Butte, Montana, union, and the unions of Grass Valley and Nevada City, Cal. Neither of these has ever had a strike which was not promptly adjusted in a manner satisfactory to both sides. The reason for the different results in Colorado must be sought in the difference in the personnel of the officers of the union organizations in that State.

Railroad Land Classified as Mineral.

Much interest has been manifested in the recent classification as mineral of a tract of 600,000 acres of what had been claimed as railroad land, in Idaho. The land in question lies south of Wallace, in the Cœur d'Alene region, and was included iu the lands granted to the Northern Pacific railroad. The lands were examined several years since by the Mineral Land Commission and was then classified as mineral. The railroad protested and a hearing was ordered, which was held in the Cœur d'Aleue land office, the notice of which appeared in a small semi-weekly paper in Kootenai county. As a result, those most interested were not awarc of the time set for hearing, and the only party to submit evidence was the railroad company. Consequently the Cœur d'Alene land office declared the land to be non-mineral and this decision was sustained by the General Land Office. Affidavits were prepared by those having mining claims in the disputed area, and these were submitted to the General Land Office, together with a request for a rehearing of the case. The petition was denied. An appeal was taken to the Secretary of the Interior, who found that the notice of a hearing of the case was published in the St. Maries Courier, 35 miles west of the lands in question, while the decision of the classification of the lands was published in Wallace, Mullan and Wardner papers. Wardner is but 12 miles from the lands. The proceedings appearing to have been irregular, and not in accordance with the law, the Secretary ordered the lands set aside and notified the General Land Office that should the Northeru Pacific Railroad make application for a new hearing, if allowed, the General Land Office should send a special agent to examine and pass upon the character of the lands with a view to furnishing evidence at such hearing, aud that in case of any such future hearing notice should be given all who are iuterested having claims in these lands.

The Premium System.

One of the most satisfactory solutions of the labor problem in metal mines is the premium system. This has been applied with marked success in various manufacturing industries, and it has also had a fair trial in mining, and without exception, as far as known, the results were satisfactory to both employer and employe. The experieuced miner knows about what is expected of him by his foreman, or superintendent, aud he also knows that if he falls very far short of the requirement an investigation is likely to follow which may result to his disadvantage. If, however, he knows that earnest industry and additional effort will meet with not ouly appreciation, but substantial reward, he is inclined to try and earu the increased compensation. In many mining operations time is an important factor, due to the fact that large capital is interested, and delayed accomplishmeut of the work means increased interest charge, and consequently increased expense. If, then, the work can be advanced more rapidly by any system or method of encouragement to the workmen, it is well to offer this stimulus to their energies. Though the paying of a bonus is a direct increase in expense, it may prove, if properly fixed, a stroke of economy.

It may be urged that if the workman can do more work under the encouragement of a premium he is not doing his full duty under the ordinary wage system, but experience has proven that it is the part of wisdom for the mauagement to show a just appreciation of extra effort on the part of the workman by increased pay. In no branch of mining is this more completely exemplified thau in shaft siuking. Under stated conditions the work should advance at a rate about which competetent judges will not greatly disagree. The miner is also aware of what this rate of advance should be. In almost every instance the offer of a premium will result in a surprising increase of this rate of monthly progress in shaft sinkiug. The economy of the premium system is shown by the saving of cost per foot charged to all top expenses, superintendence and general expense, beside interest on iuvested capital. These various amounts in the aggregate usually justify the payment of a bonus in an amount as great as $10 per foot for each foot made in excess of the minimum amount of progress required for the month's work. If the rate required is 100 feet in a single month it is good business to offer $10 for each foot suuk in excess of this requirement. It requires good judgment to determine the minimum, but this can generally be safely fixed after two or three months careful observation of the work accomplished as related to the conditions under which it is performed.

CONCENTRATES.

THE best device for using a volume of water sufficiently large for ground sluicing would be a pump run by a gas or distillate engine, in a region where fuel is scarce. It is improbable that a hydraulic ram would raise a sufficient amount for the purpose. A ram is a device of very low efficiency.

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FOR many years quicksilver flasks have been loaded with 76½ pounds of mercury, but some time since in Europe 75 pounds were substituted for the former custom of 76½ pounds. Recently the California dealers have adopted the European rule and hereafter newly-filled flasks will contain only 75 pounds of quicksilver net.

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IT is customary in smelting in reverberatory furnaces to partially roast sulphide ores before charging. It is not uncommon for zinc and other base metals to enter the matte as well as the copper. The smelting of raw pyritic ores in a reverboratory furnace is something like pyritic smelting, in which a large amount of iron enters the matte.

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SELENITE (calcium sulphate) has not the property of double refraction like iceland spar (calcium carbonate). The two minerals may also be distinguished by their crystallization. Selenite is much softer than calcite (iceland spar). Heavy spar (barium sulphate) resembles both selenite and iceland spar when transparent, but may be distinguished by its superior weight.

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THE diamond drill is valuable as a means of prospecting, as it usually makes it possible to examine the character of the rock passed through by means of a core. The prospecting holes should be distributed systematically, as a single hole, or several of them, directed in a haphazard manner are of little value. For prospecting sand or gravel, a churn or well drill may be used with good effect.

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THE country rock at the Homestake, South Dakota, mine has been variously described as hornblende schist, hydro-mica schist, sericite schist, etc. Hornblende and chlorite are present in the rock, and the ore-bearing formation is intruded by large dikes of light gray felsite, containing innumerable, almost microscopic, crystals of pyrite. It is not known that the dike rock contains gold or silver in paying quantity.

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THE reopening of a flooded mine may be facilitated somewhat if the levels are permitted to drain for a few days, or even weeks, after removing the water from the shaft, particularly in the case of soft ground, as the flooding of the mine has resulted in saturating the county on all sides with water, and it generally will be found that the vein will stand better if permitted to drain before resuming stoping and drifting.

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THE adhering of the reduced lead in an assay charge to the slags may be due to too low a heat in the furnace; to too little reducing agent; to too viscous a slag, causing the upper portion of the lead prill to be impure—to any or all of these causes; also, possibly, to presence of antimony or arsenic, which would affect the lead, causing it to crystallize. Possibly more experience in manipulation may lessen the liability to this annoyance.

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THE grade of cinnabar in ore which will pay is, like all other classes of ore, dependent upon local condition, character of ore, cost of mining and reduction and market price of the metal. All cinnabar deposits are not associated with serpentine; but, as far as known, the great quicksilver mines of the world, without important exception, are associated with sandstone and serpentine. This includes the mines of America, Spain and Austria.

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THE employment of the stadia method of measurement in surveying is permissible over very rough ground or through a country covered with dense thickets of brush. With care, stadia measurements up to 600 feet may be made with an accuracy equalling the results attending tape measurement under similar conditions. Attempts to measure distances exceeding 1000 feet are likely to result in small inaccuracies, due to difficulty in close reading of the rod.

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A MAN may be a good blacksmith and understand tempering drill bits, but he may be incompetent to repair machine drills. This class of work requires a man of experience. Each drill should be tested in the shop before being sent into the mine. One very common fault which the machinist finds is that the drill runner has failed to properly oil the machine. When a piston has been cut, it can rarely be properly dressed with a file. It is better to bush the machine and turn the piston down to fit.

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THE cost of compressing air to operate machine drills depends largely upon the cost of initial power. Free water power is undoubtedly the cheapest power, and often water power for which a charge is made on the basis of the amount used, is also less expensive than steam, electricity or other power. The cost is also dependent upon the capacity of the compressor, a large machine compressing air more cheaply, relatively, than a small one. Cost of drilling with machines depends upon many factors—hardness and condition of the ground, kind of machine used and its condition, and to no small extent upon the man running it. Greater progress can be made with high pressure of air than with low pressure, though breakage is greater with high pressure.

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WHEN it is intended to develop a buried gravel channel by means of a crosscut tunnel through bedrock the first thing to determine is the depth of the bedrock below the surface. This is important, as a tunnel driven too high to drain bedrock is usually of little utility, if not useless. Next, a careful estimate of the probable volume and value of the gravel which would be available should be made, together with cost of tunnel, equipment, and mining and washing or milling gravel. If the value of gold probably obtainable does not show a good profit on the investment, the proposition should be abandoned, as any deductions to be made from the estimate should be charged against the probable yield of the mine, as determined by bore holes, and the production of mines above and below the property, if there be any, on an equal area of the channel.

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WHERE the ore slimes badly the operator has the choice between the decantation process and the employment of filter presses. Those who advocate the former method say they can decant the solution after clarifying to a bulk representing not more than 20% of the original quantity. The solution decanted is run through the zinc boxes separately. The remaining sludge is diluted to its former volume, resettled and again decanted to one-fifth of its volume. By the first decantation 80% of the value was run off to the precipitating boxes. The remaining 20% is decanted to 20%, making 16% of the remaining values, or a total of 96%. If the values are still high the dilution, resettling and decantation may be repeated. It is a well known fact that very weak solutions do not precipitate readily, and such solutions must be brought up to the proper strength by addition of the necessary amount of strong solution at the head of the precipitation boxes.

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WHILE employing hydraulic formulas, owing to the imperfection of the work, it is advisable, if not necessary, to allow liberal factors for safety. In the case of a pipe line 900 feet long taking water from a ditch, the first 100 feet of which has a fall of 40 feet and the remaining 800 feet an up-grade of 35 feet, has only a 5-foot head. The water has to overcome the resistance at the head of the line, the resistance due to curves and friction within the pipe, and to give the water the uniform velocity with which it flows through the pipe. The entry head is almost nothing in long lengths of pipe. A pipe large enough to deliver 200 miner's inches a distance of 900 feet under 5 feet head, if straight or nearly so, develops little friction. When a pipe of uniform diameter is flowing full and the discharge end is open, without any obstruction, such as the contraction due to a valve or gate, the velocity of the water will be equal to that at the discharge end, and something over 200 miner's inches will flow through a circular pipe 15 inches in diameter and 900 feet long, having a head of 5 feet. This allows for all the factors and deductions necessary to be considered. If the pipe were laid at a uniform gradient on a trestle a somewhat smaller pipe would carry the water, but it would be far more than overbalanced by the cost of the trestle.

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AN iron gossan may consist wholly of iron oxide, silica and earthy matter and show no copper of any kind and still conceal a valuable deposit of copper ore beneath. Copper sulphide decomposes, and when it reaches the condition of copper sulphate, that salt is soluble in water, and if conditions are suitable almost every trace of copper may be leached from the surface ore. In such cases the copper is often found concentrated in the form of oxides and carbonates at some lower point, and sometimes entirely outside the vein proper, the mineral having saturated the adjoining country rock. The iron gossan, however, often contains other evidence suggestive of copper below, and this is sometimes found in a glossy iridescent coating on the iron ore. Under the magnifying glass the surface of such an occurrence presents the appearance of a group of rounded grains, resembling the skin of an orange. Although the prevailing color is generally brown, it seems tarnished with shades of purple, green and dull crimson or bluish shades, none of which are what would be called pronounced colors. When this condition is observed, almost invariably copper will be found in depth beneath the iron cap; but the occurrence described can not be considered as an index of the amount of copper content of the normal ore below. Usually the first ore below the iron cap will be oxides and carbonates of copper, and succeeding this downward may be found enriched sulphides, notably copper glance, and still lower the normal iron-copper sulphide, chalcopyrite and pyrite. In many copper mines zinc sulphide also appears in depth. In some instances the transition from oxidized to sulphide ore is abrupt; in others the transition will appear gradually, extending by degrees through considerable depth. The changes from one zone to the next sometimes require a radical change in methods of reduction.

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THE fact that only sand was found on bedrock in the ancient river channel in El Dorado county, Cal., instead of gravel and gold, as anticipated, need not be considered so discouraging as to discontinue prospecting, if the channel is known to have been profitably worked above and below the barren place referred to. Nearly all channels have poor as well as rich spots, due to the conditions prevailing at the time of the formation of the channel and the deposition of gravel and gold, with which the overlying volcanic cap has no connection whatever. The so-called overflow from the channel is not an "overflow" at all, but is the result of erosion subsequent to the formation of the channel and its covering by volcanic mud and ash. It is seldom that a channel is rich directly opposite the mouth of a tributary stream, though both streams may contain gold. The pay streak of a river channel or creek has a tendency to run in as straight a line as possible, and though the course of the stream may be sinuous, that of the pay streak will be much less so, having a tendency to run from bar to bar in the shortest possible distance. This disposition is somewhat modified by the depressions in the channel and the erratic occurrence of hard bosses of bedrock, which, resisting erosion, stand up like islands in the channels, though not reaching the surface, and deflecting the pay streak to one side or the other, and sometimes dividing it. Bench deposits or bars are probably the result of earlier deposition. Gold-bearing bars occur along modern streams at heights varying from the creek level to 500 feet or more above it. It is sometimes difficult to account for the occurrence of placer gold, no recognized theory being able to account satisfactorily for the presence of gold. Among these puzzling occurrences is the finding of gold on the "outside" bend of a stream and the existence of gold in the grass roots, or only a few inches below the surface and several feet above bedrock, where there is no gravel and no heavy wash of any kind. Both of these occurrences are common in the dry placer region of the Black Hills, South Dakota.

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THE most generally accepted theories of ore deposition are that of replacement of the original rock mass by ore, or infiltration of mineral into spaces of discision. This occurs in vein-like zones, or in masses of irregular form, where the country rock has been subjected to crushing and in some instances to shearing. In the former case the ore deposit will have no particular form, but exist as a deposit of irregular size and form, or there may be several deposits occurring along a common direction, either vertically or horizontally, or both, for a considerable distance, and having an apparently common origin or genesis. In such deposits, there generally occur many pieces of unaltered or only slightly altered country rock. In some instances the fragments of country rock have a rounded appearance, due to the alteration and disintegration of the outer portion of the fragment. Where there has been much shearing, the deposit will probably have a banded structure. These bands occur in zones which vary in width. The zones are not confined for considerable distances between defined walls. In one part of the deposit the vein may be considered a fissure, say 4 feet wide between well defined walls. The ore is removed and the vein has every appearance of being identical throughout, but 50 feet away it may be found that the mineralization has extended beyond the planes of the "walls" and the fissured zone is much wider. Zones of this kind are sometimes many feet in width and crosscutting is necessary in the operation of a mine of this character. A third type is one in which the mineral has replaced the country rock without any considerable crushing or movement of the rock mass, although there is generally present one or more fissures. Instances of this character are seen where slates have become silicified and constitute gold-bearing veins. Another type is found in the material filling a pre-existing fissure. These are of comparatively rare occurrence and do not represent as a rule large deposits or veins. Beside the above there are many other types or modified forms of those mentioned, but it may be safely asserted that it is necessary to see the ore in place, together with its geological relations to make it possible to classify the type of deposit or vein to which it belongs. A hand specimen rarely conveys a safe indication of the type of deposit to which it belongs, even by the use of a magnifying glass. The "angle of crystallization" is constant in mineral species, whether formed from ascending "thermal waters" or by "infiltration," or otherwise, and this angle can rarely, if ever, be correctly read or ascertained by employing a simple magnifying glass, particularly if the crystals are imbedded in a mass of ore. Instruments called goniometers are employed for this purpose. The simplest kind are held in the hand, and consist of a graduated semi-circle to which is attached an adjustable index, which marks the angle of any crystal placed in the proper position in the instrument. A more accurate instrument, known as the reflecting goniometer, is also employed. The best instruments of this class have two telescopes. The measurements are made with great care and precision. It is not a fact that no mines of value occur in eruptive rocks, such as diorite, diabase, etc. The reverse is rather the case. Most important mines are directly associated with eruptive rocks, but ores occur in rocks of almost every description. Valuable mineral veins occur in rocks of every geological age, and it has not been shown that any particular kind of eruptive rock is either advantageous or the reverse in this regard, though basalt is of rare occurrence in connection with ore deposits. Basalt dykes associated with valuable ores are reported in Cripple Creek district. Many valuable mines occur hundreds of miles from the nearest known volcanic rocks.

The Mines of Bong Miu, Annam.*

Written for the MINING AND SCIENTIFIC PRESS.

These mines are situated 25 kilometers from the sea and 150 kilometers south of Tourane, and embrace several flat veins, and one vertical quartz vein carrying iron pyrites and galena in ancient schists. There are also some veins of low-grade auriferous mispickel.

The principal vein dips at an angle of only 15° to 20°, and outcrops 200 meters above the base of the mountain and for 2 kilometers in length. The mountain is covered with a forest. There is also a parallel vein. All outcroppings and the alluvium—in a word everything which would yield gold on crushing—have been worked 50 or 100 years ago by Chinese and by the Emperor of Annam.

They were forced to stop, however, on finding pyrites and galena, for crushing and panning shows but very little gold. As for myself, I have only succeeded twice in finding free gold in pyrites. The average thickness of this vein is between 1.2 meter and 1.3 meter (about 4 feet). It is almost everywhere formed of bands of quartz, more or less pyritic, and bands of schist containing little or no pyrite, but it generally appears that when we find quartz and schist together, it is the quartz which contains the most pyrites. In general, the richest portion of the vein is from 2 to 3 feet. The ore carries from 8% to 13% of pyrites, 50% to 60% of schists, 10% to 15% of clay, and ½% of galena.

On careful panning, a residue remains which contains only one or two grams (one dwt.) of gold a ton. The pyrites, according to location, carry between 30 and 100 grams of gold (one to three ounces), and as much silver; the galena, carrying 8 to 50 grams of gold and 100 to 500 grams of silver. There are also traces of copper, cobalt, etc.

The local conditions are very favorable for the work. No pumping or hoisting of water required, everything going out by the drifts. Labor is very cheap—miners, 20 cents; coolies, 8 to 10 cents; but it takes two Annamite workmen to do the work of one European. Easy transportation from the port (the harbor of Tourane) to the mine, $5 a ton. Fine motive power by two waterfalls; one, 200 feet in height, is available close to the mill, but during three months only gives 20 H. P.; the other, 80 feet in height, but with a minimum of 100 H. P., 500 meters away from the mill. Wood is plentiful. We are in the middle of a great forest. The engraving on the front page illustrates the mill and surroundings.

As to treating the ore, a beginning was made in experimenting on the ore in different ways by a small mill of three stamps. Finally, the Peletan-Clerici process was tried; but it did not succeed well, and, I believe, after a study of the character of the mineral, that the reason was that the gold is in too large particles to be rapidly dissolved by cyanide. A large part of the gold being associated with pyrites, prevents satisfactory amalgamation.

Finally, a 10-stamp mill from the Risdon Iron Works of San Francisco, Cal., was erected; but amalgamation was discontinued because it gave hardly any results, and, besides, in Asiatic countries such a means of ore treatment can be only used by adopting the most extraordinary precautions against robbery.

Finally, there was added to the stamps and to the Bryan mill built in connection with the Peletan process tanks for cyaniding and a plant for precipitation by zinc, similar to the plants on the Transvaal; but we had great difficulties to overcome by reason of the enormous quantity of fines coming from the mine and the slimes caused by the crushing of the schist.

We had to be contented up to this time to treat the concentrates from the spitzkasten only and to work the sand again, and to impound in a basin the tailings which still contain 10% of pyrites, and sometimes 12%, and three to twelve grams of gold.

Having come here to study the method of treatment, as in 1896 I had come here to expert the mine, I believe, after numerous experiments, it will be necessary to abandon the Transvaal method here by reason of the following considerations:

First—The sulphide mineral being abundant, but not rich, it will be necessary to work for large capacity without endeavoring to secure a very high extraction.

Second—It is very important to note that the gold everywhere follows the pyrites and galena, and, if the slimes and part of the gangue are well separated, they contain scarcely any gold.

Third—The fines are a very large proportion and very poor.

The concentrates coming from a Johnston table, and containing 23% of quartz and 77% of pyrites, were treated by screening test as follows:

	Per Cent.
Remaining on screen with holes 1.12 millimeter	0.0
Remaining on screen with holes 0.67 millimeter	0.7
Remaining on screen with holes 0.47 millimeter	1.0
Remaining on screen with holes 0.32 millimeter	1.3
Remaining on screen with holes 0.12 millimeter	15.0
Underneath the screen	82.0
Total	100.0

Conclusion: To treat such a mineral without using a large plant, as at the Transvaal, embracing concentrating tanks for sand and slimes, and for electrolytic treatment, and with a low net cost, it is necessary:

First—To wash the mineral and throw away the muddy clay after the deposit of their pyrites, sort with care all the schist, and rejecting even the white quartz containing little or no pyrite; schist to be thrown away even when appearing to contain 5% of pyrite, for the pyrites contained in schist are worth only one-third of the value of those contained in quartz; to regulate the stamps for large crushing capacity without amalgamation; crushing by a rock breaker, quite fine, followed, if need be, by a second crushing.

Second—Great quantity of water.

Third—Heavy stamps.

Fourth—A short fall for the stamps, in order that a greater speed may be obtained.

Fifth—Low discharge.

Sixth—Screens quite coarse, up to No. 14 or No. 18, but not larger, the gold requiring, perhaps, eighteen to twenty days for a dissolution of 85% in cyanide solution; classification by spitzkasten; elimination of barren slimes; concentration by vanners or by tables, giving three products, the other classes from the spitzkasten—low grade—to be thrown away, leaving pyrites for the cyanide process and galena to sell, this last containing lead and silver, lost by the cyanide process; cyaniding by percolation of the concentrates obtained with difficulty after eighteen to twenty days, and constant or frequent circulation and pouring off a fair extraction.

But I would recommend very particularly the following: As the presence of the sand facilitates the leaching, and as in all concentrating apparatus, when one endeavors to obtain rich sulphides, one also usually has rich tailings, it would be necessary here to work not according to custom in order to secure pure concentrates, but, on the contrary, to obtain poor tailings, deprived of pyrites and containing not more than two or three grams of gold per ton. Then almost all of the gold of the mineral will be in the sulphurets, which will still contain, perhaps, 40% or 50% of quartz.

But even if the ensemble of the fines and poor sands separated by washing, sorting and concentrating forms 60% of the raw mineral, the rest will contain 75% to 80% of the initial gold, and will be easy to work by one operation. One would have for a yield only 60% or 70% of that initial gold; but if this result is not very satisfactory to the engineer, it certainly will please the stockholders better, because it leaves a greater margin of profit and at the same time requires less capital for the plant.

*See illustration on front page.

Mining in Nicaragua, C. A.

Written for the MINING AND SCIENTIFIC PRESS by H. E. WEST.

There seems little doubt that in this country, as well as in all the other countries comprising Central America, considerable deposits of gold occur. Many of these have been worked from ancient times by the Indians, most probably from knowledge acquired from their Spanish conquerors. The Leonesa mine has also been worked off and on, from the time of the Jesuits, 150 years ago, to the present day. The style of mining adopted was by shallow adits and inclined shafts, up which walked the mozos (laborers), packing the ore on their backs, as can be seen to-day all through Mexico and Spanish America. The "gallery" system was adopted in stoping, as is their usual custom—doubtless a safe, but a very wasteful, method of working ground. The ore was carried by mules to the creek and there treated by arrastras.

Speaking of Nicaragua in general, while there would appear to be numerous small mines scattered around in several provinces, there is not one with a respectable monthly bullion return. The Santa Francisca mine, near Leon, up to some eight years ago was worked on a comprehensive scale, and yielded good returns—just how much I am unprepared to state—but I understand the ore body is phenomenally wide and of considerable gold contents, most of the ore averaging over the ounce, and in places the ore body running over 100 feet in width. This deposit is apparently of solfataric origin, and the water is so hot that miners can work but short shifts, reminding one of the Comstock before the advent of the Sutro tunnel. This mine is now treating its accumulation of slimes by filter presses, with more or less success, and I understand they are now sinking, or about to sink, their main shaft to 1000 feet or so, and so prove the deposit in depth before opening out on a larger scale than heretofore. This mine is owned by the Nicaragua Development Company, owned and controlled by London capitalists.

In the province of Segovia and others, this same company owns other mines, which are being brought into the line of producers in a small way, and which also bid fair to ultimately yield large returns, as in all cases the ore bodies are of very considerable extent, necessitating operations being conducted on an extensive scale.

In the province of Segovia, which borders on Honduras, an American company holds a large and valuable concession from the government to work mineral lands, and I understand the prospects are excellent, but there would not appear to be very much actually in progress that can be classified as mining.

In several other parts of the country, on the east side, there are small mines producing their quota, but of these I have no definite information.

Along the Coco river, which empties into the Atlantic, there is some placer mining being conducted by English and Americans, but I have yet to hear of any very brilliant results accomplished. It is true, I believe, that operations to date are being conducted on a very modest scale, and with limited means as to equipment.

In the Leonesa mine, near Matagalpa, there is a very strong vein, extending over a mile through the company's property, of considerable width and with gold contents distinctly payable. The vein is composite in structure, comprising a soft manganese portion, in which invariably the highest gold contents occur. This ore is, however, "gritty" to the touch, and contains more silica than would appear to be in its composition. Usually on the north wall there is a "friction breccia," consisting of angular pieces of wall rock, cemented together with an agglomeration of quartz crystals; this ore is also payable. Extending on either wall, there often occur small quartz "stringers" or "hilos perdidos," as they call them here, that often run for a considerable distance from the vein proper, causing in places wide zones of enrichment, that with a comprehensive scale of operation would be capable of profitable extraction. The ore is thoroughly oxidized, soft, and with quartz cellular in structure, never massive.

There is almost a mile of development work done in the several tunnels, raises, etc., which opens up a very considerable quantity of ore; and it is not often that one finds such a reserve to draw from at their disposal, when a mill is for the first time ready to work.

With regard to the treatment, we are now engaged in putting in one-half of a 60-head stamp mill. The ore will be raised from the mine through a short shaft, in reality, an elevator, and dumped into the coarse breakers, from whence it falls into the mill bin, located not more than 300 feet from the shaft. All the mine buildings will be located within a very small area, contiguous to the mine; these comprise a general machine and smith shop, a large general store, assay offices, etc.

The ore first passes through the breakers, thence into the bin, from thence through the battery in the usual manner. It is contemplated to crush with weak cyanide solution, and dispense with plates. The pulp then goes through a tube mill, an adaptation from cement manufacturing practice. This machine is such as is at present largely used in Western Australia for the pulverizing or sliming of the telluride ores of that region. The use of this machine on our ore here is for very fine grinding. This is accomplished by passing the pulp from the battery through an iron cylinder lined with "silex" lining; this cylinder is partially filled with flint pebbles, which, by the revolutions of the cylinder, cause the attrition of the ore, and the flowing off of same in a fine state of division with the escaping water. The usual spitzlutten and spitzkasten are then utilized for the separation of the coarser product for regrinding in the mill, and the latter for the thickening of the pulp, for supplying the agitation vats. After agitation with weak cyanide, the pulp is run into montejus in the usual manner and fed to three presses, each 50-plate, 40 inches square, for 3-inch cake.

The pumping through of wash water is effected by other montejus worked by compressed air. Precipitation of the liquor is effected by zinc boxes, and the gold slime cleaned up by the usual sulphuric acid process, the residues being collected in a small clean-up filter press.

The cyanide liquors are again made up to strength and pumped to the upper tanks, preparatory to again running same through the batteries, the liquors being again made up to requisite strength in the agitation vats.

Such is the process that has yielded good results by laboratory experiment. The process has been worked out and the mill designed by Philip Argall of Denver, Colo. There is nothing altogether novel in the plant; all that can be said of it is that it accentuates somewhat the modern practice of sliming all ores for the more efficient extraction of their auriferous contents.

THE development of Alaska is proceeding with increasing earnestness and vigor and each year sees new districts opened to the world. The building of roads and trails and the construction of railroads as soon as it is demonstrated that the resources of any particular section warrants it, are the principal factors in the development of the country, though back of this is the richness of the placers. Of late it looks as though Alaska was about to develop valuable copper mines, and possibly tin mines also, while the gold-vein mining industry is increasing in importance with each year. The present season a number of new roads and trails will be opened, and it is expected that the usual development of the sections directly benefited will follow.

Mining in Sierra County, Cal.

Written for the MINING AND SCIENTIFIC PRESS.

Sierra county has added materially to the output of gold in California. It has developed some of the most noted quartz mines in the State and has also some of the richest hydraulic and drift mines. Among the former are the Sierra Buttes mine, operated for many years at large profit; the Young America mine, the Mountain mine, the Colombo, and numerous others.

The mining districts are, generally speaking, at a considerable altitude, above the average of gold mines of the State, ranging about 6000 feet above the sea, and this fact has placed the district at some disadvantage, owing to prolonged winters and deep snows which render transportation during a considerable portion of the year difficult and expensive, if not impossible. The Sierra Buttes are the most prominent landmark in the county, and in their vicinity are several large groups of mines. It is said the Sierra Buttes mine has produced about $15,000,000 in gold. Until lately this mine had been idle for a number of years, but it was recently bought by San Jose, Cal., people and has been reopened. The original Sierra Buttes mine is said to have been practically exhausted to the main tunnel level, but the properties lying at either end, and which were included in the purchase, are still intact and will be developed and worked through the Sierra Buttes tunnel, which holds the topographical key to the situation. The topography of the county makes it possible to work the mines of the section through the medium of adits, dispensing with hoisting and affording perfect ventilation and drainage.

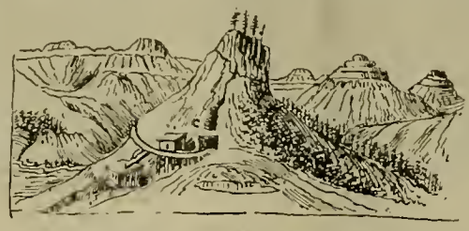
The Young America mine is also extensively developed by a series of tunnels and in former years was a large producer. Many thousands of dollars were expended in the construction of roads, and everything possible done at this mine, as at others of the district, to reduce the expense of operation, and yet freight costs from $25 to $28 per ton. The mine is credited with a production exceeding $1,500,000.

The Mountain mine is another of the extensively developed properties of the district, and, like the others mentioned, is opened by a series of tunnels on the lead or crosscutting to it. This property, like many of the others of the district, has been idle for years until recently reopened by San Francisco, Cal., capital. It consists of a group of claims aggregating 688 acres of mineral land, the greater portion of which is patented. The mine equipment consists of a 40-stamp mill, an aerial tram 6000 feet long, and numerous necessary buildings. The company owns a private road 3 miles in length, connecting the mine with the county road, which is now open after an unusually heavy winter's snowfall. The veins occur at contact of greenstone and slate and are well defined and large. The development consists of thousands of feet of tunnels, raises and crosscuts, exposing large blocks of ore. When formerly worked, metallurgical science had not reached the advanced stage it has now attained, and with the introduction of modern appliances and methods the lower grades of ore formerly left in the mines of this district may now be worked at a profit. Four tunnels have been driven into the mountain at depths ranging from 300 feet in No. 1, which extends entirely through the mountain, to 700 feet at No. 3. Tunnel No. 4 is in 600 feet and is about 1450 below the croppings. It is expected that the ore shoot will be reached in a further distance of 200 feet. A still lower tunnel is projected to be driven from the opposite side of the mountain nearly 300 feet below No. 4. A large ore reserve is said to be in sight in the upper workings which it is thought will be largely increased by the extension of tunnel No. 4 through the ore shoot. The ore is quartz, containing, in addition to free gold, about 1% sulphurets assaying $72 per ton. A portion of the old workings has been cleaned out under instruction of the manager, L. H. Carver, of San Francisco, Cal., and the necessary timbering done to place the property in condition for renewal of stoping and milling. The buildings and mill are being renovated and soon the stamps will once more be dropping. Concentrators are to be added to the mill, which was previously run without this necessary adjunct to proper treatment of ores containing valuable sulphurets, equal to about 72 cents per ton of ore. It is also the intention to put in a dynamo to furnish light to mine and plant. It is believed from 2½ to 3 tons can be crushed daily per stamp, and, it is said by Manager Carver, that working through tunnels the expense of mining and milling is expected not to exceed $1.75 per ton. Other improvements are contemplated for the future, including the removal of the aerial tramway from tunnel No. 3, the present upper terminal to tunnel No. 4, when the latter has been driven through the ore shoot and sufficient ore developed to insure a supply to the mill. This will shorten the tramway several hundred feet. It is also proposed to place rock breakers tandem at the mouth of No. 4, breaking the rock much smaller than is now possible with the present equipment in the mill, which is calculated to materially increase the capacity per stamp.

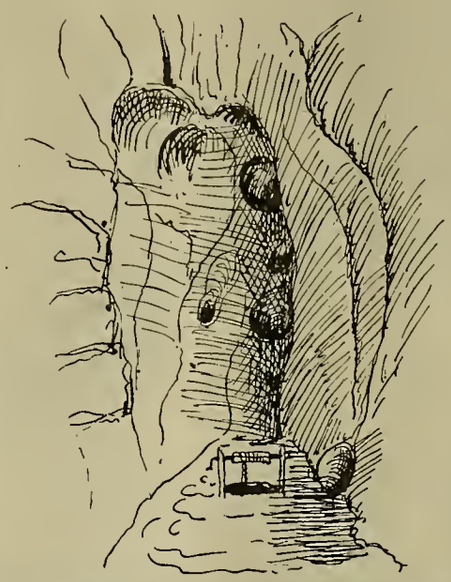
The Cave Mines of Red Mountain District, Colo.

Written for the MINING AND SCIENTIFIC PRESS by ARTHUR LAKES.

On the picturesque road between Silverton and Ouray we reach, at Ironton, a district with marked peculiarities; the one consists in some of the striking yellow, red, orange, gray, lavender and purple coloring of the hills conceivable in nature, hence the name Red Mountain, given to the district. This coloring is due to the oxidation of minute iron pyrites and other iron bearing minerals in the volcanic rocks. The other feature is the appearance of isolated knobs of quartz scattered over the area, some of which, by



National Belle Mine, Red Mountain, Colo.



Natural Entrance to Jedd Mine, Red Mountain, Colo.

Fissure Cave Entrance to National Belle Mine, Red Mountain, Colo.

their hardness, form the tops of castle rocks, like that above the National Belle mine. Most of these knobs carry ore and have mines in them, some of which are entered into from the surface by natural fissure-like caves full of kaolin and decomposed ores. When these ore deposits were first discovered they were known as "cave mines." The ore occurs in so-called "chimneys"—that is, nearly vertical bodies of ore roughly circular or elliptical in plan. The country rock is andesitic breccia, and the knobs of quartz are breccia that has been silicified by hot waters. The ore bodies are found down in these elliptical-shaped chimneys within nearly vertical zones of fractured, altered country rock, locally known as "ore breaks," which, according to the U. S. Geological Survey, were formed by "complex intersecting fissuring and were enlarged both by solution and by metasomatic replacement." At the intersection of two or more of these fissures the country rock was usually brecciated and furnished channels for ascending currents of warm or hot mineral-bearing waters, which effected the metamorphism so conspicuous in the rocks of this region. The area may have been a center of volcanic activity and the ore was deposited by the fumaroles which usually succeed such action. The mines of this class contain a great variety of minerals, some of them rare.

The common ores are galena, zincblende, gray copper, enargite, chalcocite, bornite, chalcopyrite and pyrite. The upper portion of the mines usually carries galena and the lower copper and low-grade iron pyrites. Bismuthiferous ores of silver and lead occur and also hubnerite or tungstate of iron. Among the rare minerals are covellite and kobellite, the latter a sulphantimoniate of lead with bismuth. Proustite and polybasite are found with tennantite, zincenite, zunyite and guitermanite.

The large caves such as were a feature in the upper workings of the National Belle mine at the time of our first visit, appear to have been formed by surface water, which dissolved the sulphide ores and country rock, as they moved along fracture planes. Some very rich ores in large quantities were taken from the upper workings, assaying from $150 to 3270 ounces of silver per ton. The National Belle, Yankee Girl, Guston and Zuni are mines of this Red Mountain class. The Jedd mine, at Ironton, was a "cave chimney" mine, said to have been discovered by a hunter who dropped through the snow into the orifice of the chimney, and on reaching the bottom found himself surrounded with pockets and vug holes full of decomposed ore. The cavities where the ore was extracted we saw in early days as we descended the chimney to the bottom and climbed out through a hole or natural outlet on the side of the mountain.

THE PROSPECTOR.

The mineral specimens from Forest Hill, Cal., are for the most part representative of a series of rocks which are the result of alteration of a dark-colored basic igneous rock. Nos. 1, 5 and 6 are massive or semi-schistose rocks, composed largely of chlorite and talc scales. By a gradual transition, which is partly represented by No. 4, these rocks pass over into a massive granular to a semi-schistose talc rock, represented by Nos. 2, 3 and 9, respectively. These rocks are dolomitic, and consist of the carbonates of lime, magnesia and iron. Identical rocks occur at many other places in California, notably near San Andreas, on Esmeralda and Indian creeks, near Dogtown and near Angels, in Calaveras county, and near the Buchanan mine, Tuolumne county, near Coulterville, Mariposa county, and at Grub Gulch, Madera county. No. 7 is much decayed, but is seemingly a diorite, which in depth will become much darker in color and very much harder and tougher. No. 8 is also a diorite, in which the hornblende needles and plagioclase feldspars can be plainly seen.

The small, black specimen from Gottville, Cal., appears to be the result of fused minerals. It is highly magnetic. This property is commonly observed upon heating iron-bearing minerals to the point of fusion.

The mineral from Greaterville, Ariz., is specular iron, a micaceous variety of hematite, in quartz.

The rock specimens from the Wichita mountains, Oklahoma, are mostly silica (quartz), with reddish brown iron oxide and green iron silicate. The rock may contain both gold and silver.

The rock specimen from Liberty, Ariz., is pyroxene, variety augite, which often (as in this instance) forms rock masses nearly free from associated minerals. It is usually of eruptive origin.

The drillings from Virginia City, Mont., numbered 1 to 4, under the microscope show sub-angular grains of quartz and feldspar, decayed hornblende and iron minerals. It is evident, from an examination of the grains of sand resulting from the breaking up of some of the granulated, partly decayed gneiss accompanying the drillings, that the latter are derived directly from the gneiss. The worn appearance of the grains of sand in the drillings is due to attrition in the bore hole, for, although under a low magnifying power they seem rounded, by magnifying them to fifty diameters it is seen that they are rough and not water worn, as are grains of sand in a river channel or on a sea shore. The brown pieces of spongy mineral are in all probability scales of rust from the pipe or drill rod, and the long, fibrous material may be small shreds from the rope used in drilling. If not the latter, then The Prospector must acknowledge ignorance of their origin. The fibers are not mineral, but organic. If further search is to be made for the channel, it should be made in a direction across the course of the stream.

Another Important Decision.

Following is another important decision of the Circuit Court of Appeals, in which heretofore uncertain phases of the law of extralateral right have been determined:

IN THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE NINTH CIRCUIT.

EMPIRE STATE-IDAHO MINING & DEVELOPING COMPANY, A CORPORATION, Appellant,
vs.
BUNKER HILL AND SULLIVAN MINING AND CONCENTRATING COMPANY, A CORPORATION, Appellee.

Appeal from the United States Circuit Court for the District of Idaho, Northern Division.

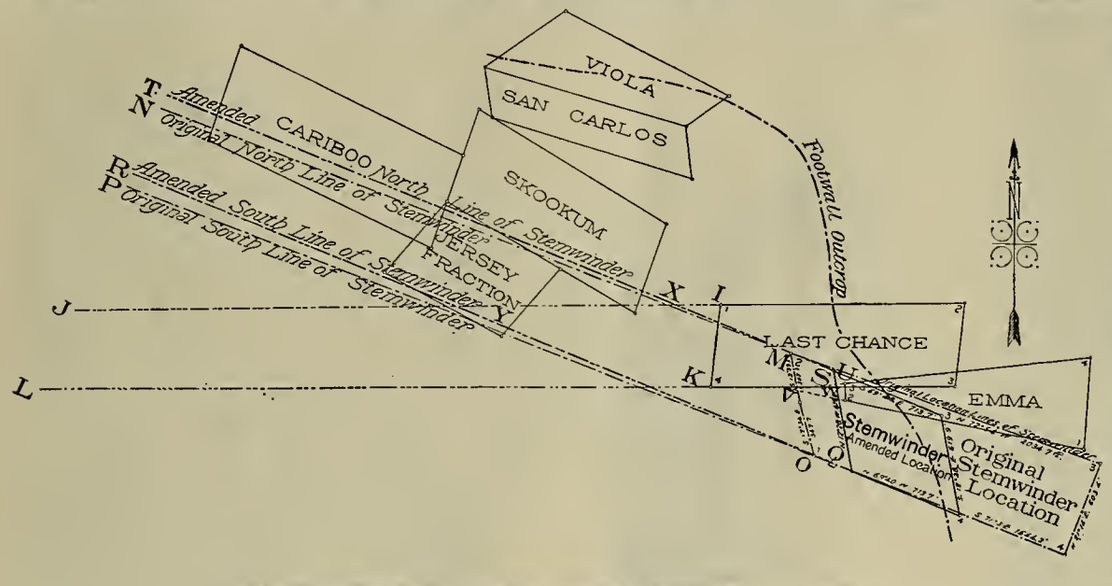
W. B. Heyburn counsel for appellant.

Curtis H. Lindley, Henry Eickhoff, John R. McBride and M. A. Folsom, solicitors for appellee.

Before Gilbert, Ross, and Morrow, Circuit Judges.

Ross, Circuit Judge, delivered the opinion of the court.

This is an appeal from a decree quieting the appellee's title as against the appellant to the Stemwinder lode claim, and defining its extralateral right in and to the ledge apexing within the surface boundaries of the claim. Annexed to and made a part of the decree is the following diagram, indicating the location of the various claims mentioned in the record and the course of the vein in question.



Map of Claims Involved in Recent Decisions of Supreme Court of Appeals.

The bill avers that the appellee owns and is in possession of the Stemwinder claim, the surface ground of which is indicated by the parallelogram marked on the diagram "Stemwinder Amended Location," except such portions thereof as are included within the surface lines of the Emma and Last Chance claims, and excepting also such parts of the lode or vein having its apex in the Stemwinder boundaries as lie within the surface lines of the Emma and Last Chance, and as lie underground between planes drawn downward through the end lines of the Emma claim produced southwestwardly to their intersection, and between planes drawn downward through the end lines of the Last Chance claim extended indefinitely in their own direction. The bill alleges that the courses of the apex of the vein at the surface is as shown upon the diagram, and that its downward course is westwardly; that the appellee owns and is in possession of all the veins apexing within the surface lines of the Stemwinder, throughout its entire depth, on its downward course between the end-line planes, as indicated on the diagram, except such parts thereof as are embraced hy the end line planes of the Emma and Last Chance claims. The hill avers that the appellant claims an interest adverse to the appellee in the Stemwinder claim, and in such part of its vein as lies westerly of and beyond a vertical plane drawn downward through the westerly boundary of the Stemwinder claim and northwesterly of and beyond a vertical plane drawn downward through the northwesterly boundary of the Last Chance claim, and between vertical planes drawn downward through the end lines of the Stemwinder claim extended westwardly indefinitely in their own direction; that the claim of right so asserted hy the appellant is false and groundless, and a cloud upon the appellant's title; that since Septemher 1, 1899, the appellant, hy means of underground workings, of which it has exclusive possession and control, has penetrated into that part of the underground vein so claimed to lie within the Stemwinder's extralateral houndaries and heyond the end line plane of the northern houndary of the Last Chance claim, and that the said underground vein, where so penetrated, contains large and valuable ore hodies which appellant is extracting, and threatens to extract, unless enjoined from so doing.

The demurrer and the plea filed hy the appellant to the hill in the court helow, were hefore this court and were here considered and determined on the appellant's appeal from the order of the trial court awarding the appellee an injunction. The decision here was that the hill was good and sufficient, and that the plea in hoth of its hranches was bad. Empire State-Idaho M. & D. Co. v. Bunker Hill & Sullivan M. & C. Co., 58 U. S. App. 311. That decision has become the law of the case, and those points, again elahorately discussed by counsel for appellant, are not open to further consideration.

The appellant in its answer to the bill denies that the appellee is now or ever was in the possession of or entitled to the possession of the Stemwinder lode claim as described in the hill, or was ever in the possession of any part of the Stemwinder lode claim, except as particularly set forth in the answer; denies that the diagram annexed to the hill as an exhihit correctly shows the surface houndaries of the Stemwinder claim, or the course of the apex of the vein, or of any veins, at the surface through that claim, or that such vein or any vein passes through the surface of the Stemwinder claim as shown upon that diagram. The appellant admits in its answer that there is within what it terms the pretended Stemwinder claim and within the Emma and Last Chance lode claims, a vein of mineral-bearing rock, hut denies that the general course or top or apex of the same at the surface is as stated in the hill, or as shown upon the diagram annexed thereto; denies that the Stemwinder claim has any northerly boundary line except as the southerly line of the Emma lode claim may he so considered; denies that the lode or vein has a downward course as indicated upon the diagram annexed to the hill, and denies that it passes on its downward course hetween the end lines claimed hy the appellee as the end lines of the Stemwinder claim, or extends indefinitely heyond a vertical plane drawn through the line claimed by the appellee as the westerly houndary thereof; denies that the appellee is or ever was the owner in fee of the Stemwinder claim, or is or ever was the owner in fee or at all of the vein heyond the westerly line of the Stemwinder claim; denies that the appellant claims any estate, right, title or interest in the Stemwinder claim, and denies that the appellee has any interest, right or title to any vein which may intersect or lie within the Stemwinder claim after such vein has departed from the exterior houndary lines thereof, or to any vein lying westerly of and heyond the westerly houndary line of the Stemwinder claim, or beyond the northwesterly houndary line of the Last Chance claim between vertical planes drawn through the end lines of the Stemwinder, as claimed hy the appellee; denies that the Stemwinder claim is of any value, hut admits that the portion of the vein in controversy is of the value of $50,000. The appellant then alleges that it is the owner of the ledge and ore hodies here in controversy, because of its ownership of the San Carlos lode claim; that the vein in which the said ore hodies lie passes on its strike or course through hoth end lines of the San Carlos claim, and outcrops throughout the entire length thereof, and descends into the earth on planes drawn through the end lines thereof in a southerly direction to and through the ore hodies claimed hy the appellee in this suit, and that such ore bodies are the property of the appellant hy reason of the fact that they are a part of the lode having its top or apex within the San Carlos claim, and are reached through continuous workings on that claim, following on the downward course of the ledge within planes drawn on the end lines thereof, and not otherwise; that the Stemwinder claim is unpatented, and that its houndaries are not marked upon the ground at all; that it lies far to the east of the ledge and ore hodies sought to he recovered in this suit, and has no connection therewith; that there is no means of approach to said ore hodies or to said portions of the ledge from the Stemwinder claim, and that no developments from the Stemwinder claim to the ore bodies in controversy have been made, and that there are intervening hetween the said ore hodies and the Stemwinder claim the Emma and Last Chance patented mining claims, helonging to the Last Chance Mining Company, not a party to this suit; that in a suit heretofore pending and determined in this court, the Last Chance Mining Company was adjudged to be the owner of the Last Chance and Emma lode claims and of the ledge and ores therein, as against the appellee, by reason of priority and right of title thereto; that the appellee has no right of way or ingress or egress through the said Emma and Last Chance claims, and has no right to follow from the Stemwinder claim to the ore hodies in controversy through or over the Emma and Last Chance claims. The appellant then alleges that the Stemwinder claim, such as it is, is junio in point of time and right to the Viola, San Carlos and Skookum lode claims owned hy the appellant; that the Stemwinder claim never did extend north of the south line of the Emma claim as patented, and that the locators and claimants of the Stemwinder claim, under whom the appellee claims title, did by agreement, in conjunction with the owners of the Emma and Last Chance claims, erect a monument on the south line of the Emma claim for the purpose of marking the extreme northern limit of the Stemwinder claim, and of any right which that claim had on the surface or underground; that no stakes or monuments marking the pretended north end line of the Stemwinder claim, or marking any corner or line of that claim, were ever placed on or within the Last Chance or Emma claim with the consent of the owners thereof, but that every attempt to place any stakes of the Stemwinder upon the Emma or Last Chance claims was forhidden and prevented by such owners, and the parties so placing said stakes were compelled to withdraw them, and that in order to definitely establish the limit of the Stemwinder location to the northward, the said monument was erected jointly by the owners of the Emma and Last Chance and Stemwinder claims; that in patenting the Emma lode claim the said monument was recognized as the houndary, and the official line established thereon; that notwithstanding the said monument and the patenting of the said Emma claim, the successors in interest of the Stemwinder claim undertook to ignore the said boundary and the monument, and upon the making of the application for patent by the owner of the Emma location, the then owner of the Stemwinder claim filed an adverse claim in the United States Land Office and commenced a suit in support thereof against said application for patent, which suit involved the question of whether the Stemwinder claim ever extended over a part of the Emma and Last Chance claims, or north of the said monument and south line of the Emma claim as surveyed for patent; that the said suit was tried and judgment rendered therein against the Stemwinder claim, and that it was decreed that the ground in controversy hetween the Emma and the Stemwinder claims was a part of the Emma claim as located and claimed hy the locators thereof on the 17th day of September, 1885, that this judgment remains unreversed, and was affirmed in the Supreme Court of Idaho and hy the Supreme Court of the United States; that the owners of the Last Chance lode claim made application for United States patent and gave notice thereof in the usual manner, and that the claimants of the Stemwinder claim filed no adverse claim against such application for patent; that at the time of the attempted location of the Stemwinder claim, on the 17th day of September, 1885, the lode and surface ground attempted to he located was not a part of the vacant, unappropriated puhlic land of the United States, and that the location thereof was void as to every part thereof north of the original south line of the Emma location; that the claim attempted to he located as the Stemwinder was not the same location or lode claim that appellee now claims and seeks to recover upon in this suit, as to shape, direction, or identity; that the appellee has heen guilty of laches in asserting its pretended claim, in as such as the appellant has openly claimed the premises sued for since 1898, and has openly mined and extracted ore therefrom, and heen in the open and notorious possession thereof since 1899, of which the appellee has had full knowledge. The appellant then alleges that the plane upon which the appellant is seeking to follow between its pretended end lines is laid along the strike of the ledge and not upon its downward course or dip, and that the ore hodies claimed by the appellee in this suit are not upon the downward course of any ledge having its top or apex within the Stemwinder claim.

To this answer the appellee filed its replication, and upon the issues thus raised the cause was tried in the court helow.

Allusion has already been made to the previous decision of this court in respect to the sufficiency of the bill, and of the pleas thereto interposed hy the appellant.

Another point again argued by the learned oounsel for the appellant was also determined adversely to his contention in our former decision in this cause, namely, that the intervention of the extralateral rights of the Emma and Last Chance claims did not cut off or extinguish the right of the owner of the Stemwinder to follow its vein or lode beyond the end line planes of the Emma and Last Chance (58 U. S. App., 311). And still another point argued by appellant's counsel, to wit, that the awarding the appellee the extralateral right in question is to permit it to follow the vein more upon its strike than upon its dip, was decided against his contention at the present term, in the case of the Last Chance Mining Co. et al. v. Bunker Hill & Sullivan Mining & Concentrating Co.

Several other points, however, remain to be considered and determined.

The case shows that the Stemwinder claim was originally located in Septemher, 1885, its location notice bearing date Septemher 17th of that year. At the time of such location it was thought hy its locators that the vein outcropping within the claim ran easterly and westerly. Accordingly, its length was laid in that direction, as is indicated on the diagram. The same mistake was made hy the locators of the Emma and Last Chance claims and of other claims in the same vicinity, as appears in this and other records in this court. The Stemwinder has not been patented, and it is contended hy the appellant that it does not appear from the record that that claim ever was marked or staked on the ground as claimed hy the appellee. One Devine was the original locator. His testimony in respect to the marking of the

boundaries of the claim is as follows:

Q. What did you do, if anything, with reference to marking the boundaries of that claim?

A. I put up three stakes on the east end; that is, I blazed them. I had a small ax, and I blazed them that day and put up one stake—made a monument and put up one stake on the northeast corner, and the other two were blazed on the east end. On the west end I blazed two trees, and did not put up my southwest corner stake that day. I put them all up but one that day.

Q. When did you put up the last stake?

A. Shortly afterwards.

Q. Within how many days afterwards?

A. I think the next day, or the next day but one.

Q. Now, let us go to those corners and see if you can recollect what the character of them was and how they were marked. What was the northwest corner?

A. It was a pine tree, about 12 inches through, I guess. We afterwards squared it up and cut the tree off.

Q. Made stump of it?

A. Made a stump of it; yes, sir. A stake of it proper.

Q. How was that tree marked?

A. It was marked "Northwest corner of Stemwinder claim."

Q. Did you set a stake at the west center end?

A. No, sir. I marked on a stub, a big stub, probably 50 feet high; blazed it on each side. I didn't cut that off.

Q. A standing tree?

A. No, sir. It was a stub at the time, probably 40 to 60 feet high.

Q. A dead tree?

A. Yes, sir.

Q. Standing in its natural position?

A. Yes, sir.

Q. Did you square that?

A. I squared it on four sides, but I did not cut it down.

Q. How did you mark it?

A. I marked it "West center end of the Stemwinder."

Q. With regard to the southwest corner, what was the character of the marking at that point?

A. Well, that day I did not put up any mark there.

Q. You put it up on the next day?

A. On the next day or two I put up a stake.

Q. What was the size of the stake, and how high did it stand up above the ground?

A. Oh, the stake was probably 5 inches through after it was squared up, and stood 4 or 5 feet above the ground. I suppose 4½ feet; I don't know exactly. I know I got it long enough.

Q. Was it firmly planted in the ground?

A. Yes, sir.

Q. How was it marked?

A. It was marked "Southwest corner of Stemwinder."

Q. What marking, if any, did you place at the southeast corner of the claim?

A. At the southeast corner?

Q. Yes.

A. I blazed the tree and cut that off on the southeast corner, and made a stake of it. It was a stub at the time I cut it off.

Q. You squared the tree, did you?

A. Yes, sir.

Q. What was the size of it after it was squared?

A. Oh, I suppose it was 5 or 6 inches through.

Q. Five or 6 inches square?

A. I think so; yes, sir.

Q. How was it marked?

A. Marked "Southeast corner Stemwinder claim." I posted the notice on it, the same as all the stakes I put on the ground.

Q. What marks did you make at the east center end, if any?

A. The east center end was a tree about 12 or 14 inches through.

Q. A live tree?

A. No sir, it was dead; and I marked that "east center end of the Stemwinder," and afterwards cut the tree down.

Q. Did you substitute anything for the trees afterwards?

A. No, sir. There was a stake there, yes, but then there was also the notice on the tree when I cut it down, making a stake of it, too.

Q. Was there a post substituted for that center end?

A. Yes, sir.

Q. What was the character of the post.

A. It was a hewed post, probably 5 or 6 inches through, squared up.

Q. How high did it stand above the ground?

A. Four or 5 feet, I don't know exactly.

Q. What did you place, if anything, by the northeast corner?

A. At the northeast corner was a little monument of rocks, and I placed a little stake in that, the day I located the claim, and afterwards put a good stake there, probably 4 or 5 inches through. That was the northeast corner.

Q. How did you mark that?

A. "Northeast corner of the Stemwinder."

Q. Did you mark the east center end stake?

A. Yes, sir.

Q. How did you mark that?

A. Marked it "east center end of the Stemwinder."

Q. Wherever there were stakes placed in the ground, were they all firmly placed?

A. Yes, sir.

Q. I will ask you with reference to this marking, whether or no the lines could be readily traced from this marking?

A. Yes, sir, they could.

Q. Where did the Stemwinder claim lie with reference to the Bunker Hill?

A. It laid nearly north of the Bunker Hill, a northerly direction.

Q. How close to it?

A. It is laid right next to the Bunker Hill.

Q. And northerly from it?

A. Yes, sir, northerly.

We also extract from the examination of the surveyor who marked the boundaries of the amended location of the Stemwinder, the following:

Q. Mr. Loring, you testified yesterday that you had made an amended location of the Stemwinder for the Stemwinder Mining Co., copy of which was recorded. What did you do with reference to marking that claim on the surface?

A. I established a post at either corner and at the north and south end centers.

Q. Describe the character of the post, and the markings that were placed upon them.

Mr. Heyburn: Wasn't that all gone into?

Mr. Lindley: No sir, it was overlooked.

Mr. Heyburn: If counsel will state that perhaps we may shorten—what is it you want?

Mr. Lindley: The stakes of the amended location of the Stemwinder. I wish to prove that they were properly marked; and with regard to the northeast corner stake the manner in which he ultimately tied that stake to a certain point. The stake itself in later years, of course, has been—is gone; it has been replaced by data furnished by Mr. Loring.

Mr. Heyburn: Is it not a fact that as a matter of law you would be bound by the point fixed upon if there has been an official survey, and that the surveyor-general would require that post put on that point if there is any dispute about it.

Mr. Lindley: All I wish to show by this witness is that the Stemwinder stakes were all of the proper size required by law, of the amended location, and that they were properly marked according to law, and that the northeast corner stake, as now delineated on the maps of James M. Porter, is where Mr. Loring placed it.

Mr. Heyburn: There is no controversy about it; we will let it go in.

M. Lindley: Go ahead.

A. To the south and (end) center was a post 6 feet long and 6 inches square, and marked "south end center of the amended location of the Stemwinder." The southeast corner was a post 5 feet long, 4 inches in diameter, squared, and marked "southwest corner Stemwinder Lode, amended location." Southeast corner was a post 4 inches in diameter, 5 feet long, marked "southeast corner Stemwinder Lode, amended location;" and the southeast corner, as I described, was 207.8 feet from the northwest corner of the Bunker Hill lede, as originally staked. The northwest corner was a post 4 inches in diameter, squared, and 5 feet long, and marked "northwest corner of Stemwindor Lede, amended location," and the northeast corner was a post 5 inches in diameter, squared, 5 feet long, marked "northeast corner Stemwinder Lode, amended location." The north and center I think I have not described yet. A post 4 inches in diameter, squared, 5 feet long, marked "north end center Stemwinder Lode, amended location."

Q. Does that complete the marking?

A. It did.

Q. In any subsequent period, Mr. Loring, did you have occasion to fix the locality where that stake stood with reference to any other survey?

A. You refer to the northwest corner? I did.

Q. State how you tied that particular corner stake subsequently.

A. In July of that year I made a survey and planted center corners. I then connected the northwest corner of the Stemwinder lede, amended location, with that center corner.

Mr. Heyburn: The corner of this claim?

A. Of a survey I made.

Mr. McBride: July of what year?

A. 1887.

Mr. Lindley: At the time the corner stake of the Stemwinder was still standing?

A. They were all standing for at least two years thereafter.

At the time of the making of the original location of the Stemwinder, no objection appears to have been made by anybody to its lines as laid.

Although, as has already been said, it has been determined in previous litigation between the owners of the Stemwinder, Emma and Last Chance that the two last-mentioned claims were prior in point of time to the Stemwinder, Devine's testimony in this case is to the effect that, as a matter of fact, at the time he marked the boundaries of the Stemwinder neither the Emma or Last Chance had been located, and the testimony of J. I. Smith, one of the locators of the Emma and Last Chance, rather corroborates Devine in that particular. At all events, the boundaries of those three claims, all of which were located on the same day, and all upon the mistaken impression of their locators that the vein or lode outcropping within them ran easterly and westerly, overlapped; and the question of overlapping having arisen between the owners of those claims, who seem to have been friendly at the time, they went upon the ground and measured 300 feet northerly from the Stemwinder discovery point, and there built a stone monument which they orally agreed should be a point in the northerly line of the Stemwinder and the southerly line of the Emma. So far as appears, no other point in such line was designated, and no record anywhere made of such oral agreement. Time ran on, and on the 15th of March, 1887, the Stemwinder Mining Co., a corporation, acquired the Stemwinder claim, without, so far as appears, any knowledge of the oral agreement concerning the stone monument, and on the 23rd of May, 1887, amended the location of the Stemwinder in the manner indicated on the diagram, from which it will be seen that the amended location is almost entirely within the original, although in defining the end lines of the amended location courses were slightly varying from those of the original side-end lines were given. At different times, commencing with February 20, 1886, and ending with May 21, 1887, the Viola, Skeokum, San Carlos, Cariboo, and Jersey Fraction claims, belonging to the appellant herein were located. The relative position of these intervening claims is also shown on the diagram.

The purpose of amending the Stemwinder location was thus stated in the notice of such location:

"That said mining claim was duly located on the 17th day of September, 1885, by S. R. Devine, who was a citizen of the United States, over the age of 21 years, and notice thereof posted on the claim and recorded in the records of Shoshone county, Idaho Territory, in Vol. C of quartz locations, page 318, on the 26th day of September, 1885, to which record reference is hereby had and made a part of this amended location, and as a basis thereof, and thereafter said locaters by conveyances duly made and recorded sold the same, and the said company by divers mesne conveyances has become and is now the owner of said mining claim and is in possession thereof and owns all the right, title and interest of said locaters therein formerly owned and held by them. That since said location was made the true course, position, and the strike of the vein as originally located, marked out as the Stemwinder vein or lode, has been demonstrated and determined, and within the line as originally staked and located herein, and by survey it has also been demonstrated that said locators staked out on each side of said vein, ground in excess of 300 feet on each side of said vein, and the object of this amended notice is to conform to the laws relating to mining claims both national and local, and to mark and define and record the same to the extent and with the boundaries hereinafter set forth, the same being within the boundaries so located, marked and staked in the original location thereof, and not otherwise. Therefore, the said Stemwinder Mining Co., by and through its said officers duly authorized hereby, give notice that it hereby locates the vein and lode so discovered originally by way of Amended Location for the purposes aforesaid, and hereby claim the vein within the limits and to the extent as follows, to-wit:

"Beginning at center of southeasterly end of claim at a post upon which amended location notice is posted, thence 69° 40′ west, 356.85 feet, to southwest corner, whence a prominent peak bears south 8° 22′ east, another prominent peak bears north 84° 35′ east—northwest corner Bunker Hill lode bears north 69° 40′ west, 207.8 feet; thence north 12° 28′ west, 619.6 feet, to the northwest corner; thence south 69° 40′ east, 713.7 feet, to the northeast corner; thence south 12° 28′ east, 619.6 feet, to the southeast corner; thence north 69° 40′, west 356.85 feet, to place of beginning, situate about ½ mile southwesterly from town of Wardner, on easterly hillside in Yreka mining district, county of Shoshone, and Territory of Idaho.

"And that said company intends to hold and work said above-described mining claim as provided by the local laws and customs and the mining laws, both local and national. It is further intended not to abandon in any manner or by implication any rights, privileges, property, possession, or title derived, originated, owned and held under the original location thereof; but that the purpose hereof is to more particularly mark, locate, define, and describe the ground, vein and premises held by said company, without waiving any rights under said original location, all of which the said company claims as the legal successor in interest and title and possession derived from said original locators."

The decree of the court below excepted the rights—surface and extralateral—pertaining to the Emma and Last Chance claims, and gave to the appellee the balance of the surface embraced by the lines of the amended location of the Stemwinder, and such portions of the underground segment of the vein apexing within its surface boundaries as lie northwesterly of and beyond a vertical plane drawn downward through the northwesterly line of the Last Chance claim, and between vertical planes drawn downward through the amended north and the amended south lines of the Stemwinder, extended westwardly indefinitely, "save and except such as accrue to said respondent (appellant) under and by virtue of its ownership of the Viola, San Carles, Jersey Fraction, and Cariboo claims shown upon said Exhibit "A" (the diagram above set out). That as against the rights accruing to said respondent (appellant) by virtue of its ownership of the Viola, San Carlos, Skookum, Jersey Fraction, and Cariboo claims this complainant is the owner of all such underground parts of said vein as lie between a vertical plane drawn downward through the southerly boundary of said Stemwinder lede claim, and such line produced indefinitely in its own direction north 69° 40′ west, marked on said Exhibit "A" "Amended south line of Stemwinder," and a vertical plane drawn downward through the original north location line of said Stemwinder, and such line extended indefinitely in its own direction north 72° 54′ west, being the line marked on Exhibit "A" as "Original north line of Stemwinder."

While disputes have been many, and seemingly bitter, between the present owners of the respective claims in question, and objections were made by some of the appellant's grantors to some of the lines and stakes of the Stemwinder, subsequent to its original and amended locations, it does not appear that such part of the lines of either the original or amended Stemwinder claims as were laid upon the Emma and Last Chance ground were put there forcibly or surreptitiously or otherwise fraudulently or against the consent of the owners of either of those claims, at the time. The same conditions appeared in the case between the present parties, and others, reported in 109 Federal, 538, where we said:

"The priority of location of the Emma over the Stemwinder claim is not only found as a fact by the court below, but is conceded by the plaintiff in error; and the plaintiff further concedes, not only in its brief, but in its complaint, that the Emma has the right to follow the vein in its dip between vertical planes drawn through its converging end lines to the point of their intersection. The underground segment of the vein included within the triangle formed by the prolongation of these two vertical converging end lines and the westerly side line of the Emma, as well as the surface and everything under the surface of the Emma claim, is thereby eliminated from controversy. Notwithstanding the location and rights of the Emma, the Stemwinder claim was so located as to include within its lines a considerable portion of the Emma surface. The lines of the Stemwinder that cross the vein are parallel, and are, therefore, in law, the end lines of that claim, whether so intended by the locator at the time of its location or not. Mining Co. v. Tarbet, 98 U. S. 463, 25 L. Ed. 253; Argentine M. Co. vs. Terrible M. Co., 122 U. S. 478, 7 Sup. Ct. 1356, 30 L. Ed. 1140; King v. Mining Co., 152 U. S. 222, 14 Sup. Ct. 510, 38 L. Ed. 419. No doubt the owner of

the Emma mine could have lawfully prevented any intrusion upon his claim, and have maintained the exclusive possession thereof. As said by the Supreme Court in Del Monte Mining & Milling Co. v. Last Chance Mining & Milling Co., 171 U. S. 55, 83, 18 Sup. Ct. 895, 43 L. Ed. 85: 'A party who is in actual possession of a valid location may maintain that possession and exclude every one from trespassing thereon, and no one is at liberty to forcibly disturb his possession or enter upon the premises. At the same time the fact is also to be recognized that these locations are generally made upon lands open, uninclosed, and not subject to any full actual occupation, where the limits of possessory rights are vague and uncertain, and where the validity of apparent locations is unsettled and doubtful. Under those circumstances, it is not strange—on the contrary, it is something to be expected, and, as we have seen, is a common experience —that conflicting locations are made, one upon another, and sometimes the overlap repeated by many different locations. And while in the adjustment of those conflicts the rights of the first locator to the surface within his location, as well as to veins beneath his surface, must be secured and confirmed, why,' asks the court, 'should a subsequent location be held absolutely void for all purposes, and wholly ignored? Recognizing it so far as it establishes the fact that the second locator has made a claim and in making that claim has located parallel end lines, deprives the first locator of nothing. Certainly, if the rights of the prior locator are not infringed upon, who is prejudiced by awarding to the second locator all the benefits which the statute gives to the making of a claim? To say that the subsequent locator must, when it appears that his lines are to any extent upon territory covered by a prior valid location, go through the form of making a relocation, simply works delay, and may prevent him, as we have seen, from obtaining an amount of surface to which he is entitled, unless he abandons the underground and extralateral rights which are secured only by parallel end lines. In this connection,' continued the court, 'it may be properly inquired, what is the significance of parallel lines? Is it to secure to the locator in all cases a tract in the shape of a parallelogram? Is it that the surveys of mineral land shall be like the ordinary public surveys in rectangular form, capable of easy adjustment, and showing upon a plat that even measurement which is so marked a feature of the range, township, and section system? Clearly not? While the contemplation of Congress may have been that every location should be in the form of a parallelogram, not exceeding 1500 by 600 feet in size, yet the purpose, also, was to permit the location in such a way as to secure not exceeding 1500 feet of the length of a discovered vein; and it was expected that the locator would so place it as, in his judgement, would make the location lengthwise cover the course of the vein. There is no command that the side lines should be parallel, and the requisition that the end lines shall be parallel was for the purpose of bounding the underground extralateral rights which the owner of the location may exercise. He may pursue the vein downward outside the side lines of his location, but the limits of his right are not to extend on the course of the vein beyond the end lines projected downward through the earth. His rights on the surface are bounded by the several lines of his location, and the end lines must be parallel, in order that going downward he shall acquire no further length of the vein than the planes of those lines extended downward inclose. If the end lines are not parallel, then, following their planes downward, his rights will be either converging and diminishing or diverging and increasing the further he descends into the earth. In view of this purpose and effect of the parallel end lines, it matters not to the prior locator where the end lines of the junior location are laid. No matter where they may be, they do not disturb in the slightest his surface or underground rights.'

"The court accordingly answered in the affirmative this question propounded to it by the Circuit Court of Appeals for the Eighth Circuit: 'May any of the lines of a junior lode location be laid within, or across the surface of a valid senior location for the purpose of defining for or securing to such junior location underground or extralateral rights not in conflict with any rights of the senior location?'

"In the case of the Hidee Gold Mining Company, decided by the Secretary of the Interior January 30, 1901, (advance sheets), it was held that the location of a lode mining claim may even be laid within, upon, or across the surface of patented lode mining claims, for the purpose of claiming the free and unappropriated ground within such lines and the veins apexing in such ground, and of defining and securing extralateral underground rights upon all such veins, where such lines are established openly and peaceably, and do not embrace any larger area of surface, claimed and unclaimed, than the law permits.

"As, therefore, upon the facts appearing, there was no valid objection to the Stemwinder location, the next question is, what rights did the owner of that location thereby secure? Confessedly, he acquired nothing as against the Emma, either on the surface or underground. But how is it as against the goverument and every subsequent locator? In the absence of any objection on the part of the owner of the Emma, the locator of the Stemwinder had, as we have seen, the legal right to extend his lines upon and across that claim. The ground to the north and south of the Emma was, according to the findings, open and unappropriated public land, with a mineral-bearing ledge passing in a northwesterly and southeasterly direction through the Emma and into the adjoining unappropriated public land to the north and south of that claim. Across that ledge and on unappropriated public land the locator of the Stemwinder laid his southerly end line, and along the course of the ledge and on unappropriated public land he laid his westerly side line. Across the ledge, partly on unappropriated public laud and partly on the prior Emma location, he laid his northerly end line, parallel with his southerly end line, and along the course of the ledge, partly on the Emma and partly on unappropriated public land, he laid his westerly side line, almost, if not quite, parallel with his westerly side line. As, in the absence of any objection on the part of the owner of the Emma, the locator of the Stemwinder had the legal right to cross the prior location, his lines, as against the government and all subsequent locators, would therefore seem to have been perfectly laid. Under such circumstances, we are unable to see why, as against the government and all subsequent locators, the location should not carry precisely the same rights, surface and extralateral, that it would carry if none of the lines had been laid upon or over a prior location, which, under the statute governing extralateral rights, would give to the locator of the Stemwinder, as against the government and all subsequent locators, the right to follow the dip of the vein in its departure from the westerly side line of the claim indefinitely between vertical planes drawn through the parallel end lines extended indefinitely in their own direction. We think, too, that this is the logical deduction to be drawn from the reasoning upon which the judgment of the Supreme Court in the case of Del Monte Mining & Milling Co. v. Last Chance Mining & Milling Co., supra, was based. In effect, the court below made the south line of the Emma the north end line of the Stemwinder, thereby destroying the parallelism of the end lines of the Stemwinder fixed by its locator, and either destroying all of its extralateral rights entirely, or limiting them to converging lines intersecting at the point Y on the diagram. This is in conflict with what was held by the Supreme Court in the Del Monte case in respect to the line e—i of the New York claim. That line, which was the northerly side line of the New York, stood in the same relative position to the Last Chance claim there involved as the south boundary of the Emma claim does to the Stemwinder; and the Supreme Court, in answer to the third question submitted to it by the Circuit Court of Appeals for the Eighth circuit, held that the easterly side line of the New York did not constitute the end line of the Last Chance claim there in question. Locations of lode mining claims are made for the purpose of reaching the underground veins. 'The area of surface,' said the court in the Del Monte case, 'is not the matter of moment. The thing of value is the hidden mineral below, and each locator ought to be entitled to make his location so as to reach as much of the unappropriated, and perhaps only partially discovered and traced, vein as is possible.' 171 U. S. 75, 18 Sup. Ct. 895, 43 L. Ed. 85."

It cannot therefore, be now held, as claimed by the appellant, that no extralateral right pertains to the Stemwinder claim. Nor are we able to agree with the apellant's counsel that the extralateral right of the Stemwinder should be bounded on the northerly side by a vertical plane drawn downward through the patented south line of the Emma claim because of the placing of the stone monument already referred to; and this for several reasons: first, it does not appear that the Stemwinder Mining Co. or its successors in interest, the appellee herein, knew anything about the stone monument or the oral agreement under which it was built at the time they acquired their interest; second, the monument was but one point, and was insufficient to indicate any boundary line; and third, no connection is shown between the appellant and the Emma and Last Chance claims, or any of their owners or locators—there was no privity between them or any of them.

Did the court below err, as against the intervening claims of the appellant, in fixing the bounding planes of the extralateral right of the Stemwinder through the original north line of the Stemwinder and through its amended south line?

By this decision, it will be seen, the court confined the extralateral right of the Stemwinder within the limits of its original location, and did not extend it beyond the planes of its amended location, and in confining it, as it did, to planes drawn through the northerly end line of the original location and the southerly end line of the amended location, it is given less of the vein on its dip than would be included within planes drawn through the end lines of its amended location.

Was it right in going back to the original north line of the Stemwinder in fixing its extralateral right as against the intervening claims of the appellant? That question, it seems to us, depends upon whether or not the amendment of the location in question was an abandonment, for all purposes, of the original? If so, it would follow that the court below was in error in this particular. That there was no such intention on the part of the Stemwinder Mining Co., was expressly declared in its notice of amended location, wherein it was stated that the error in the course of the vein having been discovered, "the object of this amended location is to conform to the laws relating to mining claims, both national and local, and to mark and define and record the same to the extent and within the boundaries hereinafter set forth, the same being within the boundaries so located, marked, and staked in the original location hereof, and not otherwise." Again it is declared in the amended notice of location: "It is further intended herein not to abandon in any manner or by implication any rights, privileges, property, possession, or title derived, originated, owned or held under the original location thereof; but that for the purpose hereof is to more particularly mark, locate, define and describe the ground, vein, and premises held by said company, without waiving any rights under said original location, all of which the said company claims as the legal successor in interest and title and possession derived from said original locators."

At the time of the original location of the Stemwinder, none of the claims here set up by the appellant had been located. At the time of its location, it being supposed by its locator that the vein or lode outcropping within its surface boundaries ran in an easterly and westerly direction, and its then supposed side lines being, as a matter of fact, laid across the vein, and being substantially parallel, the law declares that those which the locator declared his side lines were in fact his end lines. Del Monte M. & M. Co. v. Last Chance M. Co., 171 U. S. 55; Last Chance M. Co. v. Tyler M. Co., 157 U. S. 683; Flagstaff M. Co. v. Tarbet, 98 U. S. 463; Argentine M. Co. v. Terrible M. Co., 122 U. S. 478; King v. Amy Silversmith M. Co., 152 U. S. 222; Bunker Hill & Sullivan M. & C. Co. v. Empire State-Idaho M. & D. Co., 109 Fed. 538; Empire M. & M. Co. v. Tombstone M. & M. Co., 100 Fed. 910; Cosmopolitan M. Co. v. Foote, 101 Fed. 518; Tyler M. Co. v. Sweeney, 54 Fed. 284. And as they were laid, as the evidence shows, openly and above board, without any forcible, clandestine, surreptitious or otherwise fraudulent entry upon the ground of another, and without objection on the part of any one, the location of the Stemwinder thus made, carved out, as against the government, and any and every subsequent locator, a segment of the vein throughout its entire depth, which belonged to its locator. Del Monte M. & M. Co. v. Last Chance M. Co., 171 U. S. 55; Empire State-Idaho M. & D. Co. v. Bunker Hill & Sullivan M. & C. Co., 114 Fed. 417.

Unless the amended location of the Stemwinder operated as a total abandonment of the original, that segment of the vein, within the limits of the planes of the amended location, remains the property of the successors in interest of the original locator, against all persons not possessed of some prior right. That such amended location was not intended to operate as any such abandonment has already been shown by the express declarations of the notice of amended location above quoted; and that, as a matter of law, it was not an abandonment of the original location, is equally clear. Thompson v. Spray, 72 Cal. 528; Hallack v. Traher, 23 Colo. 14; McEvoy v. Hyman, 25 Fed. 596; Morrison v. Regan, 67 Pac. 955; Duncan v. Fulton, 61 Pac. 244.

The great width of the vein or lode in question is also again pressed upon our attention by the learned counsel for the appellant, extending, as he insists the evidence shows, beyond the west side line of the Stemwinder claim. In respect to this matter the court below said, in its opinion:

"The defendant also maintains that the apex of this ledge is so wide that it extends far to the westward of the west line of the Stemwinder. Upon this subject there is much and some very interesting testimony by experienced and scientific mining men, but no one has been able to set definite limits to the ledge, and that it has no distinct banging wall cannot be doubted. Its one distinct and persistent feature is its foot wall; it was the axis of action; upon it the superincumbent mass of hanging country had its oscillating and grinding motion, resulting in the creation of that heavy selvage or gouge now found upon it, and in so shaking and breaking up that hanging country as to change the relation of its component parts, thus creating large masses of brecciated rock, fissures and cavities, through which the circulating mineral elements deposited their ores. It would be expected that those conditions would decrease as we advance from the line of fissure and action until reaching a point where there had been no disturbance of the rocks. We would expect the evidence of mineralization to extend far beyond the ore deposits and as far as the country had been disturbed, displaced or brecciated, but we cannot conclude that the legal hanging wall extends to the limits of these influences. It is a fact that, in many ledges having a distinct hanging and foot wall, the country beyond either is more or less mineralized, and at times even small deposits of ores are found beyond the lines of the walls. Yet no miner would say that such mineralized country rock constituted a part of the ledge. It appears that in this ledge the footwall country has very little mineralization or even mineral stains. The reason is evident—the heavy gouge prevented the escape in that direction of the mineral elements, and the rocks, having preserved their original compact formation, there were no cavities through which the mineral elements could circulate. To hold that the ledge extends to the extreme limits of all evidence of mineralization is not a reasonable or practicable proposition in such a formation as this. If not there, where then? Not beyond the ore deposit or where such strong indications of it are found, that the miner could work or explore with the expectation of compensation. It cannot be doubted from the evidence that far beyond where any miner, acquainted with this formation, would work for ore, there is much evidence of mineralized rock, quite similar to the material recognized as clearly within the ledge. So far as can thus be concluded from all the evidence or ore developments, at and within a reasonable distance below the surface in the Stemwinder, I doubt that the apex proper in that claim exceeds 250 to 300 feet in width. Suppose, however, that it does extend beyond the west line of the claim, the only effect would be, under the holding of the Court of Appeals in the King case, 114 Fed. 417, that if defendant owns that surface it would own so much of the apex as lies within it. What its underground rights would be is a problem I am not not called upon to now solve."

We are not prepared to hold that the court below was in error in the view thus taken of the evidence in the cause. But if it be conceded that the vein or lode be as extensive in width upon the surface as contended by the appellant, the priority of the original Stemwinder location over the claims of the appellant here set up being established, the extralateral right of the appellee would remain as fixed and decreed by the court below. Last Chance M. Co. v. Bunker Hill & Sullivan M. & C. Co., decided at the present term; Empire State-Idaho M. & D. Co. v. Bunker Hill & Sullivan M. & C. Co., 114 Fed. 417; St. Louis M. & M. Co. v. Montana M. Co., 104 Fed. 664, and cases there cited.

The judgment is affirmed.

(Endorsed): Opinion. Filed June 6, 1904. F. D. Monckton, Clerk.

The Philippines at St. Louis.

At the St. Louis Exposition the Philippine government board has made an elaborate display of the mineral products of the archipelago. This is the first time a systematic attempt has been made to collect and classify the minerals, and the result has been gratifying to those most enthusiastic about the development of the Islands. One building is entirely devoted to the display of the ores and mining products. There are exhibits of copper, gold and manganese. More than 1100 natives are quartered on the ground, including representatives of forty tribes.

Trials of Rock Drills for Air Consumption.

Several weeks since a series of tests were made at Johannesburg, S. A., to determine the consumption of compressed air by machine drills, in ratio of work performed. The test was made under the direction of engineers of the Mechanical Engineers' Association of the Witwatersrand, and the results are given in the Journal of that society in a lengthy paper on the subject by J. B. Carper, E. Goffe and W. C. Docharty, of which the following is an abstract:

The trials of the rock drills were made at the City & Suburban mine.

The method adopted of making the trials was as follows: All the holes were drilled in a block of red granite, 4 feet 9 inches by 4 feet 9 inches by 2 feet thick, having density and hardness the same as that of Peterhead granite. This granite block was firmly set in the ground in a bed of concrete, and had a quarry bar fixed across it at a height of 3 feet, supported at each end by posts and A frames, firmly set in the concrete. A second quarry bar had one end clamped to the fixed bar, with its outer end supported by a post with broad flange base, and could be traversed the whole length of the fixed bar. The machines were clamped either on the fixed bar, or the traversing bar, thereby rendering possible the drilling of any spot on the face of the stone. All the test holes were drilled vertically.

There were two air receivers, each 5 feet in diameter by 20 feet long, placed side by side, about 2 feet apart, connected by one piece of 8-inch diameter pipe with valve, this valve being kept full open during the tests.

An iron pipe 2 inches in diameter, 18 feet long, led the air from the receivers to the test stone. It was provided with a stop valve at the end, and was fitted with pressure gauge and thermometer tube near the stop valve. A flexible hose attached to the end of the 2-inch pipe supplied the machines.

The capacity of the two receivers, including piping up to the stop valve, was 756.6 cubic feet. At the time of the tests the pipe connection from the receivers to the mine was entirely disconnected and blank flange put on the receiver.

The general arrangement of the stone, receivers, etc., is shown by the accompanying engraving.

Making Drill Tests at City and Suburban Mine, Johannesburg, S. A.

Each run was conducted as follows: The compressor was worked until the gauge on the receivers showed the required starting pressure (say 80 pounds). The stop valve was then shut, closing connection with the compressor. The machine being in position on the bar and all ready was then started, and drilling continued until the terminal pressure of that stage (say 70 pounds) was shown on the receiver. The machine was then stopped and the depth of the hole carefully measured and recorded. The times of starting and stopping were taken, and lengths of any stoppages during the run noted, the net time of the run being thus found. The machine was then restarted at 70 pounds pressure and run to 60 pounds and again measured, and so on for each stage down to 35 pounds. Before starting a hole the bit was carefully measured. On starting and stopping each stage of the run the pressure and temperature of the air passing through the machine was observed as well as the atmosphere pressure shown by barometer.

It was intended originally to go through all the stages of pressure for each drill with one hole, but the stone being proved to be too thin by the first holes drilled, this scheme had to be modified, and the plan was adopted of running the first two stages only, viz., 80 pounds to 70 pounds, and 70 pounds to 60 pounds in one hole, then starting a new hole with a new drill bit and running three stages, viz., 60 pounds to 50 pounds, 50 pounds to 40 pounds, and 40 pounds to 35 pounds.

In working out the results the capacity of the receivers was calculated for every pressure observed, corrected for temperature and barometer reading, and reduced to the equivalent of free air at a temperature of 70° Fahr., and 24.8 inches barometer. The capacities of the holes drilled were calculated. The results may be summarized as follows:

Three and one-half-inch machines.—One 3½-inch machine was tested, the Hercules, which gave fair drilling results with an air consumption of 16.86 cubic feet per cubic inch drilled.

Three and one-fourth-inch machines.—New machines tested, Climax, Little Vixen, Ingersoll, Holman, Slugger, Hirnant and Little Giant.

Comparing the 3½-inch diameter new machines tested, the Slugger (Rand) shows air consumption for the whole range of pressures from eighty pounds to thirty-five pounds, 11.08 cubic feet per cubic inch drilled, and in addition shows an air consumption for one stage of 8 70 cubic feet per cubic inch drilled.

The Little Giant (Rand) showed an average consumption of 11.74 cubic feet of air per cubic inch drilled.

Old machines.—It was intended to test some worn machines for comparison, and a Little Giant about three mouths old, from the mine at City & Suburban, was put on the bar. A Climax Vixen was obtained from the Ferreira G. M. Co., but owing to a misunderstanding a practically new machine was sent which was overhauled and adjusted before reaching the test bar, so that the runs of these machines are not properly comparable.

Three and one-eighth-inch machines.—Two new 3⅛-inch Slugger machines were tested, which gave a consumption over the whole range of pressures of 10.92 cubic feet of air per cubic inch drilled. This machine worked stiffly at first and in consequence did not show so good a record in the higher stages. The second 3⅛-inch Slugger was quite new also, but before starting the test was adjusted for sinking work by the removal of a plug in the valve chest provided for that purpose, which gives a more free movement of the air in the machine. The average consumption of this machine was 10.52 cubic feet of air per cubic inch drilled.

Three-inch machines.—There were four makes of machines tested, Hercules, Little Vixen, Water-Leyner and Daw, of which the Hercules worked with a consumption of 15.11 cubic feet of air per cubic inch drilled.

The Water-Leyner machine was given two runs at the higher stage pressures, eighty pounds to sixty pounds, with an average of 21.52 cubic feet of air per cubic inch drilled.

Two and fifteen-sixteenths-inch machine.—An Ingersoll machine was tested at request of S. Hancock, manager, Jumpers Deep, Ltd. It consisted of an ordinary 3¼-inch machine fitted with cast iron bush bored down to 2 15/16 inches in diameter, with piston turned down to suit. Average consumption 13.92 cubic feet of air per cubic inch drilled.

Two and three-fourths-inch machine.—Tests were made on 2¾-inch bore machines, a Climax and a Slugger, each machine being run with both 2-inch and 3-inch drill bits, with the idea of finding whether a small machine was capable of drilliug a full-size hole economically.

The tests could not be carried through in exactly identical stages owing to difficulties entailed by the use of small drill bits and machines, the feed running out, as well as the drill going through the stone in several cases.

The Slugger machine was tested with both small and full-size bits, the air consumption being 10.45 and 11.09 cubic feet per cubic inch drilled, respectively.

In both the depth of hole drilled with the full-size bits, and economy of air used, the 2¾-inch machine was equal to the larger machines.

Two and one-half-inch machines.—One 2½-inch bore machine, the Climax Little Vixen, was tested for Mr. Marley, manager, South Nourse, Ltd., being the machine iu general use in development work at the mine. This was run with a 2-inch drill bit. Consumption of air 20.29 cubic feet per cubic inch drilled.

Two and one-fourth-inch machines.—The Hercules consumed 31.04 cubic feet, and the Little Giaut ran with an air consumptiou of 19.48 cubic feet per cubic inch drilled.

Pan Amalgamation at Rosario, Mexico.*

NUMBER II.

Written by A. E. Drucker.

The Use of $FeSO_4$ in the Pans.—Formerly it had beeu the practice to use ferrous sulphate in the pans. We failed to see chemically how $FeSO_4$ did any real good in the process, uuless it aided in the reduction of AgCl by iron. It is said the iron has a stronger reducing action on AgCl in presence of $FeSO_4$ in solution, but I found that the reduction was just as good without it, and the extractions were not benefited by its presence, so its use was discontinued.

Action of Iron on AgCl.—The wearing of the shoes and dies, while grinding, causes considerable fine iron to be distributed throughout the charge. As the AgCl comes iu contact with these fine particles of iron, it is quickly reduced to silver and amalgamated. To show how readily AgCl is reduced by iron, try the following experiment:

Dissolve some silver in HNO_3 and add NaCl to obtain a white precipitate AgCl. Wash free from acid and add iron filings with some quicksilver. Notice how readily the chloride is reduced and amalgamated. The presence of an excess of NaCl solution greatly aids in the reduction.

$$2AgCl + Fe = 2\ Ag + FeCl_2.$$

We can see now how necessary iron particles are in reducing AgCl in the pans.

The average loss of iron from the pans in grinding is 3 pounds per ton of ore treated. Sometimes the loss reaches 10 pounds, depending on the amount of $CuSO_4$ used and the amount of grinding. Fine iron present reduces the HgCl formed to some extent when in a large excess. Salt greatly increases the reduction of AgCl by iron on account of AgCl being soluble in salt and increasing the surface of attack for the iron. An excess of salt is necessary in each pan, about 20 pounds.

Effect of Copper, Lead, Zinc, Manganese, Arsenic and Antimony Ores on Mercury.—Copper ores do no harm, except soluble $CuCO_3$ or oxides giving copper in the amalgam. Lead ore sickens the quicksilver, aud it is sometimes easily amalgamated, causing quicksilver to be readily floured. The more chemicals used the more will the lead be amalgamated. Cerussite and galena are not affected, but wulfenite gives base lead bullion. Lead chloride ($PbCl_2$) is easily amalgamated. This is a soluble chloride precipitated by iron in the pans.

Zinc ores are not amalgamated, since zinc is positive to iron. Zinc sulphide or blende dirties the mercury, causing losses by flouring.

Arsenic and antimony ores are very difficult to work. They flour quicksilver and make it sick and dirty, so that it will not easily amalgamate. Clean the mercury by digesting with nitric acid and retorting. The only way to treat such an ore is to roast it.

Manganese oxides froth in the pans and cause high losses in quicksilver and low extractions. Manganese oxide (MnO_2) gives pure bullion. Wheu present in considerable amount 100 pounds of bluestone will show no copper in the bullion.

Causes for the Flouring of Quicksilver.—Losses of quicksilver range from ½ to 3 pounds per ton of ore worked. The highest loss results from roast amalgamation mills treating copper ores. A fair average total loss on easily worked ores may be taken at ½ to 1 pound per ton and on refractory ores 1½ to 2 pounds. The quicksilver which escapes with the tailings as floured Hg is the principal loss. This loss is greatly increased by grinding in the pans, so that it is preferable to crush fine in the battery and keep the pan mullers off the dies.

Calomel (HgCl) formed by the action of Cu_2Cl_2 on quicksilver and dissolved in an excess of salt solution causes a continuous loss of mercury in the tails. The losses may be greatly reduced by keeping the mer-

* Abstract Cal. Jour. Tech.

cury clean by the use of nitric acid or by the use of a little sodium amalgam. About 5 grams of sodium amalgam were used in the charge of mercury for each pan and were found to clean the quicksilver and make it very active. A noticeable increase in the extractions (5% to 6%) was shown by the assay whenever it was used. Zinc amalgam also keeps the quicksilver sharp, and runs floured mercury together by cutting the chloride film which may cover the quicksilver particles. This fact was made use of in working up concentrates in the pans which contained more than half their value in floured quicksilver. We had no trouble in running the finest mercury together by this means.

The working of slimes alone tend to flour Hg. The fine mud coats the mercury globules throughout the charge and prevents them coming in contact with the silver. Therefore low extractions and great losses of mercury result. Since the grinding of slimes is unnecessary no fine iron particles are produced in the pans to reduce the silver chloride. But with the coarse sands settled in the tanks fine iron is obtained from the battery along with the iron resulting from grinding in the pans, thus giving the necessary iron to reduce all AgCl.

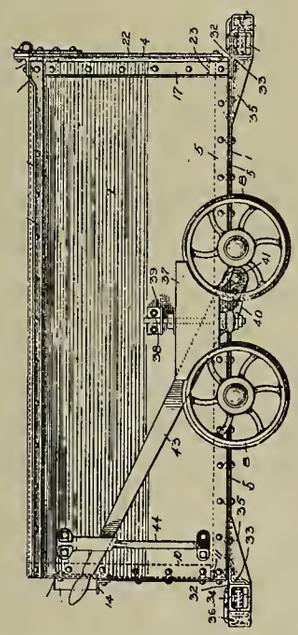
(TO BE CONTINUED.)

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 7, 1904.

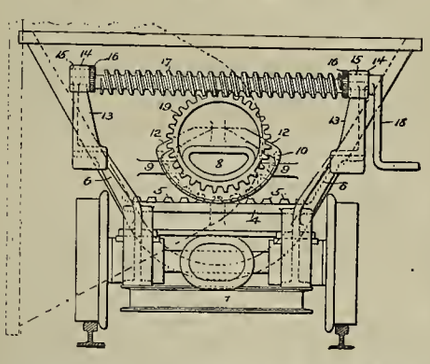
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINING CAR.—No. 761,264; A. Stucki, Allegheny, Pa.



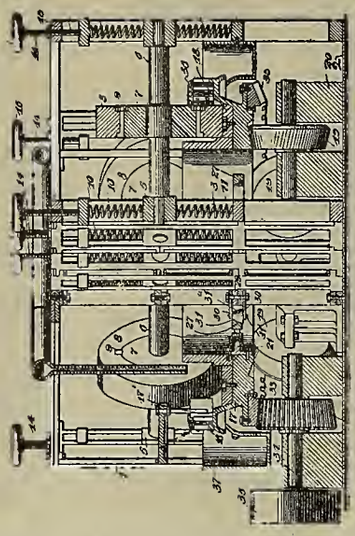
Body for mining car having one end open and comprising floor and side plates and one stationary end plate, flanged bars connecting plates, flanged bars secured to upper edges of side plates, flanged bar extending across open end of body and secured to sides, door hinged to bar, and means for locking free end of door.

SLAG CAR.—No. 761,525; G. Mitchell, Naco, Ariz.



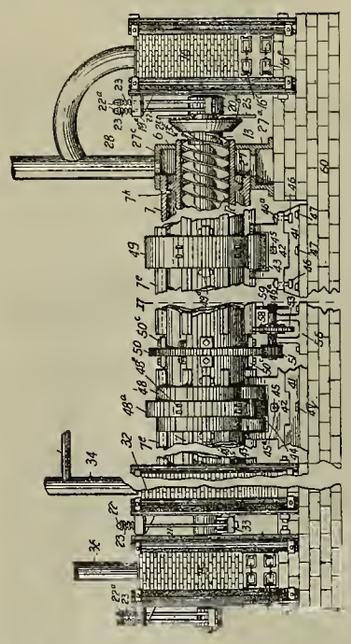
In dumping car, combination with receptacle pivotally supported and topheavy when full, of worm wheel connected with receptacle, worm to turn worm wheel and tilt receptacle, eccentric supports for worm, and means for turning supports to throw worm out of engagement with worm wheel to permit receptacle to dump.

ORE PULVERIZING MILL.—No. 761,266; W. Taylor, Los Angeles, Cal.



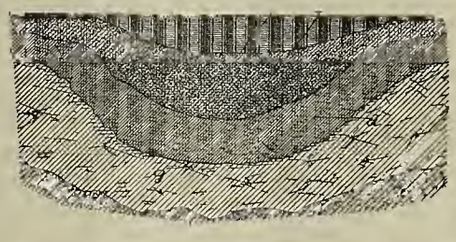
Combination in a pulverizing mill, of outer and inner series of posts, annular revoluble mortar located between two series of posts, mortar provided upon bottom with ring gear, driving gear operating in connection therewith, means for operating driving gear, conical rollers supporting mortar, mortar centering ring provided on mortar, roller bearing means provided upon inner series of posts, mortar centering ring and roller means provided with co-operating faces oppositely inclined with respect to mortar axis and adapted to bear one against other, whereby mortar is held against lateral displacement.

ORE TREATING FURNACE.—761,646; A. M. Beam, Denver, Colo.



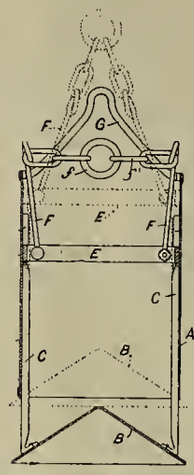
In ore treating furnace, combination of three concentric cylinders and smoke chambers operatively connected with opposite ends of two of cylinders, means for feeding ore into, conveying through, and discharging out of middle of cylinders, suitable means for connecting cylinders, meaus for supporting them, and suitable means for rotating them.

METHOD OF RAISING SUBTERRANEAN RIVERS.—No. 762,042; L. P. Friestedt, Chicago, Ill.



Method herein set forth of elevating subterranean rivers to surface, which consists in driving joining sheet-piling sections down through earth to bedrock and forming solid wall transversely to running direction of watercourse.

BUCKET.—No. 762,151; W. P. Davis, Durban, Natal.

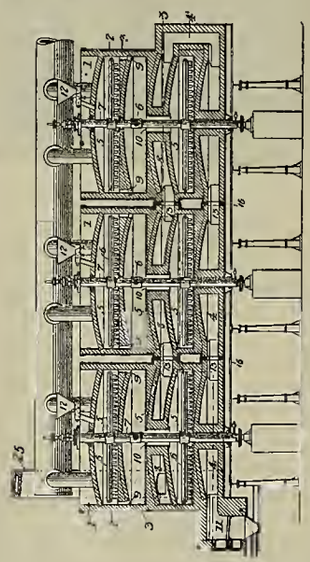


Device comprising casing, guides secured to inner surface of casing, movable bottom provided with uprights engaging guides upon inner surface of casing, and means connected to casing and uprights for lining movement of bottom.

WELL BORING TOOL.—No. 761,742; M. J. Woodward, Petrolea, Canada.

Well boring tool, combination with drill holder formed in two complementary parts comprising cylindrical section having bore formed centrally within upper end, and tubular section carrying shank fitting withiu bore and having threaded engagement with cyliudrical section, conical bearing surface upon shank, elongated sleeve fitting loosely within tubular section, head integral with sleeve arranged within bore for slight sliding movement, and frusto-conical shoulder upon head adapted to engage bearing surface upon shank.

MUFFLE ROASTING FURNACE.—No. 761,691; F. Meyer, New York, N. Y.



Roasting furnace, comprising series of roasting chambers separated by intervening spaces, heating furnace common to series, and flues for heating gas connecting with heating furnace at one end and stack at other through successive chambers.

Mining Summary.

Specially Compiled and Reported for the Mining and Scientific Press.

ALASKA.

In the Tanana, A. Chisholm of Fairbanks reports the season's output estimated at half a million dollars. The winter output was half of that with only two large boilers in use. Many more are now being taken in by steamers. Chisholm says Tanana has 30 miles of traced pay streak. Fairbanks, Cleary, Goldstream and Esther are the richest creeks. Chena and Fairbanks both have newspapers. Eggs are $50 per case and flour is $10 per sack.

Superintendent R. Day of the McGinnis Creek mining property, near Juneau, says the two hydraulic giants are operating and bedrock is exposed.

W. H. Hoggett, superintendent of the Jualin mines, is opening up work at Berners bay.

W. Gaus and W. Gleason are cutting a trail from the north end of Loch Mary to the Skookum quartz claim on south side of Mount Bandy, near Windham bay. They report having a ledge 5 feet wide, running northwest from discovery. Free gold is found in the Black Jack and Galena and assays from the quartz run $7 in gold.

ARIZONA.

Cochise County.

(Special Correspondence).—Despite the fact that the blowing in of the Copper Queen smelter at Douglas makes probable the suspension of the Bisbee smelter of the Copper Queen Co., the camp continues active and production of copper is in no way diminished. The smelter is likely to continue in operation for a few months yet at least. Preparation for greater ore production is being made. The Czar shaft with the Holbrook, Spray and Lowell have been supplemented with the Gardner shaft, on which a steel gallows frame and heavier hoist are being installed.

The Calumet & Arizona Co. is steadily increasing production. At its Pittsburg & Duluth shaft last week was put in another pump, and is nearing the ore body, while sinking is progressing on the Oliver shaft.

The Higgins property is being prospected with a diamond drill. —— The Junction is drilling an 8-inch hole on its property east of the Lowell, now down about 100 feet.——The Saginaw, farther east, is beginning operations. —— The Easter Sunday, a gold property 4 miles east of Bisbee, owned by Wallace, Devine, Brown and other local men, is being worked under lease and ore shipped to El Paso, Tex. There are several hundred feet of work on the group, which consists of four patented claims. —— The Shattuck-Arizona Dev. Co. expects to start development work on its seven claims between the Copper Queen, Pittsburg and Duluth, C. & A. and Wolverine. It is composed of Eastern men, associated with L. C. Shattuck, the original owner.

Bisbee, June 13.

(Special Correspondence).—The Tombstone Con. M. Co., E. B. Gage, manager, has solved the water trouble in the Contention mine and made it a steady producer. Superintendent E. W. Walker states the company is shipping forty carloads of ore per month to the El Paso smelter, most of this being the product of the Contention shaft, though a small part of it comes from development work which is being done on the West Side, Emerald, and Silver Thread - Tranquility groups. G. Rafferty, J. W. Clark and W. Tomlinson are in charge of these workings, respectively, and J. H. Macia has charge of the Contention.

The Contention has a four - compartment shaft 7x22 in the clear, and steel gallows frame located 300 feet west of the old Contention shaft, now caved in. A strong flow of water encountered at a depth of 570 feet caused the mine's abandonment. The new shaft is down 780 feet, and by handling 3,500,000 gallons of water per day the mine is kept drained. Moreover the water level of the whole district is being gradually lowered. In the Emerald shaft, 1½ mile distant, the level is 100 feet lower than formerly. This water is furnished to the Tombstone Improvement Co. for the town supply, and the overplus is piped down the canyon ½ mile to a point where a granite dike crosses. Here it is set free without danger of return through underground channels and flows for several miles toward the San Pedro river.

The pumps that raise this water are as follows: On the 600-foot level a triple expansion pump, 15, 23 and 39 by 13 by 24. On the 700-foot level three pumps; two are 15, 23 and 39 by 9½ by 24, which originally were intended for the 1000-foot level; and a compound duplex 10 and 16 by 10½ by 12. Besides these there are four duplex sinkers, 14 by 8 by 12, in the shaft, which is not now being lowered, but work will be resumed there this month. At present drifting on the 700-foot level is going ahead. Three shifts of three men each attend to the pumps. Two shifts are worked in the mine, and the total number employed aggregates 175 to 200 men.

Power is supplied by five 200 H. P. marine boilers with California fuel oil (using about 4000 gallons per month), and there are, besides, a set of boilers in reserve. A well equipped machine shop, blacksmith shop and carpentor shop are grouped around the shaft, and an assay office checks all shipments and development work.

The mine is 1 mile east of Tombstone on the hill and a spur track is extended to it, by which oil is hauled directly to the tanks and ore taken out from the mine chutes. In addition to ore from the mine about 100 tons per day are being shipped from the old dumps, of which there are several under lease to Mexicans.

The ruins of former workings, dismantled mills and hoists, notably among which are the Toughnut (site of the original discovery), the Sterling, Waterville, Girard, Lucky Cuss and others, are to be seen, none of which have been worked for several years. Outside of the Consolidated little work is being done.

Tombstone, June 12.

A 10-stamp mill will be built at the mines of the Gold Nugget M. Co. of Bisbee, in the Chiracahua mountains.

Gila County.

The Old Dominion C. M. Co. at Globe, which has been increasing its production of copper for the past several months, made an output of blister copper from the furnaces for the month of May of 1,600,000 pounds, or 100,000 pounds greater than the April product. Over thirty-six hours were lost—not counting minor detentions —by the breaking down of the foundation of the blowing engine.

A group of six claims near Globe was sold last week to G. W. Woy and Phœnix parties, who own interests in the property of the Iron Cap M. & M. Co., adjoining Copper Hill. Development work has begun and it is intended to save ore from the start, as sample runs show a high grade in silver and copper. The paystreak at 10 feet is 6 inches wide. This property adjoins the Old Continental on the south, the extensions of the Big Johnny on the north, and the Mineral Farm property on the east.

Graham County.

C. E. Stevens, superintendent of the Cuprite C. Co., near Clifton, reports the work on the company's tunnel progressing.——A strike in the mine of the Polaris M. & M. Co., near Clifton, is reported by Secretary Nicholls. The strike was made at intersection of the Phonolite tunnel with the Golden Eagle lead. The lead was cut by the tunnel 85 feet below the former lowest working on the lead, where 6 feet of ore of an average value of $60 a ton was said to be found, besides 12 feet of concentrating ore worth $8 per ton. Drifts will be run along the vein from the tunnel.

Clifton reports say the copper companies are running full handed and will all show increase in production this year. The smallest increase will probably be shown by the Detroit C. Co., though its gain will be important. Its increase, however, will be the smallest for the reason that changes to be made at the concentrator will take at least a month from its full operating time. The concentrator building will be doubled in size, enabling the handling of 1200 tons of ore instead of 600 tons. Shifting the machinery and putting in the new equipment will occasion loss of time, though it is intended to try to run at least a part of the plant continuously.

F. Weaver, operating near Clifton, is shipping his gold, silver and copper ore to the El Paso smelter.——Ore has been struck by Awalt & Crawford at 225-foot level of their mine at Gold Hill. The ore from this property runs high in gold values with 20% lead.——T. Nardelli has resumed work on the Summit group of claims near Metcalf. —— Broschear & Randolph of Metcalf, who have a group of claims near the camp, and who are opening their property with a tunnel, report striking ore running 5% copper.

Treasurer Hazen of the Shannon C. Co. says the Shannon Co., operating at Clifton, is making an average of 1,000,000 pounds of copper per month. In March the output was 1,152,000 and in April 1,040,000 pounds. On an average of 1,000,000 pounds of copper per month, he says, they are making net earnings of $20,000 to $25,000 per month. During the past year the Shannon has made a number of improvements, having completed an addition to its concentrating plant. During the present year it also took up a bond of $28,000 on the Yankie group of claims, which came out of the earnings of the company.

Maricopa County.

The Black Rock M. Co. is working its mine near Constellation in Wickenburg district. It is claimed the ledge has average width of 4 feet with a 16-inch pay streak. The ore has gold, lead and copper values. There are several parallel veins. A double-compartment shaft is down 240 feet. A hoist and gasoline engines are on the property. An electric plant and a 150-ton capacity mill are also proposed. A. D. Bellingor is president and manager, and J. K. Murphy is superintendent.

H. J. Bennett of Phœnix says he expects to begin operations on the New York group at Morristown this month. ——E. J. Bonsall, manger of the Gold Quarry M. Co. at Morristown, reports that the company will have its property in operation by July 15.

F. J. Sparks, operating the Bettor group of claims, 16 miles east of Morristown, has organized a company and expects to increase the number of men at work.

Mohave County.

The Gold Road M. & Exp. Co., near Acme, is sinking below the 400-foot level and expects to reach the 500-foot point next month. On the 400-foot the ore body is being opened up. For 2000 feet the outcrop is showing values and several shafts are proposed on the Gold Line and Billy Bryan locations. At the mill the new crushers are in place and a test of finer crushing and amalgamation will be made. If the results are favorable, wet crushing will be inaugurated and the capacity of the plant added to.

J. Barry of Los Angeles, Cal., interested in mining in Chloride section, has taken a bond on the Alger mines, near the Great West. He is preparing to start up work. ——S. Miller and J. Willard have a lease on the Grounds group at Music mountain, near Kingman, and have opened up a body of ore in a tunnel below the old workings.

ARKANSAS.

Boone County.

The Alma M. Co. has forfeited its lease in the Sugar Orchard district, near Harrison, and mining rights have reverted to the owner, W. H. Almy. The company's mill and mining plant will be sold and moved to other properties. The steam hoist went to Kingdon Springs last week.

Marion County.

Mann & Echols of St. Joseph, Mo., will start work on the Frazier mines, on George's creek, near Yellville, having contracted for a core drill to do the work.

The mines still find difficulty in getting teams, says the Yellville Republican. The Silver Hollow mine has 200 tons of ore on the dump, but owing to the bad roads and scarcity of teams is unable to get it to market.

CALIFORNIA.

Amador County.

At the Kennedy mine at Jackson, mules have been taken underground to haul ore along the lower levels to the shaft.

Calaveras County.

At the Gwin mine 300 men are on the payroll. Considerable work has been done on top, building, repairing, etc. The 80-stamp mill is running steadily.

At Railroad Flat the Bullion & Riverside Con. mines have been bonded to E. L. Holder, C. W. Higgins and F. Brackett, and development work has been started. Manager C. W. Higgins will begin grading for a mill site this week. The mines are located on the South Fork of the Mokelumne river. 1½ miles from the Fox ranch.——On the Licking fork of the Mokelumne river, J. Haley of West Point has a group, reported showing up well. He is working on two of the claims with arrastras, and the quartz besides free gold carries sulphurets.——P. B. Aikon of Jackson, who has two claims on the Licking Fork, has resumed operations.

J. C. Benson, general mannger of the Benson mine at Angels Camp, says machinery is being placed in the mill the Benson Co. is building. The mill will accommodate ten stamps, but for the present only five stamps will be set up.

Garland, Madson and Moorehead of Angels of the Gertrude M. Co. which is preparing to operate the Demarest mine, near Fourth Crossing, report they will start up the mine July 1.

El Dorado County.

Superintendent Everson of El Dorado C. M. Co. is increasing work on the old shaft of the Eureka gold quartz mine near Georgetown.

N. L. Kohn & Co. of Georgetown report developing pay in the Old Gregory mine, north of Smith's Flat. Gravel 90 feet above the main channel pays $5 to $10 per carload.

At the Mammoth mine, near Georgotown, which is being opened up by Superintendent W. T. Shurtleff, they are breaking ore with a 10-stamp steam-power mill.——At the Jaspor mine, where they are sinking a shaft, high-grade ore is being taken from the 120-foot level.

Fresno County.

C. Boyd reports he is shipping fuller's earth from the C. E. O. mine, near Huron, in which he is interested. The company has two quarter sections of land. They have contracted to supply one party with three carloads a week. The mine is on the line between Kings and Fresno counties, south of Huron.

Inyo County.

Improvements have been made in the buildings at Poleta mine at Poleta. Superintendent Macgregor has put in a steam hoist, air compressor, engine and other equipment.

Kern County.

Work done in the Kern river field for the month of May is reported as follows:

Wells drilled	11
Wells finished	9
Wells pumping	505
Rigs built	8
	Barrels.
Shipments by rail	820,000
Stored by Standard Oil Co.	400,000
Stored by oil companies	110,000
Total production	1,330,000
Increase in storage	510,000
Increase in shipments	120,000
Decrease in production	20,000
Total oil in storage:	
	Barrels.
Standard Oil Co.	7,280,000
Companies in field	490,000
Total amount of oil in storage	7,770,000

It is reported the Associated will begin erection of the largest reservoir yet constructed in the Kern River field, says the Oil Reporter. It will have a capacity of 2,500,000 barrels and will be beside its 1,000,000-barrel reservoir, being built.

Los Angeles County.

In the Los Angeles oil field during May production was steady, says the Oil Reporter. Storage supplies have been drawn upon to meet some local demands, but the stocks were not appreciably reduced. The increase in the local output in May was 6500 barrels. Some wells were deepened and more were abandoned. The main interest still is centered around Sherman and Santa Monica. The oil production is reported larger. Prices ruled from 75 to 90 cents a barrel on the average. The statistical position of the Los Angeles field, including the Sherman section, during May, was as follows:

Wells being drilled	11
Wells suspended	2
Wells pumping	981
Wells abandoned	0
Tanks and reservoirs	600
Barrels in tankage	56,500
Barrels produced during May	82,496
Shipped by rail	11,250

Nevada County.

Preliminary work to building a mill at the Siberian mine at Badger hill, near North Columbia, is under way. Superintendent A. S. Bigelow has men digging a ditch and running a pipe line to supply water power for the mill. He has bought the 4-stamp mill formerly at the Reward mine.

It is reported the New Eureka M. Co., J. H. Rosewall superintendent, will build a mill at its mines in Gold Flat district, near Nevada City.

At the Round Mountain Champion mine, near Nevada City, the machinery is being set up. It consists of a pump, boiler, engine and hoist. A shaft will be sunk 300 feet deep. The bond is held by G. Kartschoke.

One mile from French Corral, the South Yuba M. & S. Co. continues development of its Red Ledge copper mine. Superintendent J. McPherson says tunnel No. 6 is at a point midway between the top of the hill and the bed of the South Yuba river. Backs can be had in No. 6 tunnel from 500 to 700 feet. A smelting plant is being considered.

The Union mine on Banner mountain, near Nevada City, will be reopened by a company of local men, including N. J. Webber, W. H. Dunlap, S. L. Leiter, W. Black, W. J. Palmer, F. Simonds and G. A. Nihell. They will begin operations this week. The drain tunnel will be opened up and the three-compartment shaft will be retimbered. A hoisting plant will be put in and will be operated by water.

The Buckeye M. Co., at Nevada City, has dissolved the original incorporation under New Jersey laws and reincorporated under Arizona laws, the name of the new company being the Buckeye Con. M. Co. J. T. Morgan, G. C. Shaw and T. B. Gray are directors, the latter being president. Work will be resumed this week on the drain tunnel and development increased.

The owners of the Blue Tent mine have

bought the Grizzly Hill gravel claim, on north side of South Yuba river, near Nevada City. The Canada Hill group of mines has been sold to J. F. Littlefield of San Francisco. The properties are collectively known as the Charonet mine and work will be resumed at the Charonet. The Grand Vein mine, a ledge property, was worked by a French company, and a tunnel run 1200 feet and hoisting works put up, but work was suspended on account of the heavy flow of water. The Grand ledge, which is included in the properties, is reported to be of low-grade ore. There are two hoisting rigs on the property, one being on the Charonet mine and the other on the Grand Vein. They are connected by a pipe line running from a reservoir below the South Yuba ditch. The Grizzly Hill owners will work that mine by drifting, as it is well situated in regard to tunnel and millsites. C. Graham, superintendent of the Blue Tent mine, will have the general direction of the development in connection with Manager Canfield.

Plumas County.

At the Gold Run hydraulic mine, above Elizabethtown, 3 miles north of Quincy, a gold-bearing quartz ledge is reported uncovered last week by F. E. Thomas in his hydraulic mine, showing 6 feet across. As it is near a dangerous bank, and as the hydraulicking has been suspended temporarily until the debris dam can be raised, little development has yet been made on the ledge.

At the Claybank tunnel, at La Porte, notwithstanding the great precaution exercised after the first mishap in raising the shaft a few months ago, when a sand streak was tapped, causing about 200 feet of the tunnel to be filled, similar trouble is reported occurring last week. During progress of raising their last shaft, soft rock was encountered which gave evidence that the channel was near. The pressure became too great in the face, and, without warning, a greater part of the face broke in, causing a rush of water, sand and gravel, filling the tunnel for a distance of 130 feet, pausing then for a short while, when it broke again. The next rush filled the entire tunnel for 500 feet. Work is suspended for the present.

Machinery is on the ground for the Bellevue mine, near Quincy, to be used in cutting down the main tunnel, which seems to be too high for the channel.

Shasta County.

A test of the effectiveness of the dredger of the Detroit & California M. Co., in operation on Clear Creek, near Horsetown, near Redding, is to be made. By hydraulic force the gravel is dislodged and then pumped to the sluices on board the dredger, says the Searchlight. Satisfactory returns have been obtained. The pond of water where it has been operating will be extended and a dam will be built dividing the pond in two. The water will then be pumped from the pond where the dredging operations have been carried on and the bedrock prospected to ascertain if all of the gold is being secured by the dredger.

It is reported a 100-ton mill will be built by the Quimby M. & M. Co. near Redding.

Sierra County.

The Steamboat mine has been bonded by the Alleghany M. Co., whose property it adjoins, near Alleghany.

P. Mason has started operations near Bunker Hill, near Downieville, on mines owned by the Golden Scepter M. Co. He has men at work getting out timber and putting up buildings. As soon as the outside work is finished more men will be put on underground.

Siskiyou County.

It is reported Manager Lane of the Mount Vernon mine, at Cherry creek, near Yreka, is preparing to put in a mill with concentrators, and also a sawmill. ——Manager Brokaw of the Golden Eagle mine, on Indian creek, near Fort Jones, says he expects to have his mill ready to start up next week.——The two hydraulic mines on Cherry creek are still piping gravel, with an abundance of water, and expect the water to last until August, says the Journal.

J. R. Stearns and H. G. Elliott of Oakland having bought quartz mining property on McKinney creek, near Oak Bar, intend starting development.——A. G. Harvey of San Francisco and R. G. Elphiaston of Auburn are at Oak Bar starting work on mining property.

The Mount Vernon mine at top of divide, between Greenhorn and Cherry creeks, near Yreka, is reported yielding satisfactory returns under Superintendent Lane. The ledge varies from 1 foot to 4 feet in width.

A shaft sunk 25 feet on the Lucky Jack ledge of the Headwaters claim at Humbug, near Hawkinsville, is said to show ore. The 65-foot shaft at another point also exposes a ledge with a great amount of water, in which it is intended to raise by stoping. The Roosevelt ledge of the group also shows values, though little developed. A sawmill of 10,000 feet capacity will be put in for getting out mining lumber.

Trinity County.

The Quimby G. M. Co. has been incorporated by J. A. Brent, C. A. Marriner, J. M. Duke, W. A. Merralls and W. R. Beall of San Francisco to operate in Trinity county. Arrangements are being made to build a road 30 miles long as an extension to the rail and wagon road from Eureka, Humboldt county, in direction of the company's property.

M. G. Womack of Hay Fork has bonded for $30,000 the Potillo group of mines on Mt. Bally, in the Weaverville mining district. The group consists of three quartz claims, a placer claim and the water rights appurtenant. Reno, Nev., and New York men are interested. Men will be put to work this week on development. The lower tunnel will be extended and a shaft sunk to connect with the lower tunnel. Womack also says he has bonds on the Dedrick mines on Pony creek and also a mine near Dedrick. These will be developed and improvements placed on them.

Tuolumne County.

At the Draper mine, near Soulsbyville, twenty-five men are at work. A 10-drill compressor is being set up and will be used to run the pumps to complete unwatering the mine. There are about 100 feet of water remaining in the mine. When the mine is clear the mill will start up, says President Herthel.

At the Mt. Jefferson mine at Groveland water has been struck in the 600-foot level, west drift, and the men were driven to the level above and the pump pulled up. The 600 is flooded, and will remain so until a pump of greater capacity is set up. The ore shoot, in the 500-foot level, east, is proving satisfactory. There are 10 feet of it exposed. The mill is running steadily on this ore. The cyanide plant is in full operation. The fuel supply is accumulating daily.——D. Gilliam and J. Pool have a lease on the Newsom claim, near Groveland, and are drifting in search of a pocket.

At the Belle mine, near Tuttletown, the mill is running with twenty stamps dropping, says Superintendent W. J. Rule.

At the Longfellow mine, at Big Oak Flat, work is progressing. The raise between the 400-foot and 500-foot levels is completed and circulation of air is assured to all the workings of the mine. Ore is being taken out and run to the mill, which is keeping the five stamps dropping. The management proposes placing heavier machinery on the property. An 80 H. P. boiler will take the place of the present small one. Work in the west drift at the 500-foot level will be resumed and raises will be driven to the level above at intervals. At about 300 feet west they expect to strike the Mexican workings that were sunk to a depth of 120 feet.

COLORADO.

(Special Correspondence).—A number of students from the State School of Mines at Golden have started their work at the summer school, near Georgetown, where the management of the school has a lease on the Dives-Pelican mine. This mine will be operated by students from several colleges in the East and West, including Yale, Harvard, Columbia and Massachusetts Institute of Technology. If it proves a success it is believed it will be the means of a permanent institution of this kind located some place in the West where they can get actual work in the mines.

Work has been started on the branch line of railroad from Sunset to Eldora in Boulder county. This work is being done by the Colorado & Northwestern Railway, which runs from Boulder to Ward. The branch will open up mineral land which has been idle for several years, owing to lack of transportation facilities. Eldora has had to haul ore and supplies 22 miles to Boulder.

Clear Creek county has issued a souvenir booklet which will be distributed throughout the country for advertising the resources of the county.

Military law has been declared at an end in Las Animas county. In San Miguel county affairs are reported quiet. Things are still unsettled in Cripple Creek since the blowing up of the Independence depot on the morning of June 6, thereby killing thirteen non-union miners. As a result of that over 200 union miners have been deported from the camp and the leaders of the Western Federation of Miners in the district have been arrested and held on serious charges. Military law was declared shortly after the explosion. The operators have promised to give their decision as to the employment of union help in a few days. The Portland mine which employed none but union men has been closed by order of the militia and many of the miners arrested.

Attorneys for the Western Federation have asked the Supreme Court of Colorado for a rehearing of the trial of President Moyer, the Supreme Court having upheld the action of the Governor in detaining Moyer as a military prisoner.

Denver, June 13.

Since the above was written, U. S. Circuit Judge A. M. Thayer at St. Louis, Mo., has granted the application for a writ of habeas corpus for Moyer.

Boulder County.

The Scroohy M. Co. has bought the Bell mine at Nederland and will work it for its tungsten.——The Sparkling Jewel mine at Sugar Loaf has been improved by addition of machinery.

Clear Creek County.

A contract has been let to drive the Burns-Moore tunnel, near Idaho Springs, another 1000 feet and work has begun. The property is equipped with a compressor plant, driven by water. The Burns-Moore tunnel is 6 miles above Idaho Springs, on north side of Chicago creek. It is in 1000 feet.

The shipping record of Idaho Springs mines for May shows increase, as in May, 1903, there were 112 cars shipped, and this year 138.

At the Yankee Con. group, on Yankee hill, at Yankee, Colo., the 15-stamp rapid-drop mill is running steadily on ores, and making satisfactory clean-ups, says Manager Seeman. The mill is automatic throughout and its capacity is fifty tons per day. There is an ample supply of water to keep the mill running all of the year. The mill is fitted with amalgamators below the copper plates, and four table concentrators. P. M. Nelson is in charge. About twenty-five men are employed, which number will be increased. ——The Chemung-Belmont property, in Lake district, has been taken hold of under lease and bond by the Central Bonding Co., with N. G. Mitchell as superintendent. The milling ores are said to run two ounces gold per cord, with the smelting product $40 per ton. The property is equipped with plant of machinery and top buildings, and during the past month the company has been repairing the shaft from top to bottom, a depth of 620 feet, and intends to sink the main shaft an additional depth of 200 feet, as well as extend the lower west level.——At Yankee is the Puritan group, owned by New York men, with G. R. Steuart as manager. They have a group of seventy-two claims, which will be cut by the Puritan tunnel, which has been driven 1200 feet. Last week they started up their compressor, which is run by water wheel, the water supply being obtained from St. Mary's lake. The tunnel is a crosscut proposition, and three leads have been cut in driving thus far. Ores have been taken out of surface workings which have been shipped to Idaho Springs.——The Blair (formerly the Annex mine), in Lake district, is being worked by its Denver owners, and after crosscutting at a depth of 150 feet ore has been opened up. At this point there are two veins coming together which makes 6 feet of ledge matter, and they are taking out concentrating and smelting ores, the latter showing gray copper and galena. They will sink the main working shaft addition of 200 feet.——Eastern owners have started operations on the Gold Nugget property, in Illinois Central district, under management of A. C. King of Idaho Springs. The water has been lowered in the main shaft, which has depth of 250 feet, and the work of drifting west is being carried on at depth of 200 feet.——The Hidee G. Co. has started stoping at a depth of 380 feet northwest of its main shaft in the Lake district, and has 3 feet of free milling ores and a pay streak of smelting ores averaging 7 inches wide. They are sort-sorting the mineral into first and second classes, and last month received returns of $160 to the ton for a first-class shipment to the local sampling works. St. Joseph, Mo., parties are interested, and H. Fleuspach is superintendent.

It is reported work on the Newhouse tunnel, near Idaho Springs, will be resumed. The tunnel has been driven into the mountain nearly 3 miles at an approximate cost of $750,000. An extension of the tunnel from its present heading to the Saratoga mine, a distance of 1500 feet, will begin by July 1st. When the tunnel crossed the Gilpin county line Manager S. Newhouse expected the mining men of that county would form a pool to assist in the work, but they did not respond and the tunnel was abandoned. A contract has been signed in Idaho Springs whereby Idaho Springs parties take a bond and lease on the Saratoga group and will extend the tunnel to the mine at their own expense, the cost thereof to be repaid in credits on royalties for drainage and transportation. When the tunnel reaches the Saratoga a raise will be cut to the shaft and the water drained out. This will enable the lessees to work the Saratoga on a larger scale. By another deal the Golden smelter is said to be leased and bonded to a company operating in connection with the men in control of the Saratoga. These works will be improved wherever necessary and started up probably on common ores from Gilpin, Clear Creek and Boulder counties, pending completion of the tunnel. F. R. Carpenter will have charge of the smelter as heretofore. It is thought the extension of the Newhouse tunnel to the Saratoga mine will result in its continuance to Quartz hill according to the original design.

The Democrat Mountain M., M. & T. Co. has filed articles of incorporation with the following as incorporators: C. Jarheau, K. L. Burt and C. I. Burt. This is a reorganization of the Kelly tunnel holdings and it is intended to increase development on Democrat mountain, near Georgetown. For the present work will be centered on the west side of the mountain and several shafts will be sunk, in addition to driving the Bonanza and Jordan tunnels.

Increased work is being planned by the Mazeppa M. & M. Co., near Georgetown, and more men will be put on. Contract for 100 feet of development work will be let. Considerable work has been done by the Mazeppa Co. during the past three months. A crosscut tunnel has been driven 350 feet. This crosscut was started for gaining additional depth and at the same time cut under the old workings which are in 600 feet. With the objective point reached it is intended by Manager D. W. Shepard to put in a raise. The company is composed of St. Paul and Duluth men.

Machinery for the Terrible mine, near Silver Plume, has been put in place. The air compressor and mill are being operated by water power. The number of men will be increased.

Custer County.

The Bassick mine, near Silver Cliff, will resume sinking and timbers have been ordered. The assay office is ready for business, as the furnaces are finished. It is understood plans are being drawn up for the new mill, the insurance money having been paid.——T. A. Rippey, president of the Custer M. & R. Co., made arrangements to continue sinking the shaft on the Dolomite, and the contractors have the work under way. A whim has been placed, and as soon as the contract is finished a crosscut will be run to the vein.——The Muster M. & D. Co. has extensive operations in view for the summer. Superintendent Raymond of the Toledo mine, near Rosita, is starting a shaft 500 feet northwest of the old shaft. Square sets are being used in timbering and the shaft is 4½x9 in the clear.

The Franklin mine at Ilse is preparing to resume. It has lead ore in sight.

At Stratton's Homestead mine, 5 miles east of Custer (Rosita P. O.) the tunnel is in 160 feet and a survey shows they are nearing the vein, which runs in gold, silver, lead and copper values.——E. Spaulding, of Ilse, is making shipments of ore to the smelter carrying values.

Gilpin County.

The Bullion G. M. & M. Co., under management of G. N. Davenport, has added a steam hoist and ten stamps, which gives it a 20-stamp mill. A crosscut tunnel through the Caney point is being run to reach the main shaft, which, when completed, will give a depth of 450 feet. The company has opened up a body of low-grade ore. The property is in Silver Lake district.

The Mackey and Sarah Jane groups and the Mountz & Palmer mill, near Central City, have been sold to the Imperial G. M. & M. Co., in which Missouri men are interested, and developments and operations are to be increased. Sinking operations are to be carried on at the Mackey and the main shaft is down 120 feet, and is showing a vein 4 feet wide, most of which is a milling proposition. A steam plant of machinery will be put in, and it is intended to sink this shaft to depth of 500 feet. There is a good tonnage of surface ores which will be taken out through the tunnel, after which all operations will be carried on through the main shaft. The Sarah Jane main tunnel is being driven ahead and is in 530 feet, and it is expected that the Vanderbilt vein will be cut this week. The breast shows ore and in the winze ore has been opened up. After overhauling the Mountz & Palmer mill and adding a concentrating table for trial purposes, they started the mill and it is running on ores from the Mackey. L. J. Mountz is manager of the consolidated properties and mill.

The Evergreen mine, near Central City, is being worked by the Evergreen G. & C. M. Co., with Colorado and Missouri men interested. J. L. Walters is manager. Day and night shifts are at work and the main tunnel is in 200 feet. The tunnel is being driven to get it under the center of

the hill, so that the entire group of claims can be developed from the tunnel by drifting and crosscutting. The Evergreen ore carries copper values, with gold and silver.

The Missouri & Colorado M. & M. Co., in which Missouri men are interested, owns 100 acres of lode and placer claims at head of Silver creek, near Central City, and W. C. Hollister is manager. At present the company is confining its operations to the Snowdon group, adjoining its own group, and which is being worked under a lease and bond. The main lower tunnel on the Snowdon group is in 400 feet, and in the main part of the tunnel they have opened up 6 feet of free milling ore which carries values of $6 per ton. They are stoping and the vein in the stope is 3 feet wide. The company is making tests of these ores to determine the most economical method of handling them with a view to building a mill. Besides concentrating and milling their ores they are having them tested with cyanide. Last week they shipped a car of smelting ores. The company intends to raise from the lower tunnel to the surface with a view of operating the property through a central shaft for development of the entire group. When this raise is made they will put in machinery to gain additional depth. The Missouri & Colorado Co. has developed the Old Ann or main shaft on its group to depth of 425 feet, and intends to resume operations there and do considerable work in drifting and crosscutting. It is equipped with a steam plant and top buildings.

Gunnison County.

At Bowerman a vein was opened in the Omy lode on the Copper mountain property of the Corona G. M. Co. It was cut in the tunnel at 112 feet from the portal. The quartz is 18 inches wide and assays $40 in gold. The tunnel is being pushed ahead to cut the contact between the diorite and the granite, where ore bodies are expected, says Superintendent W. J. Nourse.

The galena-lead camp of White Pine, on upper Tomichi creek, is 25 miles on an air line across the range from Salida, and near the Chaffee-Gunnison county line. Work in mining, milling and smelting is increasing. In addition to development under way by the several older companies operating here, many new companies have begun work.——The Spar C. M. & T. Co. is rapidly advancing its tunnel on the vein of gold-bearing copper sulphides. This ore nets $30 per ton at the Salida furnaces. The Spar Co. is composed of men interested in the Cripple Creek Homestake Co., operating a cyanide proposition on Ironclad hill. W. F. McIntyre of Chicago, Ill., and F. W. Downs of Davenport, Iowa, are interested. They are also owners in the Colorado L., M. & R. Co., operating the Page cyanide mill at Florence, and the Decker mine at Cripple Creek.—— The Clover Mountain Con. M. Co., J. V. Sheppard president, is increasing development, adding to its ore reserves of milling quality. The properties are near the Brittle Silver and Legal Tender mines at Camp Sherrod. E. C. Hare of Rochester, N. Y., is interested and says they propose building a mill.——The Congress G. M. & M. Co. of Hartford, Conn., has been organized by Hartford, Conn., men and is starting operations on Galena creek on the zinc-lead belt near the Eureka and Erie mines. Operations are in charge of G. Williams of Denver and F. A. Porter of White Pine. Buildings are being erected and machinery set up to advance the tunnel on the deposits of gold-zinc-lead sulphides. An air compressor plant is being placed.

Hinsdale County.

L. Wagner, who has a bond and lease on the Big Casino group on Henson creek, near Lake City, is increasing development. Since he took hold of the Big Casino 50 feet of sinking has been done in a body of high-grade silver-lead ore.

Lake County.

A body of ore has been opened in sinking the Cleveland shaft of the New Monarch M. Co., at Leadville, being quartz with a streak running through it that carried high values in gold. The air in the property was bad, so Manager Goodwin decided to connect the shaft with the Winnie by drift and a body of iron sulphide was opened about half way that is said to run 5 ounces gold, 37 ounces silver and 10% lead. The drift will be continued until connection is made with the Winnie shaft. The sinking of the New Monarch shaft will be started by the 20th inst.

An output of 65,000 tons was shipped from Leadville mines during month of May. There was a slight falling off in the tonnage of some kinds of ore, but this was more than made up by the shipments of other kinds and the signing of contracts for ore, which will add to the tonnage in the coming months. The tonnage handled by the American S. & R. Co. was about 45,000 tons during May. The production of oxidized iron ore was cut down 5000 tons during the month, because there was more of that class of ore than could be handled by the smelter. This was the only curtailment of ore during the month. Contracts were made for manganese ore by the Colorado F. & I. Co. which is expected to result in shipments of that class of ore in excess of the amount of oxidized ore cut off. These shipments have been commenced. The zinc shipments during May were slightly in excess of those for April.

Manager MacDonald of the Arkansas Valley smelting plant at Leadville says another furnace has been put into operation.

With the discovery of $100 ore in the Nisi Prius mine, the opening up of bodies of iron and manganese ore, and a body of high grade silver ore in the Cloud City mine, and the finding of ore which runs 10 ounces in gold, 37 ounces in silver and 10% lead, in the drift between the Cleveland and Little Winnie, last week, mining is improving, says the Carbonate Chronicle.

La Plata County.

At Durango the Neglected mine is closed down temporarily. A larger mill will be built 1 mile from the mine and an aerial tramway installed. A heavier plant of mining machinery will be put in for sinking deeper. The mine has paid $12 per ton on all ore and concentrates to Durango and $12 on all supplies going in. The State a year ago appropriated $5000 for building a wagon road, contemplating that La Plata county would furnish enough money to make up, but the county has failed to do this.

San Miguel County.

U. S. Circuit Judge A. M. Thayer, at St. Louis, Mo., on the 15th inst., granted the application of C. H. Moyer, president of the Western Federation of Miners, for a writ of habeas corpus, directing that Moyer be brought before him on July 5. The writ is directed against Governor J. H. Peabody of Colorado, Adjutant-General Bell and Captain B. Wells of the Colorado National Guard, to show cause why Moyer is being restrained in "the bull pen" at Telluride. On the same date, Governor Peabody issued an order declaring martial law in San Miguel county at an end, declaring the release of the troops from duty and ordering Captain Wells, in command of the troops, to turn over to the civil authorities President C. H. Moyer of the Western Federation of Miners.

Summit County.

(Special Correspondence).—G. H. Evans & Co. have a body of ore opened in the Wellington mine in French gulch near Breckenridge. Values are in silver, lead and zinc. A streak of high grade galena is showing. One miner on this is said to take out enough each month to meet the pay roll and other expenses of ten men. The entire vein is in places seventeen feet between walls. It is opened by a crosscut and there are 350 feet of backs. A lot of low grade ore in this property is ready for a mill.

The French Gulch placer mine is in full operation. It has an Evans elevator working with a 67-foot lift. Manager Dwyer, of the North American M. Co., on Swan river, has the Bucyrus dredge running. It is working in ground about 50 feet to bedrock.

The Oro Grande M. Co., 1 mile below Dillon, has three elevators covered in a slide, but will be all right in a few days. Manager Mathews has about thirty men on the payroll.

The Gold Pan M. Co., G. H. Evans, manager, has ninety men on the payroll. Three elevators are working with a 97½-foot lift, all doing satisfactory work. A belt conveyor for handling boulders is in operation. They also have two dirigible cranes and one Evans cable hoist for handling rock and other material.

The Jessie M. Co. has its mine and mill in full operation on silver-lead ores. A large number of leasers are doing well in this camp in the silver-lead mines, also in the gold mines. This county has produced about $1,000,000 yearly for thirty years—this, too, in spite of the inaccessibility of a good part of it during at least one-half the year. This season promises well, as there is an abundant supply of water.

Breckenridge, June 12.

(Special Correspondence).—The Masontown M. & M. Co. dropped its stamps and began operations at its milling and cyanide plant on June 1st. This company was organized in October, 1903, and bought from L. Mattson of Frisco the group of claims known as the Victoria mines. For the past seven months men have been employed in erection of the mill, assay and other offices and camp buildings, and in opening up the mine to put it into shape for steady and larger production. That point is now considered reached. The ore from the mines is trammed from the lowest tunnel directly into the mill, where it is fed to an ore crusher and into bins, which supply the automatic feeders for the twenty stamps. After amalgamating the free gold on the plates, the pulp runs to leaching tanks, where it is cyanided. The liquor is then drawn off into the gold solution tanks and run through zinc boxes. The clean-up room is equipped with sump tanks, acid tank, pump, vacuum pump, smelting and drying furnaces. The zinc-gold precipitates will be treated there. The mill is lighted by electricity, as are also the mine, assay department, offices, quarters and camp generally. D. H. Lawrance is consulting engineer for the company and is in charge of milling and cyanide operations. A. E. Keables is manager and secretary; and J. V. Hoover of Masontown, Penn., is president.

Frisco, June 13.

A tunnel to cut the veins of the Ten Mile range at Geneva lake, 3 miles above Frisco, will be driven. The mouth of the tunnel opens above the Ten Mile river and the tracks of the Denver & Rio Grande and Colorado & Southern railways. This enterprise is under management of the North American M. Co. A contract has been let to drive the tunnel 500 feet, in which distance several veins will be opened. When completed the total length of the tunnel will be not less than 3000 feet and it will attain a depth of 3000 feet under the crest of the Ten Mile range, intersecting twenty fissures and contact veins in that distance.

Teller County.

G. L. Keener, operating a lease on the Globe and Lady Stitb claims of the Stratton estate, on Globe hill, Cripple Creek, shipped out during May 1550 tons, which gave average returns of one ounce gold per ton. Keener was breaking the ore down from a 30-foot vein from a stope, which had gone through to the surface, making a hole in the ground 125 feet wide, says the Times. The ore was gouged out and run through the tunnel for a distance of 500 feet, loaded into wagons and shipped to the mill. Keener, however, has found this vein cut off, and will now have to do crosscutting and development work to recover it.

El Paso mine on Beacon hill, Cripple Creek, shipped out during month of May 900 tons of ore, which gave values of $70 per ton, or a total of $63,000, says the Gazette. Besides this four cars, containing 100 tons of ore, returned gross values of $14,000 to the car, or $56,000 in all, making a gross total for the month of $119,000. ——On the Doctor-Jack Pot Co. ground on Raven hill six sets of lessees sent out 420 tons during May, which gave average returns of $30 per ton. The tonnage would have been much larger had it not been that a large amount of development work was in progress.——The output of the Pullen & Mayhew lease on the Jerry Johnson, on Ironclad hill, aggregated 200 tons for the month, with average value of $60 per ton. The Pullen & Mayhew lease expires July 1.

Affairs in the Cripple Creek district have quieted down and over 200 union miners and their sympathizers have been deported by the military to Kansas, New Mexico and Utah. Most of the mines have resumed operations, except the Portland, which was closed down by General Bell, as a "military necessity."

IDAHO.

Bannock County.

In Portsmouth canyon, 6 miles south of Pocatello, H. A. Jacobs, treasurer of the Portsmouth M. & M. Co., says operations are progressing on the company's mines. The company has holdings in Portsmouth canyon and in Black Rock creek. Sinking on the former the management has, at a depth of 76 feet, struck ores carrying copper and silver, with some gold and lead. To afford a more economical outlet and to open up the ledge at a depth of 450 feet, a tunnel is being driven, connection to be made at 200 feet distant from the present breast. The mouth of this tunnel is above railroad tracks of the Oregon Short Line.—— The Roder group on Black Rock creek has been prospected on the surface with ore showing 10% copper. To get under this depth the company is driving a tunnel which has penetrated the zone for 230 feet, 200 feet more being required. To reach the Short Line with the ores from this source a haul of a mile and a half is required. The company has been incorporated by H. A. Jacobs, S. Lewis, G. Brough, J. Borer, W. E. Slater of Pocatello, and H. Markowitz of New York City.

Idaho County.

(Special Correspondence). — Developments on the H. Y. group are meeting with satisfactory results. J. B. Whitlock, superintendent, reports the tunnel driven to cut the shoot of ore on the Dakota claim has reached 310 feet and values are showing. Assays taken at regular intervals have averaged $6 per ton for 300 feet. At 304 feet a high-grade shoot was cut. The Mullie tunnel, on same group, has been driven 52 feet and values at the face give $60 per ton. A 20-stamp mill is being arranged for.

The double-compartment shaft on the Climax mine is down 64 feet in soft ore and quartz. An assay of the ore from the bottom of the shaft shows gold values.

At the Sunnyside mine Superintendent Abbott reports the west crosscut, started in January, has been driven 208 feet and drifted on for 137 feet, and, with raises and winzes, has opened up the ore body. This ore averages $8 per ton. Within this area, 42 feet in length of the crosscut gave an average of $33 per ton. The Burr Oak tunnel has reached 1390 feet and is in [illegible]rhyolite, yielding marcasite, and is getting wet.

The Dewey mine is being steadily developed toward the south; the work has opened up a stope 70 feet wide that shows satisfactory values.——The tunnel on the Mysterious Slide group of five claims has been driven 430 feet and values obtained; sulphides in petrified wood and charcoal are some of the peculiar features met with in the tunnel.

Pack trains are starting and bids for transportation of several hundred tons of freight are being asked for. The season promises to be more active in development and installation of mining plants than any former year.

Roosevelt, June 10.

J. B. Eldridge, manager of the Independence mine near Roosevelt, reports the ores of that mine amenable to the cyanide process, and that they will be worked, says the Boise Statesman.

The Thunder Mountain Gold Reef M. Co., near Roosevelt, has bought the Mayflower group and has been working during the winter. The work is under the management of J. Jewell and ore has been taken out that will be shipped as soon as the roads are open. Two shifts are being worked, driving crosscuts to tap the ore shoot, and ore from other portions of the lead will be taken to the outside to be tested for determining the proper method to treat the main ore body.

Shoshone County.

The Wake Up Jim G. M. Co. has been incorporated at Wallace. The properties of the company are quartz claims in Beaver and Summit districts. The following are the incorporators: C. S. Crysler, T. Shuster, A. B. and J. A. Ward and B. M. Crysler.

After a closedown of six months, the Gold Hunter mill, at Mullan, has started grinding again, says Manager J. Gearon. About thirty men are employed, and this number will be increased.

The main Hercules lead has been cut on the Ajax property, says A. J. McAlpine of Spokane, Wash., secretary and treasurer of the Ajax Co. The mine is 1½ mile from Burke, and adjoins the Hercules mine on the east. Near the west end of the property they have a tunnel in 110 feet. Lately they have been working on the east end of the property and last week miners went into the old tunnel on west end and found galena. Men have been put to work in this tunnel drifting toward the Hercules.——Near Burke, the Moonlight has men driving a 1000-foot crosscut tunnel, which is in 600 feet.—— The Benton is making a showing. Ore is being taken out of the Oom Paul. The Humming Bird, at Burke, is working five men.

It is intended to open up the Black Bear fraction this summer, says P. Bernier of Wallace, Idaho, part owner. The property is a quarter of a mile from Gem, and adjoins the Frisco mine. A tunnel 2500 feet long will be driven to tap the ledge at depth of 1400 feet.

The Stewart mine, on the ridge between Government and Sierra Nevada gulches, near Wardner, is shipping ore, a spur having been put in for the purpose. They have put in a Cornish jig for treating the second-class ore.

Owyhee County.

A. F. Stevens, manager of the Addie mine, near Silver City, is preparing to increase equipment for the mill before starting a run on the ore being taken out. He has completed a survey for the raise to be made to connect the tunnel with the Calaveras shaft, 400 feet above it, to get air. The shoot of ore in the tunnel is being opened up. They are timbering behind the face and found in cutting hitches in the walls that there was still rich ore behind what they had taken to be the walls. They are now in the Calaveras ground.

Washington County.

In Seven Devils district, near Weiser, the Ladd Metals Co. has a grant of several acres of land at Landore and will begin work on construction of a smelting plant, says the Weiser Signal. It is also stated that the Ladd Metals Co. will begin moving to Landore this week; all the ma-

chinery and supplies of the company at Homestead, Or., where they first proposed building. It is also stated the Ladd company has secured control of the Blue Jacket, White Monument, Peacock and Helena mines, owned by the American M. Co., which they will operate in connection with their smelting plant. These mines are producers of copper ore.

MISSOURI.

Jasper County.

W. R. Caulkins, manager of the Golden Rod mine (the Yellow Dog), states that they are making 74,600 pounds of zinc ore and 10,000 pounds of lead ore on each day's run. He also states that the mine is clearing $1100 per day. They have put down a well 150 feet deep for water to use in their boilers. This mine is ½ mile north of Webb City. The American Co. is said to have struck the same run of ore north of Center creek.

The Durby & Bryant M. Co.'s ore at Neck City brought the top price last week of $39. Their mine is on the Smallhouse land and they are hoisting 250 tubs of dirt a day and making sixty tons a week of 64% ore.

The Portland M. Co., under the management of G. Y. Bast, is making turnins of both lead and jack. A mill is proposed for a shaft which the Portland Co. has finished near Webb City.——O. J. Raymond of Webb City has started a shaft on the Burgner land.——Ashcraft & Burcb have started a shaft on the drill hole on the Ashcraft & Reynolds land north of Webb City, and are down with it 40 feet. Tbe drill log shows lead and jack, shallow as well as the deep sheet run of ore. The drill has been moved to the northeast corner of the land next to the Golden Rod mine, and another hole will be drilled.

O. E. Duenweg of tbe Cornucopia M. Co., on the Eclipse lease at Alba, reports that he has rented the Cornucopia mine and mill to Alba and Carthage men.——J. M. Stewart has his electric mill under cover and is making progress on the interior works. Mr. Stewart reports a strike in one of his drifts.——T. Coyne is setting up the electrical equipment for his mill on the Missouri Zinc Fields ground.

The work of developing the Vancil lease of forty acres at Prosperity continues. This tract adjoins the Aylor forty.——A sub-lease on the Vancil forty owned by F. E. Carringer and J. Vancil is making satisfactory showing. Three-fourths of this sub-lease is held by Carringer. A drift was driven at a depth of 180 feet and a body of lead and zinc ore struck. A drill hole was put down on the lease 300 feet west of the shaft and a 14-foot face of ore found at 160 feet.——Patton & Dodge of Webb City have bought an interest in the J. P. lease on the Vancil land and tbe name has been changed to tbe Eleven O'clock, the shaft being north of the Ten O'clock. The shaft is down 50 feet. The drill hole showed a 27-foot face of ore, for which the company is sinking.

O. W. Sparks, E. H. Cullison and L. H. Winter of Joplin, interested in a mining tract at Badger, have sunk a shaft on the Riverside mine. They have reached a depth of 150 feet, where they struck a 15-foot ore body. There is a crusher on the ground and they report making ten to twelve tons of jack per shift.

The highest price reported paid for zinc ore at Joplin last week was $38 per ton for one bin of 64% zinc, but this lot of ore was not loaded. However, some ore bougbt the previous week and loaded last week brought that price. The assay basis price was quoted from $32 to $35 per ton of 60% zinc, says the News-Herald. ——The shipment last week was the smallest in zinc, in lead and in value of any week of the year. It was the smallest since the second week in December, when all the smelters were restricting their purchases. In fact, that is the present situation. The reserve stock has been increased in two weeks to 2000 tons. The excuse was made that a lack of cars prevented loading the ore. Even with the night shifts taken off at most of the mines and the output already reduced about 500 tons from this cause and the heavy rains of last week, it is more than probable that more ore will be added to the reserve again this week.——Lead likewise suffered a decrease in price and the shipment was correspondingly reduced.

The Millard M. Co. of Carthage has been incorporated by J. H. and J. V. Millard, D. M. Knigbt, S. A. Sylvester, J. D. Bing, G. L. Jameson, W. E. Gilchrist, R. C. Baker, J. Netcott, P. C. Heege and G. Chandler.——The Lehigh M. & M. Co. of Carl Junction has beeu incorporated by T. C. Reddish, O. F. Elliott, D. Stiers and C. F. Smith.

Manager Conukey of the company which is building the Gravity mill at the Incline shaft, near Webb City, says tbe mill will be completed this week. It is built on tbe gravity system, requiring no power in transmitting the dirt from the crusher to the rolls, and from the rolls to the jigs, etc. A series of screens will also size the dirt for the jigs. The mill will be run by electric power supplied by the Southwest Missouri E. L. Co., whose plant is at Grand Falls. This company expects to build a transformer station on the hill near the Incline mine. The motor for the mill will be a 75 H. P. —— The Ashcraft mill, owned by the Nicholson M. Co., has been rebuilt and is ready to be put in operation.

At Sarcoxie J. J. Dinkelbihler, of Joplin, is preparing to develop lead and zinc prospects on the Roper land. He says the mineral face is 30 feet wide and 90 to 100 feet deep.

The Cornucopia L. Co., of which G. F. Wittmer, of Carthage, is president, has a lease of forty acres on the Ware farm, 1 mile northeast of the United Zinc Co. mines, in Peacock Valley. A strike of jack was made in the first drill hole last week at a depth of 186 feet.

Serage Bros. have started building a lead smelter on the site of the one recently destroyed by fire. near Joplin. Manager C. B. Serage states it will be completed by July 1.

In Webb City and Carterville section the Chicago Lead and Zinc Co. on the Guinn land is building a concentrating plant.——The Leo mill, soutb of Prosperity, has been sold to the operators on the Porto Rico lease, and is being moved over and re-erected.——A concentrating plant is being built by Carterville parties on the Burgner land, northeast of the J. Durby mill.——E. Burch, J. Veatch, W. E. Beatty et al. are sinking a shaft on a lease 2 miles southeast of Scotland. Indications are said to be favorable for a shallow lead deposit.

The Premier Lead and Zinc Co. on the Guinn land near Webb City has begun building a mill. The frame work is up and ready for cover. The 10-inch drill hole which was sunk for ventilation purposes, 50 feet south of the head of the south drift, struck a lead prospect.

J. G. Wilbur, W. M. Scott, J. W. Durby, T. S. Creighton and C. B. Rice have organized the Great Scott M. Co. at Carterville.

Lawrence County.

At Aurora the Gold Dust mine on the Kentucky land has been sold to the Allen M. & M. Co. The latter company is still getting out ore from the Little Nugget mine.——Progress is being made in the work of enlarging the Big Bob shaft on the U. Z. ground, which will be put down to a depth of 225 feet, says the News-Herald.

MONTANA.

Deer Lodge County.

The Chicago & Montana G. M. & M. Co. will build a 10-stamp mill this summer at its mines near Cable, says Manager J. C. English. He will begin operations as soon as a roadway can be cut through the snow. The company has been working five men at the mine all winter. Tbe tunnel has been driven 200 feet and they have broken into a body of ore that contains gold. They will sink the shaft, which has depth of 35 feet.

Prospectors are working over the territory west of Anaconda, especially at Olsen gulch and Georgetown Flat, says the Inter-Mountain. Ores are said to carry values in gold.

Flathead County.

The Homestake M. & Dev. Co., composed of Spokane, Wasb., and Eastern meu, has taken up its bond for $25,000 on the Homestake group of seven claims, the Oregon group of three claims and the California group of five claims, near Libby. The Homestake group is within 16 miles of the railroad. The ore bodies carry values in silver and lead. The Oregon group is a copper-gold proposition. On the California group is a ledge 20 feet wide averaging $5. Work has been started.

D. P. Bowers of Latah, Wash., reports he is negotiating for the Silver Cable mine, near Libby, and is preparing to increase operations there. The mine has values in gold, silver and lead, and is 20 miles from transportation. There is a concentrator at the mine and a few men are at work, but it is intended to make the mine a shipper.

NEVADA.

Esmeralda County.

A. H. Mayne of Salt Lake City, Utah, who has bought a group near Sodaville, says he will begin forwarding ore this week. He has an 8-foot ledge showing values in copper, with gold.

Lincoln County.

The Duplex mill has been started up by the Santa Fe M. & M. Co., near Searchlight, with M. McKee in charge. Two shifts are at work. An ore road has beeu built up to the mill and a 40-ton bin erected. At the mine a 50-ton bin has been placed at the head of tbe shaft. Operations are being increased underground to make room for more men. Sinking is in progress in all three shafts, and in No. 1 north and south drifts are being run on both the 50-foot and 100-foot levels.

At the Quartette mine at Searchlight the electric plant has been started up. There is a 25 H. P. dynamo which will be used to generate power for the lighting system and also for operation of the pumps. The station on the 700-foot level is completed and sinking will be resumed.

Washoe County.

At the Standard mine at Olinghouse they have cut through 2 feet of ore carrying $30 per ton in the crosscut tunnel at a depth of 120 feet, says the Wadsworth Dispatch. J. Caravanta and S. Capura are owners.

NEW MEXICO.

Grant County.

J. L. Wells, who has a lease and bond on the Last Chance mine, near Lordsburg, has fitted up the boiler and hoist and put in a pump. Tbe workings have been unwatered. Tle ore is said to run 50% iron, a little manganese and lime and twenty-five ounces in silver.

Development work is being done on the coal fields near Steeple Rock. A number of new locations have been made.

The Chatham smelter at Silver City has been blown in. The furnace bas a daily capacity of 75 tons. A black copper product will be produced. There are about 300 tons of ore on the ground, with regular shipments being made daily from the Burro Mountain and Pinos Altos districts. The site of the smeler is advantageous, with water enough to run a larger plant. It has good dumping facilities and 100 feet from the railroad track. The iron for flux comes from Boston hill and the lessees of the Providential mine at Chloride Flat furnish the lime. W. Clayton is superintendent of the plant.

J. C. Woodward has again taken possession of the Casino mine, in the Burro mountains, south of Silver City, ownership having reverted to him througb forfeiture by the company which bad closed a deal for it. Woodward will resume operations.

The Colorado Fuel & Iron Co. will resume operations at Fierro this week. Arrangements have been made to ship fifty cars of iron ore per day.

The Chatham C. Co. has blown in its smelter at Silver City. The mill is of sixty-ton capacity.——Tbe Comanche M. & M. Co., which bought the Silver City Reduction Works which was burned a year ago, has men at work cleaning up the site. They are taking out all of tbe old machinery which will be repaired, and as much as possible of it used. The smelter will have two 100-ton capacity stacks. It is intended to also build a refinery in connection with tbis plant.—— The headquarters of the American Con. C. Co. will be removed from New York to Cincinnati, O. The company will start development on its properties in Grant county in August.——The National Co. is at Steins Pass drilling for water to be piped to the National mill.

Lincoln County.

The Mescalero M. & M. Co. has bought the Ririe group of nineteen mining claims in the White Mountain district. The principal values are in gold, silver and lead. J. Ririe of Roswell is interested.

Santa Fe County.

The machinery and other equipment owned by the Cochiti G. M. Co. at Madrid have been sold at a receiver's sale for $25,000.

Sierra County.

M. Henesy last week bought tbe interests owned by thirteen parties in the placer fields at Pittsburg, east of Hillsboro, on the Rio Grande river.

Socorro County.

The Dividend M. & M. Co. is developing the leads on Colorado Nos. 1, 2, 3 and 4 claims at Estey City. The ore is carbonate and will be treated in the mill by leaching and precipitation. The mill has two 125 H. P. boilers and four engines from 30 H. P. to 125 H. P. These run crusher, dynamos and blower. Two dynamos run the power and light plant for the camp. The mill and smelter will handle 125 tons a day. The crusher has a daily capacity of 200 tons. The company has a water storage tank of 90,000 gallons capacity and a laboratory and assay office, says the New Mexican.

Owing to the scarcity of water, the mill of the Mogollon G. & C. Co., at Cooney, is hampered. From March 31, 1903, to May 1, 1904, the company shipped 78,049 ounces troy of silver; 182.4 ounces troy of gold; and 1,064,915 pounds of copper. Ore strikes were made on the fourth and the fifth levels near the junction of the Bar and Twig veins.

Taos County.

The South Fork M. Co., of Raton, proposes to build a 100-ton mill at its mines, says Superintendent J. Morris.

OREGON.

Baker County.

President R. J. Davison of the Oregon M. Ex. Co., owning the Snow Creek mine near Greenhorn, and Manager F. D. Smith have made final payment on the Snow Creek property, the sum aggregating $17,500. A reduction plant is in full operation.

The mill on the properties of the Gold Ridge M. Co. at Durkee is in operation again.

W. H. Plummer of Spokane, Wash., and Eastern associates have bought the Cougar mine, near Sumpter, for $600,000. Machinery will be put in to increase the producing capacity.

Clackamas County.

The Molalla Central M. Co. proposes putting in a reduction plant to handle the ore taken from its mine on Ogle creek, near Molalla. Work has been continued on the mine all winter. The ore is gold bearing.

Crook County.

The Red Jacket M. Co., with head office at North Yamhill, having property at Ashwood, is putting in a pumping plant. Work has been shut down on the property for a month. The shutdown was caused by a heavy flow of water in the 300-foot level. As soon as the pump is ready, development work will be resumed.

P. A. Brady, superintendent of the Humboldt and Red Lion mines, in the Greenhorn mountains, near Greenhorn, says sinking will be resumed at the Humboldt this week. The company has bought the Forty-Nine Jimmy, a parallel property, and Brady says the plan is to sink to the 100-foot level, crosscut to the Jimmie lead, a distance of 100 feet, and work this property through the Humboldt shaft. The shaft is down 70 feet. The Humboldt was equipped with a 500-foot depth plant last summer. Machinery for a mill will be put in on the Red Lion.

Grant County.

A. H. Willett, of Portland, M. L. Byck and W. P. LaRoche, of Savannah, Ga., have bought one-quarter interest in the Copperopolis C. Co., for $30,000. The company's holdings are in Quartzburg mining district. They will build a concentrating and leaching plant, which it is proposed to have in operation by January 1 of next year. The present equipment includes a compressor plant for operating air drills and steam power, a 100-light electric dynamo, operated by water power, and 1200 feet of flume for conveying water to the power plant and buildings. Ten claims are included, comprising 200 acres, and ore bas been opened up carrying values in copper, with gold and silver. Tbe property is on tbe west fork of Dixie creek, and near the north end of Cougar ridge. The mill to be built will be of 100 tons capacity. During the present year the extension of the Sumpter Valley Railroad to Prairie City will give the advantage of railroad connection only 3 miles distant, with easy grade and good road. The railroad will be built along Dixie creek.

Jackson County.

At the Shorty-Hope mines, near Ashland, it is reported the night and day shifts are still drifting on the Golden Spike ledge and are in 508 feet. The vein has widened. The 401 feet of 8-inch galvanized iron pipe has been put in place; extending from the raise to the face of the drift, this pipe ventilates the tunnel and removes the gases after shooting. The officers of the company are considering putting in air compressor, receivers, drills, hoists, pumps, etc., the compressor to be run by water power.

Josephine County.

Machinery for the Takilma smelter at Takilma is on the ground. Shipment included an 80 H. P. boiler, a Connersville blower with direct connection with 60 H. P. engine, and engine and dynamo with a 20 H. P. engine for the sampler. Smelting will be started about July 1st. Other machinery is arriving, says Superintendent A. I. Goodell.

The Granite Hill mines, near Grants Pass, are being developed and equipped by the American G. F. Co., of Chicago, Ill., of which W. J. Morphy is manager and L. Y. Wickersham superintendent. In the mill, a six-drill compressor, a 65 H. P. engine, an electric dynamo, with separate engine and a 120 H. P. boiler, are at work. Ten 1000-pound stamps and four Frue vanners are being set up and will be put in operation next week. Superintendent Wickersham says they propose putting in ten more stamps by the close of summer. The main shaft is being sunk by machine drills on three eight-hour shifts. Other drills are at work in the drifts on the two levels and a body of ore is being uncovered. Free gold, pyrite and galena are showing.

About 500 men are on the payroll of the Granite Hill, and this list will be increased.

For $15,000 the Golden Wedge mine has been sold to Wilmington, Del., men. The property has a 2-stamp mill. The values are in gold. It is intended to put in a larger plant and operate the property. The mine is near Galice creek. A. B. Cousin of the Galice Con. Co., near Grants Pass, is interested.

SOUTH DAKOTA.

Lawrence County.

The Bear Gulch M. & M. Co. is developing its gold and tin prospects along Bear Gulch, near Tinton. The company's ground covers 400 acres, and adjoins the Tinton Tin Co. group. W. E. Fritt, of Chicago, Ill., is secretary of the company.

The Minnesota M. Co., which bought the Garden City M. Co. group, the Bill Phillips property, and the Waller millsite, at Maitland, has started its shaft on north end of the Garden City group. A wagon road has been opened by the company to the sito of the shaft.

Pennington County.

It is reported the Montana mine, near Rochford, has resumed operations. Shaft sinking is under way.

UTAH.

Box Elder County.

The management of the Iona M. Co. of Park Valley is preparing to build a mill. Extensive bodies of milling ore are being developed, similar in character to those in the Century, says Manager Madson. He expects to have the plant in operation by October 1st. —— Superintendent C. J. Peterson says a shipment of concentrates from the Century mine was forwarded last week. On the same car were eight tons of high-grade galena, which, he says, assays 65% lead, 45 ounces in silver and $6 in gold.

The Sunrise mine, near the Century mine of Park valley, will be equipped with machinery and started up, says Manager Simon. The ore is gold-bearing.

Juab County.

About forty men are on the payroll at the Uncle Sam mine, near Eureka. The mill has ten men.

The management of the Centennial-Eureka mine in Tintic at Eureka is increasing work. The ore bodies which yielded values on the upper levels have been opened on the 1400-foot level, and are being blocked out, says General Superintendent Allen.

Salt Lake County.

Twenty cars of concentrates were dispatched from the Utah C. Co. concentrator at Bingham during month of May.

L. La Vine of Boston, Mass., manager of the Bingham West Dip Tunnel enterprise, is arranging to start development. A compressor plant and other machinery are going in. A road has also been built from the railroad to the mines, a distance of 4 miles. The principal works of the company are on west side of the Oquirrh range of mountains, where a tunnel 5x6.8 feet in the clear with 2x3-foot water drainage beneath track, has been driven to 300 feet. The tunnel is headed southeast and will tap some of the principal veins of the West Mountain district at depths ranging to 2000 feet. The tunnel will serve also to drain the mines of the district.

The delivery of copper, gold and silver-bearing matte from the Yampa smelter in Bingham canyon at Bingham to the converters of the valley has been resumed after an interval of thirty days, during which the company's plant has been remodeled, under direction of Superintendent Bellinger.

Salt Lake City reports say 200 miners employed in the mines at Bingham, 20 miles from Salt Lake City, were discharged on the 14th inst. in consequence of taking a day off without permission. Notices were posted at all of the mines in Bingham several days before notifying employes that if they took a lay off on Miners' Union day they would be discharged. A large number of the men contended that they were entitled to their annual holiday and disregarded the notice and the wholesale discharge followed.

At a distance of 6200 feet from its mouth the tunnel with which management of the Bingham Con. is draining the Dalton & Lark group of mines at Bingham is opening up the Brooklyn ledge, with which connection was made last week, says Manager MacVichie. The station at which connection was made is 1400 feet below the apex of the ledge. To connect with the main channel in the Miner's Dream, in which ore is exposed above, they will be required to drive 800 feet from the point at which the intersection with the ledge was made. Adapting the course of the tunnel to the strike of the ledge a variation of 45° has been necessary, and this change has been made. The flow of water from the tunnel has been reduced to about 1600 gallons per minute, with very little appearing in the breast, says Manager MacVichio.

At Alta shipments of high grade ore have been resumed from the Alta-Quincy mine. The Alta-Quincy is on the south side of Little Cottonwood Canyon, south of the Columbus Con. group, and also adjoins the South Columbus. The vein opened in the Alta-Quincy is said to show a width of 25 feet, mostly milling ore, which will be concentrated. There is, however, ore of a grade which will warrant shipment direct to the valley smelters.

Manager Lavagnino of the Butterfield mines at Bingham is continuing development work. Soon after operations began in the Eagle Bird vein, in the Queen tunnel level, a body of shipping and milling ore was cut into. From development work nearly 3000 tons of ore are on the dump. The concentrator at the mouth of the Queen tunnel, undergoing changes, will be ready to start up in July with a daily capacity of fifty tons. It was formerly a stamp mill, but rolls, jigs and other machinery are being added.

Sevier County.

The Live Oak M. Co. has been organized at Richfield to develop eight lode claims in Sevier county. The officers are W. W. Clark, O. Keeler and E. Clark.

Summit County.

Work on the Brown Eagle mine, in Elkhorn district, near Park City, was started last week and a shaft is being sunk. The surface showing is encouraging.——The approach of summer has been the cause of placing a number of jigs on the creek in Woodside canyon, flowing from the King mill, says the Park Record. Jigs have also been set up in Empire canyon, near the old Daly dump, and good values are reported as being obtained by the parties operating them.

Tooele County.

Preparations are under way for starting work on the 800-foot level of the Honerine mine at Stockton. This level has been drained by the tunnel. The retimbering of the intermediate shaft will begin this week, Manager Snyder says, and the work of sinking to the tunnel level will be started. The arrival of the machinery for the new sampler has been delayed.

WASHINGTON.

Ferry County.

W. J. Casey et al. have started development work on the Art Dumont, a silver-lead mine on the Thirty-mile divide, 2 miles northwest of the Congress mine, on Bridge creek, near Republic. There is a 60-foot shaft and a tunnel has been driven 200 feet. This taps the ledge at depth of 150 feet below apex. The ledge is 7 feet in width; of this 5 feet is said to be shipping ore. The mine will be made ready for stoping. The wagon haul will be about 15 miles. All but four of this will be over the Republic-Keller wagon road.——G. W. Spence has a group of claims on Ninemile, 15 miles east of Keller, which are being opened up.

After testing the ores of the Mountain Lion mine at Republic, the mill has been closed down and the shipping of ore to the smelters will be resumed.

Stevens County.

G. B. Dennis, C. E. Mitchell and J. C. Kleber, of Spokane, are preparing to develop a group of molybdenum mines, 15 miles from Bossburg. A mill will be built.

Plans for increasing the output of the quarries of the Crystal Marble Co. and enlarging the finishing plant in Spokane are being made. G. M. Annis, president of the company, says they are working fifteen men at the quarries, near Colville. It is intended to put in additional machinery at the quarries this summer, including two derricks and a channeler. The plant in Spokane will be enlarged to three times its present size.——J. N. Jones, of Spokane, secretary of the Great Western Marble & Onyx Co., which owns quarries at Blue creek, in Stevens county, says the company's plant has been idle since December 25. They are waiting to put in finishing machinery to market the product. The quarries are opened up.

WYOMING.

Carbon County.

El Rey gold mine, on Purgatory gulch, near Encampment, is being prospected. The work is being done on the ore shoot which was opened last winter. A stamp mill is being figured upon, says Manager P. Lee. Superintendent Watson says the ore carries free gold. El Rey is owned by the Consolidated G., C. & Coal Co., backed by Pennsylvania coal men.

The North American Copper Co. concentrator at Grand Encampment is in full operation, with R. B. Lamb as superintendent. The capacity of the mill has been increased and the cost of operation decreased. A better grade of jig and table concentrates is being produced, the concentrates averaging 29% and the table concentrates 30% copper, says the Encampment Herald.——Another change is the cutting out of the roaster, which is not at present used. It is planned to do away with roasting concentrates altogether, and the skip track which led from the mill to the roaster has been taken up and relaid from the mill direct to the smelter bins.——The water wheel that operated the crusher on the first floor has been taken out and a 20 H. P. direct-current motor substituted. This motor drives the crusher and conveyor No. 1. The ore after being crushed is elevated to a ¾-mesh screen, from which the undersize goes to ore bins below and oversize to rolls. From the ore bins the material is raised on elevator No. 2 and divided into two parts. The ore passes into a 2-mesh screen, and oversize of this screen, which is undersize of ¾-mesh, goes to first jig, called the coarse jig, while undersize goes into the second screen, which is 5-mesh. Oversize of 5-mesh screen, which is undersize of 2-mesh, goes to the second jig, which produces medium product. Undersize of 5-mesh goes to classifiers. Product from first pocket of classifiers goes to the sixth course tables. These tables make three products—concentrates, middlings and tailings. The concentrates go to the smelter bins, the tailings to waste, and the middlings to the third elevator and are carried up with the middlings from the first and second jigs into a 6-mesh screen. Undersize goes to classifiers and oversize to the third jig.——Product of second pocket of classifiers goes to three tables on either side of concentrator floor, the next pocket to six other tables. The overflow from first set of classifiers is handled by a separate type of classifiers, the product from the first pocket going to one table, next to another and the balance to a Wilfley slimes table. There are three jigs in each unit, two double 2-screen and one single 2-screen. The outside jig on each unit is the coarse jig, and makes an intermittent bed product only. The second or middle jig makes a continuous bed product, while the third makes a "hutch" product.

Two of the jigs on the A side were built at Encampment. They are of the latest Hartz type, the others being an older type with semi-circular bottoms. Each jig is run at a different speed and stroke. The first jig has the longest stroke and slowest speed, the second a shorter stroke and greater speed, and the third takes still shorter stroke and higher speed—the stroke and speed varying with character of ore.

There are eleven trommels in the mill, one common to both units and five on each unit. There are two elevators common to both units, and one elevator to each unit, and eight dewatering screens to each unit. Changes have also been made in the four 14x27 rolls. They have been fitted with a new type of dewatering feed boxes and with back springs to take the motion off the tension spring. Wooden cheek plates have been added. The rolls have been converted into friction-driven rolls and fitted with paper driving pulleys and friction clutches. There are two rolls to each unit, one crushing the intermediate product and the other the final product of the rolls. The roll common to both units is 16x30. By a system of dewatering launders the product is passed to a settling box, going from there to elevators and passing to the jigs.——The slimes tables are not used to any extent. Tailings are pumped into a flume which empties on the ground on east side of river. A centrifugal pump, with 8-inch suction and 6-inch delivery, is used, being capable of delivering 1200 gallons of pulp per minute.——A new system of reporting work has been instituted in the mill as well as in all other departments of the plant. Every millman makes out his individual report for each shift and this information embodied in a general concentrator report. Daily postings are made of tailings and concentrate assays for guidance of millmen in their work. The table concentrates show an average of 10% silica, while the jig concentrates contain an average of 15% to 16% silica. ——Concentrates are passed from the jigs to the bins, and by a system of tramways both jig and table concentrates are brought to a common point and conveyed to the smelter by skip. Every bucket of material is weighed, and assays for silica, copper and moisture are made for smelter purposes. By this method definite information is secured on every ton of concentrates handled. The skip is operated by an electric hoist, carrying three-fourths of a ton per load.——Another improvement is a 42,000-gallon water tank, being built south of the mill, from which tank the mill will be supplied. Including the man who operates the aerial tram and skip, and the man in charge of the power house, the entire working force of the mill for a twenty-four-hour run has been cut down to twenty-five men. While the mill was originally built for a capacity of 300 tons, the former management expected it to handle only 200 tons. Superintendent Lamb says during a run of twenty-four hours he handled 400 tons of ore, dry weight, and turned out fifty-one tons of concentrates. It cannot be stated at this time just what the maximum limit of the mill will be, as the launders are not of sufficient size to handle the amount of material which the other parts of the mill will send down to them. The launders are being enlarged. The mill has made 650 tons of concentrates since start-up in April.——The smelter of the company has been blown in and copper bullion is being turned out. E. K. Hum is general manager of the company.

FOREIGN.

AFRICA.

Transvaal.

The details of the accident at the Robinson Deep mine at Johannesburg, April 25 last, have been made known by the official inquiry. It shows that there were no safety clutches, as the shaft is equipped with steel guides. The rope, which was of the flat type, broke as the cage neared the surface, dropping forty-five men 2000 feet to the bottom of the shaft. It was an 8-ton rope, with a breaking strain (new) of 113 tons.

AUSTRALIA.

Since the beginning of the present year gold to the value of $23,088,565 has been shipped to all countries, a falling off of $5,158,545 for the corresponding period of last year, writes J. P. Bray, U. S. Consul-General at Melbourne.

Victoria.

The gold returns for the central division of the Ballarat mining district for the quarter ending March 31st show 38,008 tons of quartz were reduced for 12,555¼ ozs. of gold. In addition, 335 ozs. 2 dwts. were obtained from cyanide, 19 ozs. 3 dwts. from tailings and 80 ozs. 5 dwts. from alluvial, making a total of 13,009 ozs. 14 dwts. Dividends to the extent of £6150 were paid. For the corresponding period of last year 40,026 tons were treated for 12,030 ozs., and alluvial, pyrites, etc., brought the total amount of gold produced to 12,821 ozs.; and dividends reached £2000.

The March gold yield of the Bendigo district reached 24,031 ozs. This is said to be the highest return for March in any year since 1876, and with two exceptions is the best for any month for twenty-one years past. The total yield for the first quarter of the year is 60,505 ozs., being an increase of 14,147 ozs. over the aggregate for the corresponding period of last year.

BRITISH COLUMBIA.

Boundary District.

Van Debogart Bros. and J. Falls are at Hall Siding opening up their placer lease. They have 160 acres of ground half a mile from the railroad track, and on either side of Hall Creek leased from the Government. Work has resulted in finding coarse gold, besides a large amount of black sand carrying values. If the tests which are being made on this black sand prove satisfactory a hydraulic plant will be set up.

About 800 H. P. of electrical machinery is being set up in the British Columbia C. Co.'s smelter at Greenwood, says D. McIntosh. Two more convertors have been blown in. Bonds and leases are being taken on a number of properties, and much development work is being done. ——M. Kane et al. of Greenwood have a bond on the Mavis property. A. Miller of Greenwood has bonds on the Helen from the Helen M. Co. and the Barber from G. R. Naden & Co. Work has been started on all these.

W. T. Smith and J. Haas have a bond on the properties owned by the Boundary Creek M. & M. Co., near Greenwood, and have started work on the Spokane claim. Work is being resumed on the Defiance, which was idle all winter, and a hoist, a pump and other machinery are being put in. These are silver and gold producers.

The Oro Denoro is shipping 50 to 100 tons a day to the Granby. The Emma is shipping ore to the Granby, the Greenwood, the Trail and to the Hall Mines smelter. The ore is said to be valuable for fluxing.

East Kootenay District.

Operations have been resumed on Bull river, near Fort Steele, by the Gold River M. & P. Co. The company will build a dam across Bull river 2 miles above the Pack bridge, and from this point to the diggings a flume 16x5 feet will be constructed, which will be about 1½ mile in length. The equipment of the company will consist of hydraulic pipe, monitors and sluices, and a sawmill capable of cut-

ting 20,000 feet of lumber daily, which will be used in the construction of the dam and the flume. Superintendent D. S. Guinter has forty-five men at work.

Lillooet District.

(Special Correspondence).—The Iowa-Lillooet G. M. Co., Ltd., C. T. Hancock of Dubuque, Iowa, president, has built a gold dredger on the Fraser river, at Lillooet.

An English company has one dredger in operation at Lytton and another under construction, which is expected to be completed this month.

Lillooet, June 12.

Rossland District.

At the Spitzee mine, at Rossland, connection has been made between the first and second levels. The new workings will be utilized for ventilation and for delivering ore to No. 2 station. The management expects to increase shipment.

Vancouver Island.

It is expected to start the smelter at Crofton about July 1st for a continuous run of both furnaces, says H. C. Bellinger, manager. The smelter was closed down pending negotiations for a sale and also because of a shortage of ore. They are accumulating ore.

West Kootenay District.

The Kingston and McMinnville group of claims at Camborne have been bought by an English company. K. Burnett of Rossland is interested. The Kingstou group comprises the Kingston, Pittock, Maggie R., Tongue, Senator and Howard fraction claims, and the McMinnville group is made up of the Ishpeming and Houghton claims. On the Kingston are two tunnels, one in 50 feet and the other 65 feet, being 100 feet lower than the first. Both are being driven on the same lead of free-gold quartz, 42 feet wide.

CANADA.

Alberta.

The Canadian Pacific Railway is opening up an anthracite coal mine at Banff and invites tenders for driving a tunnel 1200 feet long.

Yukon Territory.

The annual report of the Department of the Interior of the Dominion of Canada for 1903 gives the following concerning the production of gold in the Yukon Territory: The gold production for the year ended June 30, 1903, amounted to $12,113,-015.34, as compared with $9,566,340.52 in the previous year. The output of last year is attributed to an unusually rainy season, owing to the fact that a large amount of the pay dirt is removed by hydraulic methods.

Dawson reports say that a nugget was found on May 25th on a bench claim on the left limit of Dominion creek, opposite No. 9, which weighs 126 ounces and is worth $2000. Claim No. 5, above Discovery, on Sulphur creek, which was sold last year under the supposition that it was worked out, is said to be paying. Two winter dumps were taken out, from one of which $25,000 worth of gold was washed out in May. The other dump is larger and is being washed. The claim is owned by W. Ripley, J. Banning and A. Baird.

MEXICO.

Chihuahua.

It is stated that P. Gintber, Santa Rosalia, manager of the Encinillas M. Co., Ltd., 65 miles southeast of Santa Rosalia, is preparing to enlarge the smelter from its present capacity of 80 tons to 300 tons. The shutting down of development after two years of work, the failure to haul any ore and the leaving of the present smelter idle after its completion several months ago, are unexplained. The traction engines and the ore trains have been at Santa Rosalia several months idle and the roadway is completed to the mines.

R. M. Dudley, J. Pothast et al., of Chihuahua, have bought the Esperanza mine of P. Alvarado at Parral and adjoining his Palmillo mine. They have had an option on the Esperanza mine for several months and have done considerable prospecting and development work.

W. W. Fiske of Boston, Mass., who is developing the Oro Fino gold property near the Sinaloa line, near Choix, Sinaloa, says he has the ore body exposed and is arranging to build a quartz mill in the fall.

Durango.

New York and Boston, Mass., men have organized the Mexican Con. M. & S. Co. to develop the Nueva, Australia and Porvenir mines, at Guanacevi. J. A. Coram of Boston, Mass., says a concentrating plant and smelter are proposed.

G. H. Sowers, president of the Amazon G. Co. of Chacala, reports the 100-ton smelter of his company was blown in last month and is working satisfactorily. The property is a gold-bismuth mine, carrying some copper and lead and largely furnishing its own flux. Although only 60 miles from the coast and over a good wagon road, it requires about twenty days to haul freight from Topolohampo to Chacala, and notwithstanding that an agent is kept at San Francisco, Manager Sowers says it takes months to get freight from the states to the mines. Fourteen Americans are employed at the smelter and mine, and 100 laborers besides packers and wood choppers.

O. Koehler and O. Warmund, of San Antonio, Texas, and S. D. Bridge, of Monterey, Mex., are increasing work on their San Domingo and Hay Tunnel properties adjoining the Velardena mines, near Durango. D. C. Irish, of Central City, Colo., is in charge with 100 men at work, which number will be increased. The output will be shipped to smelters.

Jalisco.

At Las Moras mine, 6 miles southeast of Ameca, arrangements are being made to put in a concentrating plant. The property is owned principally by Philadelphia, Pa., interests; G. E. McCormick, Ameca mining man, manager. Las Moras mine is a copper proposition. It has a large body of low grade copper ore. The principal development consists of a crosscut tunnel 700 feet in length. The vein has a north and south course. The formation is said to be a mass of brecciated porphyry, the copper occurring mainly along the lines of fracture. There are through the mass frequent occurrences of calcite, but siliceous material in the shape of quartz is scarce. The principal ores are copper pyrites and red oxides. Concentration tests by jigging have been made. The average value of the ore through the tunnel is 3% copper with a little silver.

B. H. Hammet, who holds title to 250 pertenencias of gold placer ground in Pihuamo district, says he expects to start operations in August. Two carloads of hydraulic machinery are on the land, and three additional carloads are expected at Tuxpan station, the terminus of the Zapotlan branch of the Central. Water will be piped from the Belem river, a distance of 2 miles.

N. Z. Seitz of Philadelphia, Pa., vice-president and manager of the San Felipe M. Co., operating near Guadalajara in Hostotipaquillo district, says a 100-ton mill for amalgamation and concentration of ores is in process of erection and will be ready for use in August. The power for its operation will be secured by utilization of a fall of 147 feet in the Amajac river, near the millsite. From this power, electricity will be generated by a Pelton wheel. The electric light and power plant will be used not only to light the mines and their vicinity, but also to furnish power for electric drills and the crushing and milling operations.

It is reported the iron mines at Ferreria de Tula, together with the foundry in operation there, will pass into the hands of Americans, as an option has been given on the property to R. E. Beach, president of the New York company operating there. The price specified in the option is $700,000 gold. The New York company has been operating the iron mines and foundry for several years, paying a rental of $30,000 per year. The company proposes to build a standard gauge railroad from the mines to Colfradia, a station on the Zapotlan branch of the Mexican Central road north of Sayula. Work on the line has been started. At present the company has to transport the foundry products for several miles in carts.

The Philadelphia C. & G. M., M. & S. Co. continues development near Ameca. The ground contains several parallel veins, which are developed by shafts reaching a depth of about 300 feet. It is equipped with a 35-ton concentrating plant and is shipping concentrates. The mine also produces a quantity of high-grade shipping ore. The values are in copper, gold and silver. E. A. Hall is president and A. J. Hall is resident manager.

Lower California.

(Special Correspondence). — It is reported that the Yharra mines, near Calmalli, have been leased for a term of two years to E. I. West of San Francisco, Cal., who will make needed improvements in the plant.

San Diego, Cal., June 13.

G. P. Brown, superintendent of the Esperanza mines on Cedros Island, off the west coast of Lower California, has bought the plant of the National S. and R. Co., at National City, San Diego Co., Cal., and will move it to the Esperanza mines.

Oaxaca.

A flow of natural gas is reported by S. Pearson & Son, who are prospecting for oil near Jaltipan. J. B. Body is superintendent.

C. A. Hamilton & Co., operating mines near Taviche, propose to build a customs smelter at Taviche, to have a daily capacity of 140 tons. Copper converters will be included in the equipment, also auxiliary lead furnaces.

L. G. Teruel of Mexico City, owning the Ferrocarril de Oaxaca a Ejutla, is reported preparing to build a smelter in Oaxaca, to consist of lead-silver and copper-matting furnaces.

Sonora.

A car of ore from the Tiger mine in Sonora has just been sent out to the smelter which is said to run over $10,000. The Tiger Combination M. Co. of Bisbee, Ariz., B. F. Graham, manager, operates these mines. The company is considering placing the proposed mill at the Bavispe, a distance of 12 miles from the mines, and where sufficient water power can be had the year to run the plant. In case the mill is built at the river a larger tonnage can be handled and it is proposed to either build a wire cable way or a narrow gauge railroad between the mines and the mill site to handle the ore.

The smelter of the Yaqui River S. & R. Co. at Toledo, 90 miles east of Minas Pritas, has been blown in and is reported making a successful run. The value of the Barranaca natural coke was proved to their satisfaction, says President Klauser. The coal gave a residue of 12% asb, of which 2% is iron, making it desirable for fluxing. The 30-ton furnace was used and run on silver-lead ore. That is now converted to copper and the 100-ton lead stack is approaching completion. Another 50-foot stack is also to be built. The plant is in operation.

Teric.

The Buena Vista mine at La Yesca, owned by City of Mexico men, is reported producing values to the extent of $80,000 a month. The property is under American management. The ore runs from 2 to 2½ kilos of silver and from 12 to 14 grams of gold per ton. A mill with a capacity of 100 tons daily is in operation.——The same vein on which the Buena Vista is located is said to run through the property of the Zapopan G. M. Co., a Guadalajara company in which G. E. Purnell and C. C. Bruckner are interested. There are three antigua mines on the property, none of which is producing at the present. Development work is in progress, however. The Zapopan company is operating the San Miguel mine, also in La Yesca district, and ore is being taken out. There are 300 tons of ore ready for milling, and a 25-ton mill will be started this week.

Personal.

O. B. STEEN of Santa Monica, Cal., is in San Francisco, Cal., on mining business.

J. F. THOMPSON of Lewiston, Idabo, is in San Francisco, Cal., on mining business.

W. LANGDON is master mechanic for the Old Dominion C. M. & S. Co. at Globe, Ariz.

J. W. SELOVER, a mine owner of Seattle, Wash., is in San Francisco, Cal., on business.

H. M. DEAVITT of the Chicago office of the Engineering Co. of America is in Boston, Mass.

E. COPLEY of Salt Lake City, Utah, is in the East on business connected with Nevada mines.

W. L. CARD returned to Denver, Colo., last week from a professional visit to Bingham, Utah.

C. L. DIGNOWITY of Salt Lake City, Utah, is in old Mexico, on examination of mining properties.

W. E. THORNE of Denver, Colo., has gone to Dillon, Colo., as superintendent of the Oro Grande M. Co.

W. E. DEFTY of Phœnix, Ariz., is in Sonora, Mexico, on mining business, to be gone till after July 1st.

J. M. HADLEY of Nevada City, Cal., interested in Nevada county mines, is in San Francisco, Cal., on business.

T. A. LISTER, president of the North American C. Co., returned last week to Lordsburg, N. M., from a visit East.

A. A. STEEL of the Engineering Co. of America is engaged in examination of low-grade gold properties in Colorado.

ELMER BISHOP, for several years manager of the P. & O. mine, adjoining the Bassick at Querida, Colo., has resigned.

J. POLIN, superintendent for the Grand Central M. Co. at La Colorada, Sonora, Mexico, is in Denver, Colo., on business.

C. R. DOWNS, superintendent, the Bunker Hill mine near Amador City, Cal., is in San Francisco, Cal., on mining business.

H. S. STEWART, manager of the Duquesne M. & R. Co., is in Pittsburg, Pa., from Nogales, Ariz., on company business.

J. T. BAILEY of the Engineering Co. of America has returned to New York after having finished important work in Alabama.

L. D. HUNTOON, of Paterson, N. J., is at Silver Plume, Colo., in charge of the Yale students at the summer school of mining.

M. FRIEND of the Compound Metals Co. of London, England, is manager of a smelter company at Taviche, Oaxaca, Mexico.

J. G. LOUGHRAN is manager of the P. & O. mine at Querida, Colo., vice E. Bishop, resigned. J. Fitzgerald is superintendent.

W. J. CASEY, president of the Union Gas Engine Co. of San Francisco, Cal., is visiting the St. Louis Fair and other Eastern points.

G. CRISMON, president of the Utah mine at Fish Springs, Utah, has returned to Salt Lake City, Utah, from a trip to Alberta, Canada.

W. F. SNYDER, manager, and C. Ellingwood, secretary, of the Western Exploration Co., are visiting Eastern points from Salt Lake City, Utah.

W. H. RUSSELL, E. M. of Inyo and Mono counties, Cal., is at present reporting on properties in the State of Guerrero, Mexico, for an Eastern company.

F. W. BRADLEY of San Francisco, Cal., has left for his annual summer trip of inspection of mines under his direction in California, Oregon, Idaho and Alaska.

H. SCHEERER, at the head of the faculty of the Freiberg School of Technology, Freiberg, Germany, is visiting the mines, mills and smelters of Utah.

W. H. BRULE, formerly at De Lamar, Nev., is assistant to Superintendent R. B. Lamb at the concentration plant of the North American C. Co. at Encampment, Wyo.

W. CONNELLY has succeeded A. J. Houle as superintendent at the Ferris-Haggerty mine of the North American C. Co. at Rudefeha, Carbon county, Wyoming.

E. S. KESKEYS, who has been superintendent of the Juhilee company at Carl Junction, Mo., has resigned to take a like position with the B. & H. mine at Chitwood, Mo.

P. A. BRADY has charge of the Humboldt, Red Lion and '49 Jimmy mine, near Greenhorn, Or., having resigned as superintendent of the Belcher mine in same district.

O. O. LARSON, consulting engineer for the Mascot company at Salida, Colo., has gone to Gladstone, San Juan county, Colo., to take charge of the Venetian mill and assay office.

W. Y. WILLIAMS, superintendent of the mines of the Granby Con. M., S. & P. Co., at Phœnix, B. C., has been appointed consulting mining engineer for all the mines of the company.

R. J. COLEMAN has gone to New York and Boston after a two months' trip to Lluvia de Oro mines in western Chihuahua, Mexico, from which place he returned last week to Nogales, Ariz.

CHARLES R. VAN HISE, an American geologist, for several years identified with the United States Geological Survey, was on the 7th inst. inaugurated as president of the University of Wisconsin at Madison, Wis.

G. McM. ROSS has resigned as superintendent of the Andes mine at Virginia City Nev., and is in San Francisco, Cal. He will go to Copperopolis, Calaveras county, Cal., as manager of the Union group of copper mines.

E. R. WOAKES of London, England, manager of John Taylor & Sons' lead mines and smelters in Spain, has been granted by the Spanish Government the official title of "mining engineer," permitting him to direct mines in Spain.

G. E. ANDERSON of Logan, Utah, has gone to the properties of the Norway Nickel M. Co. on the west coast of Norway and will begin forwarding its ores to reduction works. W. Christopherson, of Salt Lake City, Utah, is superintendent.

A. B. W. HODGES, superintendent of the Granby smelter at Grand Forks, B. C., has been appointed general superintendent of the Granby Con. M., S. & P. Co. properties, and will have charge of both

the smelter works at Grand Forks, B. C., and the mines at Phœnix, B. C.

A. E. SALAZAR of Santiago, Chile, professor of engineering in the National University of Chile, is in San Francisco, Cal. He has visited Cornell, Michigan, Wisconsin and other universities, and will visit the engineering departments of the University of California at Berkeley and Stanford University at Palo Alto, Cal.

Trade Treatises.

"Electric Locomotives for Gathering Purposes" is the title of Bulletin No. 8 from the Jeffrey Manufacturing Co. of Columbus, Ohio. The instructive descriptions of these locomotives for underground haulage are accompanied by numerous cuts.

"Graphite as a Lubricant," 8th edition revised, is an instructive treatise on the subject of lubrication of machine parts, from the Jos. Dixon Crucible Co., of Jersey City N. J.; and will be supplied on application of any one interested in the care and running of machinery.

The Wellman-Seaver-Morgan Co. of Cleveland, Ohio, have issued an attractive pamphlet descriptive of their safety hooks for skips and cages in mine shafts, to prevent drawing a cage up into the sheave in case of overwinding. The booklet is well illustrated, showing the simple and positive operation of the hook, which not only prevents the cage or skip from coming in contact with the sheave, but releases the cable while safely suspending the cage over the shaft.

The Denver Engineering Works Co. have issued Bulletin No. 1026 on "Stamp Mills." It is well illustrated by halftones and line drawings, showing mill construction methods and all the apparatus and equipment of a complete gold mill, together with valuable descriptive matter and tables, giving much information in a condensed form. In addition to the above, it contains a complete specification of a 10-stamp mill and building, together with a complete list of material necessary to construct the building. This bulletin may be had on application to the Denver Engineering Works Co., Denver, Colo.

Commercial Paragraphs.

THE Denver Engineering Works of Denver, Colo., report they are furnishing the Summer School of Mining at Georgetown, Colo., with a Box electric drill.

THE Rand Drill Co. of New York report having a contract from the Safe Investment G. M. Co. for an air compressor and several rock drills of the slugger type.

AN exhibition of mining and hydraulic apparatus, open to all countries, will be held at Barcelona, Spain, in September and during the following months of this year. This will be an excellent occasion for American machinery makers to exhibit their goods, and will undoubtedly pave the way for their gaining a foothold in that market, writes J. G. Lay, Consul-General at Barcelona, Spain.

GEO. W. LORD CO. of Philadelphia, Pa., has issued a handsome reproduction of a photograph taken in India, which illustrates the peculiar and ingenious construction of poles to carry electric wires in that country. It is of interest to electrical and other engineers throughout the world. A prominent feature of the illustration is several cartloads of Lord's boiler compound, on carts pushed and pulled hy half-nude natives.

Books Received.

"Mining and Mine Investments" is the title of an unusual publication having mining as a subject, written hy A. Moll. It is a volume taking up the mining industry from the popular standpoint and is intended hy the author to be a means of information on this subject in the hands of those who have or wish to acquire mining interests, but who have neither practical nor technical knowledge or experience. It treats of various kinds of mining in simple language, devoid for most part of technical phraseology, making, what is to many, a mysterious business, plain and easy of comprehension. The book contains several illustrations which will be a valuahlo aid to the understanding of mining reports and operations to those unfamiliar with them. Price, 2s 6d net. Methuen & Co., 36 Essex street, Strand, W. C., London, Eng.

Latest Market Reports.

SAN FRANCISCO, June 17, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25 7/8d (standard ounce, 925 fine); New York, har silver, 55¼c, refined (1000 fine); San Francisco, 55¼c; Mexican dollars, 46¼c San Francisco, 44¼c New York.

COPPER. — New York: Standard, $12.75; Lako, 1 to 3 casks, $12.75; Electrolytic, 1 to 3 casks, $12.50; Casting, 1 to 3 casks, $12.50; San Francisco: $15.00. Mill copper plates, $17.00; hars, 18@24c. London: £56 2s 6d spot per ton.

Following are the figures of the German consumption of foreign coppor for the months January-April, 1904, compared with the same period of time in 1903-1902:

	1904.	1903.	1902.
Imports, tons.....	40,859	27,260	27,309
Exports, "	2,651	3,833	2,905
Consumption, tons..	38,208	23,427	24,404

LEAD. — New York, $4.20; Salt Lako City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¼c 1000 to 4000 ℔s.; pipe 6½, sheet 7, har 5¾c; pig, $4.85. London: £11 7s 8d ℔ long ton.

SPELTER.—New York, $4.75; St. Louis, $5.00; London, £21 15s ℔ ton; San Francisco, ton lots, 6¾c; 100-℔. lots, 7c.

The supply of ore on hand in the Joplin, Mo., district is increasing, duo to the smelters not huying up their full capacity. The local reason given is shortage of cars. The mine owners are still agitating a united movement to restrict production.

TIN.—New York, pig, $26.20 @ 26.45; San Francisco, ton lots, 28c; 500 ℔s., 28½c; 200 ℔s., 29c; less, 29½c; har tin, ℔ ℔., 30@32½c. London, £119 10s spot.

PLATINUM. —. San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75 @ 82c ℔ gram.

QUICKSILVER. — New York, $44.50@45.50, large lots; London, £8 San Francisco, local, $43@43.50 ℔ flask of 75 ℔s.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER. — Half-and-half, 100-℔. lots, 18.50c; San Francisco, Plumhers', 100-℔. lots, 16c.

ZINC.—Metallic, chemically pure, ℔ ℔., 50c; dust, ℔ ℔., 10c; sulphate, ℔ ℔., .04c.

NICKEL.—New York, 40@47c ℔ ℔.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittshurg, Bessemer pig, $13.35 @13.60; gray forge, $12.50; San Francisco, har, 3c ℔ ℔., 3½c in small quantities.

STEEL. — Bessemer hillets, Pittshurg, $23.00@23.00; open hearth hillets, $23.00 @23.00; San Francisco, har, 7c to 12c ℔ ℔.

CHICAGO CURRENT QUOTATIONS.

Bessemer	$15 25@15 75
Foundry Northern 1	14 00@14 25
Northern 2	13 50@13 75
Northern 3	13 00@13 25
Southern 1	13 40@13 90
Southern 2	12 90@13 40
Southern 3	12 40@12 90
Forge	11 65@12 15
Charcoal	14 50@15 00
Billets, Bessemer	24 00@24 00
Bars, iron	1 40@ 1 45
Bars, steel	1 51@ 1 51
Rails, standard	28 00@30 00
Rails, light	24 00@26 00
Plates, hoiler	1 91@ 2 01
Tank	1 76@ 1 81
Sheets, 27 store	2 36@ 2 41
Angles	1 76@——
Beams	1 76@——
Tees	1 81@——
Zees	1 81@——
Channels	1 76@——
No. 1 railroad wrought	10 50@11 00
No. 1 cast, net ton	10 00@10 50
Iron rails	14 50@15 50
Car wheels	12 50@13 00
Cast horings	3 75@ 4 00
Turnings	6 50@ 7 00

WHITE LEAD.—Per ℔., in kegs: 500 ℔s. and over at one purchase, per ℔., 6¾c; less than 500 ℔s., per ℔., 7c; in 25-℔. tin pails, ¼c ℔ ℔. above keg price; in 1 and 5-℔ tin cans, 100 ℔s. per case, ½c. per ℔. above keg price. Dry Lead—In hhls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER. — (Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50 @5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00 @35.00.

NAILS.—This week the hasic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ hhl.

CEMENT.—Imported, $2.15@2.65 ℔ hhl.; California carload lots, $2.10 f. o. h. at works; small lots, $2.45 ℔ hhl. in sacks, 4 sacks to hhl., 10c for each sack roturned.

GENERAL SUPPLIES.

ANTIMONY. — New York, Cookson's, 7¾c; Hallett's, 6¾c; San Francisco, 1000-℔. lots, 8c; 300@500-℔s., 8¼c; 100-℔. lots, 10½c.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-glycerine, per ℔., in carload lots, 15½c; loss than ono ton, 17½c. No. 1*, 60%, carload lots, 13½c; loss than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black hlasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, 8$; Lion, $9, in lots not less than 1000.

FUSE. –Triple tape, $3.60 per 1000 foet; douhle tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feot and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS. — Cyanide of potassium, 98%-99%, johhing, 23@24c ℔ ℔.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 ℔s.; hyposulphite of soda, 3@3½c per ℔.; caustic soda, in drums, 3@3½c ℔ ℔.; Cal. s. soda, hhls., $1.20@1.40 ℔ 100 ℔s.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, hhls., 10c; caustic potash, 10c in 40-℔. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3¼@3½c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ ℔.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carhoys, 66% B, 1¾@2c ℔ ℔.; nitric acid, carhoys, 8c ℔ ℔.

COAL. — San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymho, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumherland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in hulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

BONE ASH.—Extra No. 1, 5@6c ℔ ℔. No. 1, 4@5c.

OILS.—Linseed, hoiled, hhl., 49c; cs., 54c; raw, bhl., 47c; cs., 52c; Lucol oil hoiled, hhl., 44c; cs., 49c; raw, hhl., 42c; cs., 47c. Kerosene—Pearl, per gal., 20c; Astral, 20c; Star, 20c; Extra Star, 24c; Eocene, 23c; Elaine, 26c; Water White, in hulk, 13½c; Mineral Seal, iron hhls., 18c; wooden hhls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c.; Deodorized Stove Gasoline, hulk, 16c; do., cs., 22½c; 86° Gasoline, hulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in hulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E W. S., hhl., 75c; cs., 80c; Neats-foot Oil, pure, hhl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 70c; Bleached, do., 80c; Whale Oil, cs., 52@57c.

RED LEAD.—500 ℔s. and over at one purchase, ℔ ℔., 7c; less than 500 ℔s., 7¼c.

LITHARGE.—Pure, in 25-℔. hags, 8@9c ℔ ℔.

BORAX.—Concentrated, 6@7c ℔ ℔; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ ℔., 60c.

SODIUM.—Metal, ℔ ℔., 50c.

BISMUTH.—Suhnitrate, ℔ ℔., $2.10.

MERCURY.—Bichloride, ℔ ℔., 77c.

MOLYBDENUM.—Best, $2.00 ℔ ℔.

CHROMIUM.—90% and over, ℔ ℔., $1.00.

PHOSPHORUS.—American, ℔ ℔., 70c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ ℔.; 100 ℔s., 35c; 1000 ℔s, 34c; ton lots and over, 33c, Pittshurg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittshurg.

URANIUM.—Oxide, ℔ ℔., $3.50.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

Obituary.

SAMUEL MONTGOMERY, a pioneer miner of Carihoo, B. C., died at Barkerville, B. C., June 1st. Deceased was horn in Inniskillen, Ireland, in 1814.

S. S. ROBINSON, well known in the copper country of upper Michigan and in the West as a mine manager and bridge huilder, died at Detroit, Mich., on the 14th inst., aged 81 years. Deceased was at one time manager of an iron and silver mine at Leadville, Colo., and of the Mimbres silver mine in New Moxico.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports nf the fnllnwing U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JUNE 7, 1904.

761,808.—SHAVING APPARATUS—W. R. Allen, Ho quiam, Wash.
761,810.—CARGO CONVEYOR—C. H. Anderson, S. F.
762,125.—ELECTRIC ALARM—J. P. Bolton, Fresno, Cal.
761,941.—ELEVATOR—M. Bradfield, Los Angeles, Cal.
762,133.—BALING PRESS—W. Bullard, Chico, Cal.
761,817.—MITER BOX—S. C. Burris, Seattle, Wash
761,819.—SHOE HOLDER—O. G. Gates, Los Angeles, Cal.
762,146.—HORSE COLLAR MEASURE—W. Cosbie, S. F.
761,767.—CAN COVER HOLDER—E. W. Hayden, Bayles, Cal.
761,839.—REVERSING MECHANISM—E. Johnson, Seattle, Wash.
762,174.—GOLD SEPARATOR—W. Laudahn, S. F.
761,893.—TROUSERS HANGER—W. S. Lee, Tacoma, Wash.
762,076.—BROOM BRIDLE—N. N. S. Matcovitch, Sacramento, Cal.
762,849.—GLOBE VALVE—W. A. McGowan, Cathlamet, Wash.
761,897.—CIGAR CUTTER—M. P. McIntire, Lakeside, Wash.
762,213.—NUT LOCK — W. L. Morrow, Stockton, Cal.
762,247.—LOOM SHUTTLE—J. H. Northrop, Tustin, Cal.
762,084.—AMMUNITION—C. Petersen, S. F.
762,195.—SAW SWAGE — W. C. Renie, Hoqulam, Wash.
761,914.—LIFTING JACK—G. Riggs, Bothell, Wash.
762,209.—LASTING MACHINE—L. B. Stamm, S. F.
762,212.—BEAN THRESHER—J. Trethewey, Stockton, Cal.
761,797.—WRENCH—F. W. Vogel, Santa Monica, Cal.
762,216.—TRUNK—C. P. Weil, Baker City, Or.
761,803.—SKIRT SPREADER—G. H. Wickelherg, Seattle, Wash.
36,943.—BADGE DESIGN—J. L. Mallery, Grants Pass, Or.

Notices of Recent Patents.

Among the patents recently nhtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy nf special mention:

LASTING MACHINE.—No. 762,209. June 7, 1904. L. B. Stamm, San Francisco, Cal. This invention relates to improvements in machines for lasting hoots and shoes. Its object is to provide a machine particularly for lasting that portion of the shoe intermediate nf the heel and toe, whereby both sides of the upper may he drawn equally and simultaneously over the last, stretched, laid upon the last and held while the tacks are driven in.

BROOM BRIDLES.—No. 762,076. June 7, 1904. N. N. S. Matcovitch, Sacramento, Cal. This invention relates to an improvement attachment for brooms which is designed to increase the life of a broom hy strengthening it adjacent to its point of attachment with the handle and to preserve its shape hy gripping and clamping the straw in such manner as to control its spreading, whereby compensation is made for the wear which usually takes place hy reason of the operator sweeping always with one side of the broom or exerting more pressure on one side than on the other.

AMMUNITION.—No. 762,084. June 7, 1904. C. Petersen, San Francisco, Cal. This invention relates to improvements in ammunition, and particularly ammunition intended for use in rapid fire guns, where it is desired that the feed of the ammunition be continuous and automatic. The invention comprises a plurality of cartridges linked together in the form of a chain, said links consisting of a flexible extension carried hy each hullet and having a central loop to engage the shell of a succeeding cartridge.

ADJUSTABLE HORSE COLLAR MEASURE.—No. 762,146. June 7, 1904. Wm. Coshie, San Francisco, Cal. This invention consists of a ruler having one continuous side sufficiently long tn measure the depth nf the animal's neck, two transverse sides, one of which is slidable with relation to the longer side and two other independent sliding measures movable upon the transverse sides and adapted to fit the top and hottom of the animal's neck, so as to give all the necessary measurements.

GOLD SEPARATING AND RECOVERING APPARATUS.—No. 762,174. June 7, 1904. Wm. Laudahn, San Francisco, Cal. This invention is especially designed for working dry placer and other deposits containing gold and without the use of water. It is also designed for separating gold from auriferous heach sands. It consists in the employment of a chamber containing quicksilver, a mechanism hy which the gold-hearing sand may he forcibly submerged and allowed to rise through the hody of quicksilver so that the gold carried thereby will he brought into intimate contact with the quicksilver and amalgamated and obtained, while the waste or worthless material will he discharged over the top.

BEAM THRESHERS AND CLEANERS.—No. 762,212. June 7, 1904. J. Trethewey, Stockton, Cal. One-half assigned to George H. Harris of same place. This device is particularly applicable for threshing heans, flax and the like. It consists in the combination of mechanism for feeding the material, delivering it successively to a plurality of threshing cylinders running at different rates of speed, and thence transferring the separated heans or other material to cleaning shoes in the main machine, at the same time discharging the straw and refuse, and finally in transferring the material from the preliminary cleaner to a supplemental one, on which the work is completed.

BALING PRESS.—No. 762,133. June 7, 1904. W. Bullard, Chico, Cal. This invention consists in an arrangement of a horizontally disposed haling chamber, a second chamber substantially in line therewith and having a vertically movable hottom and operating connections, a feed hopper located above said second chamber having an intermediate revoluhle hottom adapted to receive the material to he haled in charges, and means hy which it may he periodically inverted to discharge the load into the chamher below, means for operating and locking the said revoluble hottom, a horizontally reciprocating follower adapted to compress the material into the haling chamher, and means for putting on the hinding ties by which the hales are held in their compressed condition.

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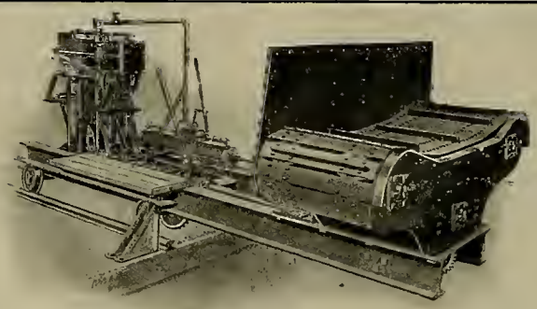

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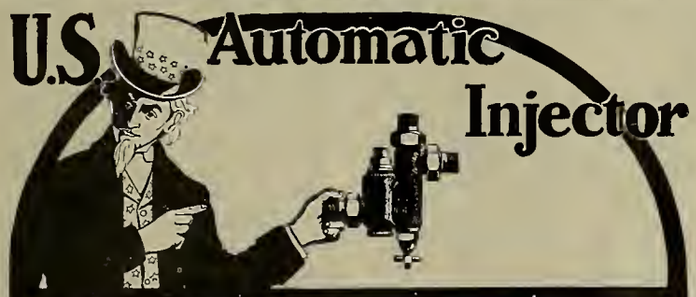

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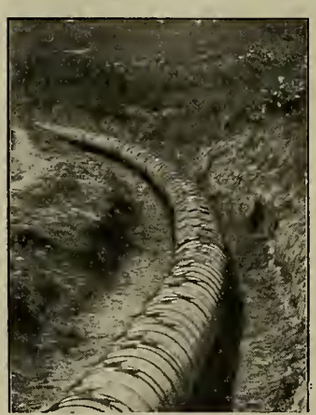

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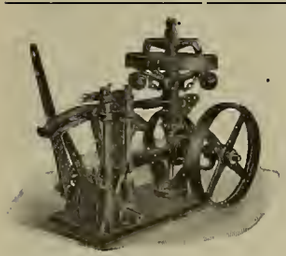

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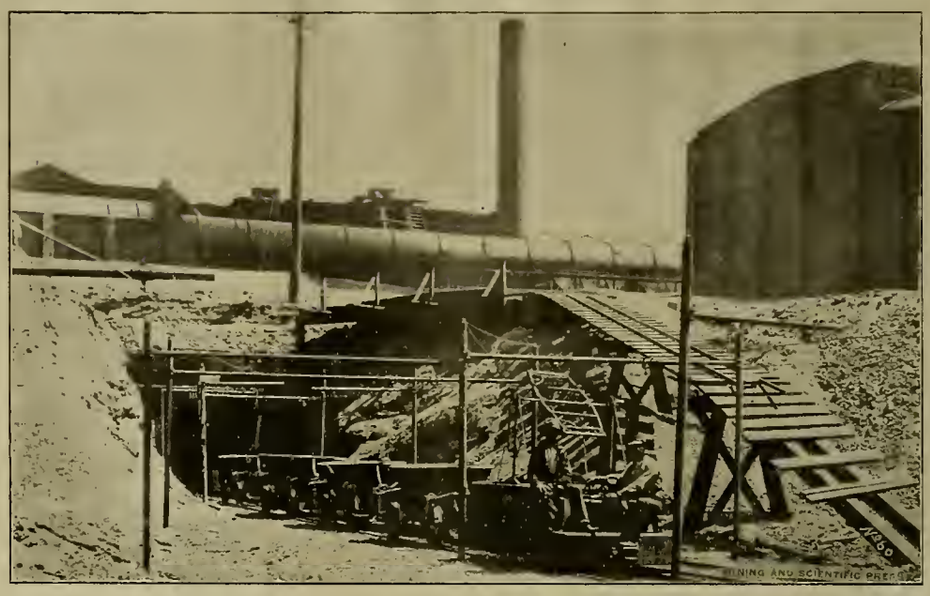
Whole No. 2292.—VOLUME LXXXVIII. Number 26. SAN FRANCISCO, CAL., SATURDAY, JUNE 25, 1904. THREE DOLLARS PER ANNUM Single Copies, Ten Cents.

Machine vs. Hand Drilling.

There is little room for discussion as to the respective merits of machine vs. hand drilling, for the reason that, generally speaking, machine drilling with almost any kind of a machine drill is less expensive than hand work. The rate of drilling is much more rapid and the larger hole made by the machine drill bit admits of a heavier charge of powder being placed where it will do the greatest execution. Occasionally a condition is found which does not require nor justify the machine drill. Thus in soft, spougy ground, the heavy blows of a machine drill simply pack the cuttings like so much hard putty, but in hard ground the machine drill finds its field of greatest usefulness aud economy. It is true that all mine managers do not agree on the relative efficiency of machine and hand drilling in shaft sinking, but it will be observed that those whose experience inclines them to favor hand work in any kind of mining, have been working in fairly soft ground. Those whose experience has been gained in very hard, tough ground will agree that the machine drill is far more serviceable and economical than the best hand work. Hard ground requires power behind the drill, and this the machine drill has. There are, it is true, conditions under which it is, perhaps, more desirable to resort to hand work, owing to the character of the ore. In a vein which is small, and much waste is broken when stoping with machines, more satisfactory work can often be accomplished by hand drilling, particularly when experienced miners are employed. A vein less than 2 feet in width with accompanying gouge, or in soft ground, can be more economically worked by hand than with machines. The practice in such cases generally is to cut out the soft ground first by picking or by blasting, if need be, thus stripping the vein, and when a sufficient area has been exposed to put in a series of holes across the vein, blasting off the clean ore with a minimum of waste. The reverse condition, when the walls are hard and the vein soft, would be treated by first cutting out and removing the clean ore, and then blasting out one wall or the other, for working room. Obviously in either of these cases a machine drill would be of little, if any, advantage over hand drilling, aud in some instances it would be a positive disadvantage. In machine drilling it is economy to run under high pressure, approaching 100 pounds per square inch at ordinary altitudes. The drill will not last as long as when operated under 60 pounds pressure, but it should do 25% more work aud this will pay for much more than the difference in the wear and tear on the machine. The disadvantage of the use of machine drills is in the cost of compressor plant, cost of the machines aud equipment and loss of time in setting up and taking down of machines. The same argument applies here as that before used—it pays to put in a compressor plant and drills if you have hard rock and enough work to do to justify it. In a certain mine the cost of driving headings by hand, cut 12 feet wide aud 10 feet high, was $16 per running foot. When machines were put in the same ground the cost dropped to $8 and $10 per foot. The cost of cutting five shaft stations, each 40 feet long, together with the ore pockets under the level, was reduced $1200 by the use of machine drills. As opposed to this the superintendent who had a gold mine in which the values occurred in streaks and cavities in a small soft vein, and who shot out twice as much hard country rock as he did ore, breaking vein and waste together, and subsequently sorting by hand underground, did not make his mine pay, though he used machine drills. His successor substituted single-hand drilling for machines in drifting and stoping, and in all other work on ore, soon found the mine out of debt and paying a monthly profit. He still retained the air plaut and used machines in shaft work, crosscutting, etc., and here they more than paid for their maintenance. The determination whether or not to use machine drills must be based, like many other questions in mining, upon the exercise of common sense.

An important influence in the matter of cost of mining with machines is found in the manner in which the drill is treated, by the miner. If he be careless, and fails to oil the machine properly, and through lack of care in starting has many fitchered holes, there will be much lost time, which means increased cost. The chuck tender, too, will increase expense occasionally by missing the chuck when he is attempting to free the bit by striking at it wi h a heavy hammer, and knocking off a few iuches of the flange of the shell. If a reasonable amount of pounding on the drill bar fails to release the bit it is cheaper to abandon the hole than to break the machine.



Electric Motor Hauling Slag Cars at Cananea Con. Smelter, Cananea, Mexico. (See Page 426.)

The Concentrators of the Cananea Con. Copper Co., Cananea, Mexico. (See Page 426.)

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ESTABLISHED 1860.

Published Every Saturday at 330 Market Street, San Francisco, Cal. Telephone, Davis 771.

ANNUAL SUBSCRIPTION.

United States, Mexico and Canada.....$3 00
All Other Countries in the Postal Union..... 5 00

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J. F. HALLORAN.....Publisher

SAN FRANCISCO, JUNE 25, 1904.

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The Need of Foresight.

Mine management which is unable to see into the future and to anticipate the needs of a mine as to equipment and system of development is likely to prove to be extravagant. It is true that oftentimes the superintendent or manager is obliged by reason of insufficient means to do things which is contrary to his judgment, but not infrequently a short-sighted policy seems to direct the destinies of property well provided with money for equipment and development. Shafts are sunk in improper places; mills are located where they should not be; elevators are employed, when by a different arrangement gravity might have been taken advantage of; long tunnels are run to intersect veins or ore deposits which do not extend downward to the tunuel level. These and many other similar things are done which experience shows to be undesirable, unnecessary and often harmful to the best interests of the property. There are times when timidity influences the judgment of the mine superintendent. A fear of striking a large volume of water may deter him from running a crosscut, which in after years being run, in the face of the risk involved, disclosed as a result a valuable ore deposit. No mine manager likes to take the risk of flooding his workings, but in such a case the diamond drill will give the desired information while entailing no risk from water whatever, as the hole may be plugged. In one instance a mine superintendent, being desirous of connecting a new shaft with old workings, the upper portion of which was caved, went to great expense to surround himself with every precaution against the large volume of water he expected to strike. The workings were connected, and the old levels found completely drained by the new. This the management might have quickly learned at the expense of a few hundred dollars in the purchase and operation of a diamond drill, and he would then have the drill ou hand to continue prospecting investigations. These are only a few instances where foresight and knowledge save much time aud money.

A New Idea in Mine Promotion.

The recent rapid development of mining in Mexico has led, as may have been anticipated, to the promotion of schemes having little or no merit. United States Vice-Consul General Conley says of one of these concerns, which is advertising extensively in the United States, that it has title to no mines; has little or no development on the denounced claims, and that the pictures accompanying their prospectus and advertisement are those of another property, in which they have no interest. Among other inducements to would-be investors, and one which is calculated to inspire the unwary with confidence, is the offer of the promoters to defray the expenses of a trip to Mexico and return of any prospective investor who wishes to visit the property, provided he agrees to subscribe for a large block of stock. Such methods of mine promotion are reprehensible and do much damage to the introduction of new capital into the mining industry. It is no new thing to find mining property described in exaggerated terms, for the reason, perhaps, that in many instances the plain truth would form an unattractive propositiou for those who are seeking investment; and yet this plain truth may indicate to experieuced miners that the property was one of great possibilities. The old saying, "Mining is a gamble," has been worn threadbare. That mining to a certain extent is speculative can not be denied—so is railroading, farming, manufacturing, stock raising and almost every other industry and pursuit; but the business of mining is largely what the operators and managers of each property make it. Where there is a lack of geological, mechanical and commercial knowledge, a mining proposition is likely to become a gamble pure and simple, and the venture is most likely to prove a failure in such hands, while possessing the elemeuts of success. In undeveloped property the management should proceed with caution, and not undertake great expense that is not justified by the character aud condition of the property. Where a property consists of flat beds of ore lying at or near the surface, a deep shaft is inadvisable and a useless expense. So would be a lengthy tunnel run at a geological horizon far below the deposit. Nor would an extensive smelting plant be justified before sufficient ore were developed to, at least, pay for the plant. By the exercise of competent, experienced judgment, backed by an honest administration of the business affairs, mining is to a great extent robbed of its inhereut risks, but the extensive advertisement of fake mining schemes, where positive misstatemeuts concerning the property are made, should be prohibited. Unfortunately, generally, words of caution appearing in reputable mining journals seldom reach those who are likely to become the victims of unprincipled schemers, as this class of people do not usually read technical papers.

THE index in this number is for the issues from January 2 to June 25, 1904, inclusive—one volume, twenty-six issues. It contains over 3000 references to the contents of this one volume. The cost of this to subscribers was $1.50. Everything relating to mining and engineering, and their allied sciences, for the past half year is found therein. Probably the statement will not admit of successful contradiction when it is said that in no other way could such a compendium of information be secured and at such trifling cost. Much of what so appeared will be republished in various forms later on, but our readers, as usual, had it first. There is probably no other journal of the kind that coutains so much that is written by the men who do the things they talk about, or that is more alive to the immediate demands of the great basic industries that it represents. That this is so is attested by the universal commendation received from our myriad readers the world over, whose unsolicited testimony to this journal's great value is constantly and cordially appreciated.

THE eighty-seventh meeting of the American Institute of Mining Engineers will be held in Lake Superior iron and copper regions, beginning at Duluth, Minn., on Sept. 14. The iron mines of the Mesabi range and in the vicinity of Ishpeming, and the copper mines near Houghton, will be visited. A session is also to be held at St. Louis, Sept. 26.

A Monopoly in Mining.

In Western Australia the London firm of Bewick, Moreing & Co. have made somewhat of an innovation in undertaking the management of numerous mines which that firm does not own or control. The signal success attending their efforts in the development, equipment and operation of their own properties, may be considered as due to the careful selection of the mines and to the equally careful choice of experienced men to manage these properties. Doubtless the same care will be exercised in relation to the further selection of properties they may offer to manage, as well as in placing proper men in charge, and as long as good judgment is used in this direction success may be anticipated. In America J. D. Rockefeller is accredited with an idea which eclipses that of the London firm, in that the Standard Oil magnate is reported to be forming a syndicate with a capitalization of $2,500,000,000, the purpose of which is not only to manage all the important mines of the Universe, not taken up by Bewick, Moreing & Co., but to own or control them—excepting the Calumet and Hecla. As the latter is a copper mine, it may be that only the producers of the red metal are to be taken into the gigantic merger, but essentially some great combination of capital will doubtless undertake the monopolizing of the gold production of the world.

A Mine Jumping Case.

The "jumping" of the noted Vulture mines in Maricopa county, Arizona, the past week has attracted a great deal of attention in that sectiou, and the outlook for a long legal battle is promising. The Vulture property was discovered in 1863 and has been extensively developed and is equipped with a large milling plant. Although there are hundreds of thousands of dollars worth of development and improvements on the property, the mines were not patented, and if assessment work was not performed, the mines, nineteen in number, were subject to relocation. The laws of Arizona require the posting of an affidavit of assessment work performed, and the recording of the same with the county recorder within thirty days of the completion of the work, and the affidavit so filed is in that Territory considered prima facie evidence of the performance of the necessary work. If, however, the relocators can conclusively prove that the work was not done as required, then the affidavit is fraudulent and would be set aside by the courts. The Vulture is a large low-grade property and has had an interesting history, and numerous owners. Whether the new claimant will be able to retain possession legally remains to be seen.

THERE are few things in the operation of a mine more disastrous to the interest of all concerned than for a mine superintendent or manager to deceive himself as to the true condition of the mine. If samples are not actually representative they cannot be of great value in making conclusions. If they are too low the result is surprisingly agreeable, but this seldom happens. The reverse is usually the case, and large amounts of ore sent to mill or smelter often fail to come up to the grade represented by the carelessly taken samples. When the samples indicate a good profit should be forthcoming and loss results, owing to low grade of the ore, there is something which requires investigation. Either the sampler is at fault, the assayer is incompetent or the reduction works is responsible for failure to save the values, but investigation generally shows the trouble to lie in faulty sampling. The effect is demoralizing, and whatever the real merit of the property it is likely to do it great damage. Rich mines can stand these shortcomiugs and irregularities, but the low grade oues cannot, and suspension of all operations generally follows such mistakes in management, when under different and more careful direction success may be possible.

THE Supreme Court of Montana has unanimously decided the "fair trial bill" passed at the recent special session of the Legislature of that State to be constitutional. The law was attacked by the Heinze interests, the legislation haviug been passed through the influence of the Amalgamated Copper Co. It provides for a change of venue where either party to a suit is dissatisfied with the trial court.

CONCENTRATES.

IN Mexico the laws constitute shares held in mining companies' personal property, while the mines themselves are classed as real estate.

****

THE metric gramme, which is the unit of assayers' computation by the metric system, is equal to 15.432 grains. A gramme of pure gold is worth 66⅓+cents.

****

ALCOHOL has nearly double the expansive force of water at the same temperature. Alcohol has the same expansive force at 174° F. that water has at 212° F.

****

QUICKSILVER that has been "sickened" by lead may be cleaned by digesting with a weak nitric acid. When the lead is present in large amount it is better to retort the quicksilver.

****

A BOX to contain three tons of ordinary broken quartz ore may be made 5 feet long, 4 feet wide and 3 feet high. When level full this will hold 60 cubic feet, the equivalent of three tons.

****

THE iron mines of the Mesabi iron range of Minnesota produce a large amount of fines which are difficult and expensive to handle in blast furnaces of ordinary construction. It is the practice to briquette these fines before introducing them to the furnace.

****

THE value of second-hand mining and milling machinery depends to a great extent upon its location and upon the condition of the machinery. A second-hand mill would obviously be worth more to another mine in the same vicinity than one located at a great distance.

****

THE unit of the metric system is the meter, which was originally intended to be the one-ten millionth of the quadrant of the earth—that is, from the pole to the equator. In length the meter is equal to 39.37 inches as established by the Congress of the United States.

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THE use of preservative paints on structural steel is advisable whether the steel is to remain exposed to the weather or is to be enclosed by brick or stone as in the walls of buildings. They lengthen the life of the material by preventing rust and corrosion by dampness or acids in the atmosphere.

****

A TANK for containing a solution of iron sulphate must be made without the use of iron nails or screws. Such tanks are made with framed lumber and the whole tightened by means of wedges. Boxes in which copper-bearing water is to be run for precipitation on scrap should be made in similar manner.

****

CONCENTRATES collected in the box beneath the end of concentrating machines may be settled, and the water caused to flow away by placing a hammer so it can be made to strike the box automatically. This causes the contents of the box to be jarred and the sulphides settle, relieving them of a large amount of the water.

****

SCHEELITE is calcium tungstate. It contains tungsten trioxide 80.6; lime 184. Molybdenum is usually present up to 8%. In addition to scheelite other tungsten ores of importance are wolframite, an iron-manganese tungstate, of variable composition; huhnerite, which is near wolfram in composition; powellite, a calcium molybdenum tungstate, and stolzite, a lead tungstate.

****

THE object of the brick arch in the firebox of a boiler is to hold the gas generated by the combustion of coal or oil in the firebox, so that air will mix with it, and it also protects the flues from sudden chill of cold air which rushes in when the furnace door is opened for firing. It also aids in restraining the escape of small particles of coal. It saves coal by holding the gas until it can burn.

****

STEEL HEAD FRAMES can be designed and constructed to meet any condition or requirement that can be met by wooden structures. They are as enduring as wooden frames and lack the liability to destruction by fire to which wooden frames are subject. The liability to damage by lightning seems small, as, although there are numerous steel frames in regions where electrical storms are common, no disaster from this source has attracted particular notice.

****

ALL concentrating machines are adjustable, and the speed of belt or number of vibrations may be regulated as well as the water feed, grade, etc. Machines must be changed to suit any change in the ore, or change in milling operations. A finer or coarser screen would make a difference in the discharge of pulp from the mortar, and this would in most instances necessitate a different adjustment of the concentrators. The same may be said of any other material change at the battery.

****

THE California State law requires that notice of assessment work on unpatented mining claims be posted and recorded, but provides no penalty for such failure. The actual performance of the work is the principal thing, and if the work be actually done the claim owner cannot be deprived of his holdings. Residence on the claim is not necessary, and a claim may be held by a resident of another State so long as the proper amount of work is performed. The work may be done by an agent. It is best, however, to post the notice of assessment work done and record the same.

****

WHEN an abandoned mining claim, or one upon which the owner has failed to perform the necessary assessment work, is relocated by another, any improvements thereon become the property of the locator, for the reason that the relocator holds possession, and whoever may seek to enter the property for the purpose of removing mills, hoists, smeltors or other fixed improvements, is a trespasser and as such may be prohibited by law from carrying out such intention. The relocator may use the machinery and buildings so acquired and convert them to his own use.

****

SOMETIMES the fitchering of a machine drill is due to the slipping of the clamp on the bar, or if the machine is mounted on a tripod, to the slipping of one of the legs. Tripods are not commonly used underground, but may be used to advantage where the roof of a stope has broken too high from the previous round to make it convenient to set up a bar. It is unsafe to employ too high a pile of blocking if the base of the blocking does not cover a good sized area. It should be built up in crib form. A machine may be set on broken rock or ore, if a substantial and wide base be provided for the bar or tripod.

****

MOLYBDENUM has been successfully concentrated by the oil process and also by electro-magnet. The ore should be crushed by rolls in preference to stamps, as the latter would have a tendency to slime the molybdenite, which occurs generally in the form of scales, and being very soft would be difficult to save by subsequent concentrating methods. Where molybdenite has been badly slimed a saving has been effected by catching the slime from the tanks which contained the greater part of the molybdenite, the coarse material being comparatively barren. For this purpose some form of hydraulic classifier should be used.

****

THE cause for the miniature explosions occurring in a crucible assay charge before fusion may be due to the presence of moisture in the charge or to too high a heat at the start. Have a more moderate fire at first and increase the heat by addition of charcoal or coke and arrangement of dampers and draughts, or, if a gas furnace, act accordingly. The fresh charge is necessarily porous and contains air in the interstitial spaces. The imprisoned air will expand under the influence of the heat and thus cause small explosions, which may occasionally be of sufficient violence to throw a portion of the charge out of the crucible.

****

ALTHOUGH XXXXX and XXXXXX exploders are more powerful and destructive than XXX or XXXX caps, they are not more dangerous to handle, as commonly supposed, for each kind is made from mercury fulminate of the same composition and strength, but the amount is increased in the higher grades of caps. Any force, whether blow or scratch, which would cause a XXXXXX cap to explode would also explode a XXX cap. In blasting operations the high-grade caps are more effective than the lower grades. They cause a more instantaneous and complete explosion of the nitro powder, thereby increasing the force of the shock and the rending power of the gases, and the amount of nitrous oxide is correspondingly decreased.

****

IF it is demonstrated that a mill method in vogue is no longer adapted to the ore the practice should be discontinued for one which will give more satisfactory results. If some one has a device by means of which he can make a saving from tailings going to waste it is a good idea to adopt it, if the loss cannot be stopped by a change in the method of treatment in the mill. Mercury traps are found inexpensive and often satisfactory adjuncts to a good mill. The fact that they collect both quicksilver and amalgam after the most careful amalgamator indicates that often a physical condition exists over which the millman has no control. The matter of coarser or finer crushing must be decided by the result of experiment. Coarser crushing increases capacity, but it may curtail loss. Finer crushing reduces capacity and may also result in loss because of increased sliming of the ores.

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IN making connection between mine levels the work may be facilitated by sinking a winze to meet the raise. This will the more quickly secure good ventilation and the generally good result will in most cases more than offset the small additional cost of winze sinking. A small portable hoist operated by electricity or compressed air is a valuable aid in sinking winzes. Winzes may be sunk at an angle to the plane of the vein, and are often cut at as low an angle as 35°, to be used as chutes for timbers to be delivered to the stopes below. As the stope progresses upward the timber may always be delivered at the topmost floor and then taken to whatever point it is required. This is particularly useful in the square-set method of timbering, where a large amount of timber has to be handled, and it is a much less expensive method than that of hoisting timbers by means of snatch blocks from the level below.

****

AN economical "stamp mill" for crushing small amounts of very rich gold ore may be improvised by mounting a heavy, round cast-iron mortar provided with trunnions at the sides, in such a manner that it may be raised by a cam and tilted to dump its contents into a pan. The pestle should be about 4 feet long and provided with a heavy broad head that will fit the bottom of the mortar. The upper end should be attached by a small rope to a spring pole, which is strong enough to suspend the pestle about even with the top of the mortar. By this means a considerable amount of quartz rock can daily be reduced sufficiently fine to free most of the gold with the minimum of manual labor. Several pans and stout screens are required in the outfit; also quicksilver, to be used in amalgamating when panning. A valuable accessory is a grinding mortar for fine pulverizing. It will double the capacity of the plant.

****

A LARGE ore body may be stoped at low cost if only the expense of breaking down the ore and shoveling it into cars be considered. If, however, the additional expense of timbering is included, the cost is increased from 20 to 60 cents per ton, depending on the magnitude of the stope and the system of timbering adopted, as well as the cost of timber. If timbering is necessary, then it is safe to say filling must also be provided and this adds to the cost. This will be increased by superintendence, and if a shaft mine, by cost of hoisting, ventilation (generally) and drainage, beside interest charge and depreciation of plant. It is not unusual to find those interested in mines figuring upon the gross or assay value of their ore, when a long experience has shown that it is seldom safe to figure on more than 90% of the gross value. A mine statement for a period of thirty days is sometimes misleading, as it may omit many important general charges, and the expense of mining is thus made to appear less than it actually is. A mine which can be operated through tunnels can be worked at a lower cost per ton than one worked through a shaft when other conditions as to character of the ore, size of vein, etc., are similar.

****

"ROTTING IRON" is a term used in the United States Mint at San Francisco, Cal., for a process of extracting precious metals from ferruginous slags by melting with sulphur. This iron is originally derived from deposits of retorted amalgam containing base metallic scales due to the abrasion of shoes, dies, etc., in stamp mills. A considerable portion also finds its way into mint furnace slags from tongs, boods, grate bars and other tools used in melting operations. These iron slags are sent to the "sweep cellar," where they are ground in Chili rolls, and in passing through an amalgamator frequently "sicken" the quicksilver. The amalgam on being retorted leaves a "king" (button) of iron, rich in gold and silver. These iron kings are treated by the melter usually in a No. 80 crucible, a sufficient amount of sulphur being added to convert the iron into a sulphide. This is repeatedly dipped from the surface, great care being required to avoid taking up unsulphurized iron. The contents of the pot are finally allowed to cool, gradually forming a nearly perfect liquation, resulting in a king of precious metals in the bottom of the crucible. The resulting matte and the dipped iron sulphide are then returned to the sweep cellar where the remaining gold and silver are effectively amalgamated. Frequently heavy melting losses on deposits of poorly retorted amalgam are due to the base metal content.

****

THE mining law of Arizona in regard to affidavit of assessment work is as follows: "Within three months after the expiration of time fixed for the performance of annual labor or the making of improvements upon any mining claim, the person on whose behalf such work or improvement was made, or some person for him, knowing the facts, may make and record in the office of the county recorder of the county wherein such claim is situated, an affidavit * * * * that such assessment work and improvements were done and performed upon said claim, not including the location work of said claim (the location of a claim in Arizona requires the sinking of a shaft 10 feet deep, or equivalent work, as a part of the act of location, and this is in addition to the annual assessment). * * * * Such affidavit, when so recorded, shall be prima facie evidence of the performance of such labor or the making of such improvements, and said original affidavit, after it has been recorded, or a certified copy or record of the same, shall be received as evidence accordingly by courts of this Territory. The relocation of forfeited or abandoned lode claims shall only be made by sinking a new discovery shaft and fixing the boundary in the same manner and to the same extent as is required in making an original location, or the relocator may sink the original discovery shaft 10 feet deeper than it was at the commencement of such location, and shall erect new, or make the old, monuments the same as originally required. In either case a new location monument shall be erected, and the location notice shall state if the whole or any part of the new location is located as abandoned property, else it shall be void."

Quicksilver and Its Production.

The advance sheets of the "Quicksilver Production of the United States to the End of 1902" have been received from the United States Geological Survey, through the courtesy of J. Struthers, Ph. D., under whose direction the statistics and descriptive matter were compiled.

The production of quicksilver in the United States during 1902 was confined to the States of California and Texas. In 1889 production was reported only from California and Oregon. The following table shows the comparable items for the census years of 1889 and 1902:

	1902.	1889.
Number of mines	41	17
Number of operators	37	11
Wage earners—		
Average number	1,329	961
Wages	$ 881,340	$ 591,323
Contract work	23 164	(*)
Miscellaneous expenses	59,767	35,490
Cost of supplies and materials	322,267	219,622
Product (†)—Total value	1,550,090	1,190,500
Quicksilver—		
Quantity, flasks	34,291	26,464
Value	$1,467,848	(‡)$1,190,500
Cinnabar—		
Quantity, short tons	11,727	2,750
Value	$ 82,242	(*)

*Not reported. †The United States Geological Survey reports $1,467,848, which does not include 11,727 short tons of cinnabar, valued at $82,242, mined but not reduced. ‡Exclusive of 20 flasks, valued at less than $1000, produced in Oregon.

Idle mines reported for 1902 numbered fifty-six—fifty in California, three in Oregon and three in Texas. There were ten operative mines for which no production was reported, the employes being engaged in development work. Seven of these mines were located in California and three in Oregon.

The following table gives the production, in metric tons, and the value of quicksilver in various countries in the years 1899, 1900 and 1901, as reported by the United States Geological Survey:

COUNTRY.	1899.		1900.		1901.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
United States	1,057	$1,452,745	983	$1,302,586	1,031	$1,382,305
Austria	536	492,021	510	499,052	525	547,513
Italy	205	246,000	260	312,000	278	361,400
Russia	362	321,814	304	270,256	(*)	(†)
Spain	1,361	1,481,229	1,095	1,193,550	754	1,105,890
Totals	3,521	$3,993,809	3,152	$3,577,444	2,588	$3,397,108

*Mexico exported 324 tons of quicksilver in 1899, 335 tons in 1900, and 335 tons in 1901. †Statistics not yet available.

THE EXTRACTION OF MERCURY FROM ITS ORES.—Mercury is extracted by heating the ore in a retort or furnace; the metal is expelled as a vapor, which is subsequently condensed in cooling chambers and collected.

Up to the present time mercury has been extracted from its ores solely by the dry process. Various chemical and electrolytic methods have been proposed repeatedly and numerous experiments made, but without commercial success.

Perhaps the development of electric current generated by water power in localities where the use of fuel is nearly or quite prohibitive will render profitable the extraction of the metal by some electrolytic process.

The principal ore of mercury is cinnabar, mercuric sulphide, accompanied at times with minute globules of native mercury. The metal may be extracted from the ore by a simple distillation, either in a retort or in a shaft furnace, and though mercury may be separated from cinnabar in numerous ways, only two methods are used on a large scale.

In present furnace practice the heat necessary for the decomposition of the ore, either with or without the admixture of lime or iron, is applied in two ways—first, by heating the ore charge in a tightly sealed iron retort, which produces the mercurial vapor undiluted with furnace gases; and second, by treatment in a large furnace, where the products of combustion come in direct contact with the ore and pass out of the furnace in the form of sulphur dioxide gas, nitrogen, and unused air, mixed with the expelled mercurial gases, from which the metal is obtained by condensation in the cooling chambers. Thus the essential difference between the two methods is that the vapors given off in the retort furnaces are entirely separate from the furnace gases of combustion. The retort method possesses the advantage of yielding the mercurial vapor in a concentrated and easily condensible form, which is more than offset, however, by the high cost of fuel and labor involved and the small size of a single charge. At present the use of iron retorts is restricted to exceptionally rich ores and mercurial soot and concentrates.

The furnaces now generally used in California are of the shaft type, into which the ore is fed continuously. There are two kinds of these furnaces—one called the "coarse ore" furnace, used for treating lump ore, and the other the "tile" furnace for medium sized and fine ores. In general they consist of a cylindrical brick shaft, into which the ore is charged at the top, while the cinders are removed at the bottom. The heat necessary for the reaction is supplied at or near the bottom of the shaft, the gases of combustion passing through the ore-column, and, together with the liberated mercurial vapors, pass out from the furnace through a pipe at the top and are led to the condensing plant. The general type of tile furnace consists of a number of narrow rectangular shafts, each having a series of tiles inclined inward and dowuward and so placed alternately on the louger sides that the fine to medium sized ore (up to 3.5 inches in diameter) will follow a zigzag path in its descent, until it is finally discharged at the bottom through the drawing pit. The ore is gradually heated in its descent by the products of combustion from the fuel burned in the fireplace at or near the bottom of the furnace.

The condensing plant generally consists of a cooliug device and a condensing chamber in which the liquefied mercury is deposited. The gases passing out from the furnace must necessarily be of a temperature higher than the boiling point of mercury (360° C.), and the mercury content of these gases by volume is often less than 1%. In addition to the products of combustion of the fuel and the mercurial vapors, these furnace gases contain sulphur dioxide, which is derived from the decomposition of the ore, which when cooled yields acid liquors that attack ordiuary materials of construction. In the construction of the condensing apparatus for the proper cooling and condensation of the mercury three factors must be taken into consideration: The distance the gas has to travel, the interior capacity of the chamber, and the area of the cooling surface. The details of adjusting the construction of the condenser to give the best results vary at each plant. The materials used in building the condensers should be non-absorbent of mercurial vapor, good conductors of heat, not affected by acid vapors or liquors, and capable of being molded into the required form. No one substance answers all requirements. Iron is a good conductor of heat and may be easily shaped, but it does not resist the corrosive action of the acid vapors, and to overcome this disadvantage the iron pipes are often protected from corrosion by a coating of cement. Brick absorbs mercurial vapors, is attacked by acids, and is a bad conductor of heat. Wood will resist acid, but is a bad conductor of heat, and cannot be placed near the furnace where the temperature of the gases is high. Glazed stoneware resists the action of acid and mercury, and may be made thin in order to offset its poor heat conducting qualities. As with the variations in the selection of the materials of construction used, so is it with the general arrangement of the condensing plant.

The Copper Deposits of Encampment, Wyoming.

The United States Geological Survey has recently published a description of the geology and copper deposits of the Encampment district, Wyoming. The author of this report (Professional Paper No. 25) is A. C. Spencer. The region investigated is an oblong area embracing 450 square miles, extending east and west across the north end of Park range. The town of Encampment and the settlements of Battle, Rambler, Copperton, Dillon, and Rudefeha, are the direct outgrowth of interest in the mineral resources of this district. Encampment, the distributing point, is 43 miles by wagon road from Walcott, on the Union Pacific Railroad. Though elevations range between 7000 and 11,000 feet, the slopes are gradual, and roads may be constructed at comparatively slight cost, so that all parts of the region are easily accessible.

The report gives the results of the first detailed study undertaken by the Survey of the pre-Cambrian rocks in the Rocky Mountain region south of Montana. Three sedimentary formations and an older series of volcanic flows are found closely folded together and intimately intruded by dark colored igneous rocks locally known as diorite. Large amounts of granite and quartz diorite also occur, but these seldom contain ore. The best ore deposits have been found in the quartzites, where the copper minerals form a cement in zones of brecciated rock, but there are other types of deposits—such as fissure veins, igneous dikes containing infiltrated sulphides, impregnations near igneous contacts, and metamorphic zones in hornblende schists that are marked by calcareous silicate minerals carrying chalcopyrite and magnetite. The dark intrusive rocks are regarded as the source of most of the copper in the ore segregations, and its concentration in veins and ore bodies is attributed to circulating waters. Copper is the predominant metal of value, although a few occurrences of silver-lead ores have been noted, and gold is found either by itself in quartz veins or in small amounts accompanying other metals. Valuable coal deposits exist and are worked for use at the mines and in the smelter situated at Encampment.

A large part of the report is devoted to a description of mines and prospects. It contains several topographic and geologic maps, and the occurrence of deposits is illustrated by forty-nine diagrams, which add to the value of the paper. It may be obtained, without charge, on application to the Director of the United States Geological Survey, Washington, D. C.

The Mines of Cananea, Mexico.*

Written for the MINING AND SCIENTIFIC PRESS.

At Cananea everything is assuming an appearance of solidity and permanency. Improvements are going steadily forward in every department. The concentrator, originally of 300 tons capacity, has been increased to 1000 tons per day, and another is well under way which will be handling another 1000 tons by the first of the coming year. This will then be the largest concentrating plant in the Southwest. The new building, as well as the remodelling of the old plant, is under charge of L. D. Ricketts, who is the Phelps-Dodge Co.'s consulting engineer and sunerintendent of their Globe mines.

The plant is equipped with every modern appliance known for successful concentration. The crusher house is situated apart from the concentrator and all ore is handled by gravity, fed by automatic feeders and finally taken by Robin's belt conveyers to bins above the coucentrator. There is a system of belts; the first takes the coarse ore to the crushers, while the fines, separated by grizzlies, are taken directly to the main belt aud dumped thereon along with the fine ore from the crushers. The whole system works automatically and economically. When completed the concentrates will be received directly into cars at the foot of the coucentrator, making the process completely automatic.

Seven furnaces are in operation at the smelter, and each month lately has marked an increase in the production of copper. For April the production was 5,400,000 pounds and in May the product was 15,000 pounds greater. The completion of the new brick dust chamber last fall has made an important saving of large quantities of flue dust that was a source of heavy loss formerly.

The camp's water supply is now conceutrated at Ojo de Agua, 9 miles east at the head of the Sonora river, and about 1,500,000 gallons daily are pumped, supplying town, smelter and concentrator. Some water from the mines is utilized, where it must necessarily be pumped out, but the several pumping crews formerly necessary are now reduced to oue, and that smaller than before.

At the Veta Grande a trausportation tunnel has been driven, connecting with a like one from Capote, and meeting under the Oversight mine. This has a total length of 6236 feet and will greatly facilitate production of ore from the Veta Grande and Oversight mines which formerly went to Capote chutes and Veta Grande chutes, near Capote. El Cobre Grande is again being worked, supplying about 100 tons per day, along with development work. Work at Puertocitos has been suspended for the present, and little is being done at Elenita, but the Elisa is working full force and with Capote supplies the bulk of the ore.

New buildings on the Mesa, the residence section, are not noticeable, though during the past year the large municipal building and the residence of W. C. Greene have been completed. This will be the residence district of the town's permanent population, the floating population preferring Ronquillo (Old Cananea) for convenience to the works. Ronquillo also has the postoffice, company store, offices, etc.

The old Democrata Co., located in the midst of the Greene holdings, and a producer, while it was yet necessary to ship to Nogales, is still a steady producer, in charge of P. Hook.

The Old Mexicana mine, at one time a heavy producer of silver-lead ore, and situated 4 miles east of Cananea, is now idle, but it is stated that work will shortly be resumed. It is owned by the L. L. Lewis Co., of California.

The Phelps-Dodge Picacho mine, near Bacoachi, 50 miles south of Cananea, is still shipping high-grade gold ore and carrying on development work.

It is reported that the Lightfoot & Howard property, near it, will change hands immediately on receipt of titles from Mexico City and that development work will be pushed rapidly. This is locally considered one of the best prospects, yet undeveloped, in Arizpe district.

Cananea, June 16.

*See illustrations on front page.

THE PROSPECTOR.

The mineral specimens from Copperton, N. M., are gypsum (calcium sulphate). No. 2 is the variety selenite.

The rocks from Churchill county, Nevada, are: No. 1, an aggregate of chlorite scales, the result of decomposition of a dark, basic rock. No. 2 is silica, and is evidently the silicification of a dike rock, probably apatite. No. 3 is trachyte, in which the feldspars and hornblende are distinctly seen; quartz is not recognized in the rock. No. 4 is felsite, a variety of acid eruptive rock.

The mineral from Lundy, Cal., is pyrite (iron sulphide); it may contain either gold or silver or both. Iron sulphide, thought to contain gold, may often be prospected satisfactorily, and tested for that metal by

roasting the pyrite and grinding the roasted ore in a mortar and carefully panning. In case of very fine gold, such as often occurs associated with pyrite, the gold may be invisible and float off in the slimes. In such case a fire assay would be necessary.

Topographic Work in Western States.

The field work of the Western division of topography, United States Geological Survey, during the season of 1904-05 will cover portions of eleven States. This work is under the general supervision of E. M. Douglas.

Under the direction of H. L. Baldwin, Jr., several 15-minute quadraugles will be surveyed in Montana. In addition to work on the 15-minute quadrangles, 200 square miles will be surveyed in co-operation with the reclamation service.

In order to determine whether mining operations at Butte cause subsidence of the surface, a number of bench marks will be carefully established with proper reference to distant points.

In South Dakota 2½ 15-minute quadrangles will be surveyed. It is also proposed to survey, in co-operation with the reclamation service, 190 square miles of area.

In Wyoming R. T. Evans will have charge of a party in the Medicine Bow quadrangle on a scale of 2 miles to 1 inch, with 100-foot contours. This sheet includes several mining areas, among the best known of which is that about Centennial. R. B. Robertson will connect the triangulation from the Colorado positions with those in northwestern Wyoming, carrying it across the southern portion of the Bighorn Forest reserve.

In Colorado, F. Tweedy, assisted by Pearson, Chapman, Moore, and Buell, will complete the topographic survey of the Blackhawk 15-minute quadrangle. They will also finish three special maps of the mining areas about Central City, Idaho Springs, and Silver Plume.

Work in California and Oregon will be under the direction of R. B. Marshall. The Iron Mountain special quadrangle will be completed by A. I. Oliver. Work in co-operation with the State will be continued in the Sacramento Valley, where it is planned to survey five 15-minute quadrangles. The oil center special sheet will be completed and the Bakersfield 15-minute quadrangle continued. Two 15-minute quadrangles north of San Jose and Mount Hamilton will be surveyed.

The survey of the Grant's Pass quadrangle in Oregon will be undertaken by A. I. Oliver and E. M. Fry. The Telocaset quadrangle will be completed by W. C. Guerin.

In Washington work on the Pullman quadrangle will be continued by L. C. Fletcher. A. H. Sylvester will complete the topographic survey of the Mount Adams quadrangle.

In Utah A. E. Murlin will complete the survey of the Gilbert Peak quadrangle, comprising a portion of the Uintah Forest Reserve. The survey of the Frisco quadrangle, which includes the Horn Silver district, will be commenced.

A. Stiles will complete the topographic survey of the Van Horn 30-minute quadrangle in El Paso county, Texas, and commence the survey of a 30-minute quadrangle to include the principal oil wells in and about Beaumont. The Bonham 30-minute quadrangle will be completed by F. McLaughlin.

During the fall and winter of 1904-05 topographic surveys will be extended, under direction of T. M. Bannon, near Phœnix and Mesa, Arizona. Surveys in charge of R. T. Evans will be continued in the Grand Canyon. A special map covering the Tombstone mining district will be made by R. H. Sargent, who is at present in China engaged in making surveys for the Carnegie Institution.

Surveys in New Mexico will be carried on under direction of R. H. Chapman. These will include the Socorro 15-minute quadrangle and the extension of triangulation southward and eastward from the Gila river forest reserve. It is planned also to measure a base line in the vicinity of Socorro.

A Coal Loading Machine.

Coal mining is one of the most important industries of the United States. It gives employment to hundreds of thousands of miners, and were it not for the introduction of mechanical devices in the mining and handling of coal it is doubtful if the rapidly increasing demand could be met. The first important innovation in coal mining was made twenty years ago by the introduction of the coal cutting machine. It was not well received by the miners, who regarded it as encroaching upon their domain, but since then higher wages have been paid them, and the selling price of coal is at least 20 cents per ton lower than it would have been but for the coal cutters.

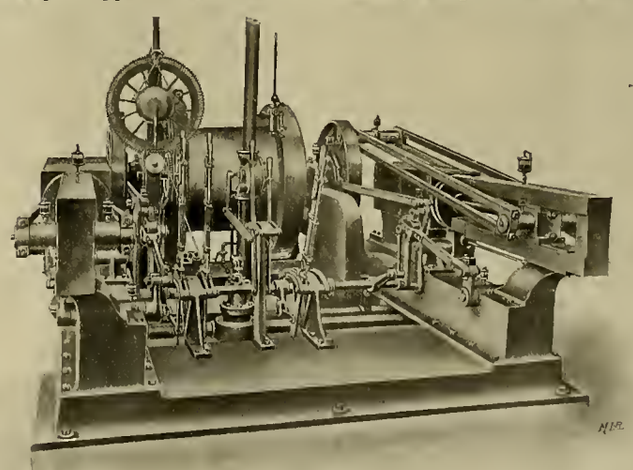
More recently electricity and compressed air have entered the mine and now an automatic loader is taking the place of the shovel. Under the direction of one man and a helper, said the manufacturers, it can do the work of ten shovelers. Its work is regulated by one man, who stands at a lever and directs its movements. It is stated that it can load 20 cubic feet (1000 pounds) of coal per minute, that it fills a two-ton car in four minutes. With one helper it can, it is claimed, send out the loaded car and bring back an empty one and clean up a room of twenty tons in one hour, and load and send out 120 tons from six rooms to the main entry in eight hours without the help of mules. To load this amount of coal requires the hard work of ten shovelers.

The accompanying photograph represents one of ten machines built for Joseph Leiter of Chicago for his mines at Ziegler, Ill. This machine is the invention of W. E. Hamiltou of Columbus, Ohio. In its operation the coal is gathered by a sweep, consisting of a special type of scraper-conveyor, so pivoted on the vertical head shaft that it may be oscillated through a sufficient angle to reach the coal across the entire face of the room, and at the same time accommodate itself to the surface of the floor. The lower end of this sweep consists of a hinged gathering plate, which is forced under the edge of the coal pile, thus bringing the coal in contact with the flights of the conveyor. These scrape it through a trough to the head, where it is discharged into a second conveyor of the apron type. This serves the double purpose of a picking table and conveys the coal back to the pit car. The sweep, which is forced under the coal by an automatic feeding mechanism, passes from one side of the room to the other and back, gathering coal as it passes in both directions, the machine being forced forward by its own power under control of the operator. The entire machine is carried by a steel truck which is self-propelling. The same truck carries a pair of drums connected to the motor by gears and clutches. These carry wire cables, which, passing over a snatch block at the cross entry, form a tail rope system for delivering empty cars to the machine and hauling the loads to the entry. The machines, as built for Mr. Leiter, are driven by electric motors, but can be equipped with either compressed air, gasoline or steam engines, and worked in veins of coal as low as 4 feet. While this machine will be used chiefly in coal mines in the East, it is thought it will be of service in many metal mines in the West, and can be used as well for loading ore, crushed stone, salt, and coal in yards, or on wharfs to cars or vessels. The machine is made by the Hamilton Manufacturing Co. of Columbus, Ohio.

Automatic Coal Loading Machine.

A Small Direct-Acting Hoist.

Henry Bolthoff, of the Hendrie & Bolthoff Manufacturing & Supply Co., of Denver, Colo., mining machinery, designing and constructing engineers, has recently brought out a new first motion hoist, built in small sizes only. The distinctive feature is in building in a self-contained frame a first motion hoisting engine occupying about one-half the space origiually occupied by such machinery. By examination of the accompanying engraving it will be seen that the cylinders are located at the drum end of the hoist. In order to accomplish this it has been necessary to make an extended crank pin and use a double connecting rod. The first impression of engineers may result in a critieism of this long crank pin and the assertion that this is a serious defect. However, in actual practice, such, the manufacturers say, has not been the case, and already this engine has been installed on a large number of properties in Colorado and Arizona and is said to be giving universal satisfaction. It is equipped with a reversing device of new design using a single eccentric for the control of each valve. The guides are square-box type, made in one piece, and the cylinder is encased in a square jacket with metal lagging. This engine is equipped with Bolthoff's automatic signal alarm indicator, having an attachment which can be set so as to stop the hoist automatically at any desired point, for instance, to prevent the cage being hauled into the sheave by overwinding. This device can be seen in the engraving. From the small sheave wheel below the dial a small wire leads to a quick-acting whistle-valve, operating the exhaust control with which these hoists are equipped. When the cage passes the danger point the indicator trips a releasing catch, dropping a weight which in turn operates the whistle valve, closing the exhaust of both cylinders instantly, thus bringing the engine to a dead stop. These hoisting engines are built in both single and double drum types, are equipped with post brakes, and the workmanship is above the average. By reference to the cut it will be seen that the



Small Direct-Acting Hoist.

length over all of this hoist is only about one-half of the length of a hoist of the same build in the older form. This reduces the cost of foundation material as well as the first cost of the hoist. It makes a simple and compact type of engine especially adapted to the lighter work. At the present time there are but four sizes in operation, as follows: 7x21, 8x24, 10x30, 12x36. These hoists are being manufactured and sold by the Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo.

The Young Quartz Miner.

Written for the MINING AND SCIENTIFIC PRESS by MATT. W. ALDERSON.

PART I.—TOOLS NEEDED. HOW TO SHAPE, SHARPEN, HARDEN AND TEMPER THEM.

Some time since I received a letter from a young man who had completed his common school education and who plans this coming year to take a course at the State School of Mines of Montana. In the course of his letter he says:

"Cau you help me by suggesting how I can best get a good, practical kuowledge of quartz mining? I found that the short time I had spent as clerk and delivery man in a grocery store was a very great aid to me when I went to business college. I completed the course in half the time taken by many others. It seems to me that a few months actual work in a mine would help me in comprehending the course at the school of mines. I tried to get a chance to work in the B—— mine, but the foreman told me that the miners' union made no provision for apprentices, but required that all persons working in the mine be paid full wages, aud that orders from his employers were that he employ none but skilled help. So he couldn't give me a chance. I tried to find something about the use of tools iu the fine mining library we have here, but all the writers seem to 'shoot too high' for me. The only suggestion I found was that the prospector should have worked in some mine in the section he thinks of prospecting."

Recognizing that there are other youug men having the same ambition as the writer of the above, I give a geueral, open answer.

The young man who seeks to become a miuer should seek employment in a small mine. In a large miue the help is always classified, men being put at the kind of work at which they are found to be most efficieut. This is not possible in a mine where there are but a few men employed; for each must lend a hand at different things, as occasion requires.

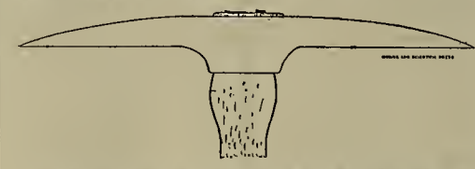
If the young man kuows of some one who has claims needing representation, a good plan is for him to take a contract to do the work and hire a skilled workman to help him. He will do well to select a man well aloug in years. The man of age may not be so active, and so one may be apprehensive that he will not be able to do as much work as some younger man; but, if the old man is a man of experience, and at least ordinary intelligeuce, the chances are that he will do more aud better work than a younger man, because he has learned to handle himself so as to do his work with ease and to the best advantage. The young man should bear in mind that this is his opportunity to learn, and he should select a helper capable of doing the work well and willing to tell how he has learned to do certain things in the easiest, best way.

If the young man cannot get the job of doing the representation work, possibly he may get employment from the man who does.

Having secured an opportunity to work, he must first familiarize himself with the tools. If he has secured a contract, he must know what tools he will need, so he may obtain them by purchase or otherwise. For awhile, at least, he will be a helper, so there will be but one miner. The necessary tools for this man will be oue shovel, two picks, one sledge, one striking hammer, fifteen drills in varying lengths, from 12 inches to 3½ feet, oue spoon and one gad, a large and small water can and some gunny sacks, the latter for making "mops" to prevent the mud from spattering wheu drilling wet holes. Other tools may be advisable under certain conditions, but the above are absolutely necessary. Fewer drills may be ueeded in soft rock, but in ordinary rock these are as few as will enable a man to work to advantage, aud in hard rock he should have not less than thirty. Do not cut too many short drills; the long "starters" soon become too short.

The size and shape of the tools are important to know. For all-round-work the shovel selected should be a loug-handled shovel with round pointed blade. The length of this shovel will be 5 feet from end of haudle to point of blade. For work in a shaft or drift this handle will be too long. It is made the required length by cutting off whatever may be necessary to suit its length to the place where the work is being done.

Ready-made picks are in general use in quartz mines in the West, preference being given to those all steel and weighiug five or six pounds. The six-pound is the weight in most general use in development work, the lighter weight being used in raising and stoping. Most illustrations picture quartz miuers swinging a crescent shaped pick, but one never sees such a sight in a Western mine. Picks used in quartz mines have the points straight out from the handle on the under side, the upper edge curving toward the ends to meet the point. They assist the reach and enable one to get into corners that could not be conveniently reached with a curved pick. (See sketch of pick).



The writer has had one man in his employ who used a single-handed striking hammer weighing seven pounds, and another whose hammer weighed four pounds, with a handle 16 inches in length; but the hammer favored by the majority of miners weighs 3½ to 4 pounds and has a handle 12 inches long. The hammer for double-hand work should weigh 6 to 6½ pounds and have a handle 2 feet in length. The sledge for general work should weigh 8 or 10 pounds, the lighter weight being the one most frequently preferred.

The spoon is made of a round bar of iron ⅝ inch in diameter and 40 inches in length. One end is flattened and formed into a half cylinder about 6 inches of its length, a half inch of which is turned up to form a scoop-like point, which is utilized for removing the pulp made in drilling a hole. The other end is drawn to a narrow flat point, useful in loosening and cleaning holes where the pulp does not crush easily, but packs, as when one is drilling a dry hole in clay.

Drills for single-hand work are of ¾-inch or ⅞-inch octagon steel; for double-hand work, ⅞ inch or 1 inch.

The young quartz miner who seeks to master his business and qualify himself for managing a property where numbers of men are employed, should certainly know how to shape, sharpen, harden and temper his tools. He will then know whether he may excuse a man who pleads that his drills were improperly sharpened, etc. His shop, in starting, should contain not less than a forge and good bellows, an anvil with hardy, a pair of gad tougs, a blacksmith's hammer and a tool hammer. All of these can be purchased at any hardware store in a mining section, and all will be ready for use but the hardy, which will need tempering. Good work may be done with either coal or charcoal as fuel. Coal containing much sulphur is inferior to charcoal.

It is important that a cutting tool be well shaped, also that it be sharp, and it is of vital importance that it be properly tempered. The tempering quality of steel is due to the presence of ¾% to 1¼% of carbon in the material, which gives it the power of possessing decided hardness simultaneously with a valuable degree of toughness. The carbon is thought to be dissolved in the iron under the influence of red heat and to be held in place by cooling.

To follow the usual instructions for tempering steel requires much more time than most blacksmiths can give. A man skilled in tempering may temper drills for a contest, but the smith who has 100 or more drills to sharpen in an eight-hour day is not likely to take the time that tempering requires. I have seldom known a mining blacksmith to temper drills—his practice is usually simply to harden them—though I have books in my library and a number of clippings from mining journals which say that tempering is what must be done and which tell just how to do it. Neither have I known a blacksmith to follow the system for tempering given in any work I have. I will describe, then, methods in use in my section, and the reader is at liberty to follow them, or otherwise, as his judgment dictates. But they are short methods, of proved excellence, and "time is money" in tool sharpening, as in everything else.

In working steel, the novice must be cautioned against heatiug the metal to too high a degree, for by so doing he is apt to drive the carbon from it, thus rendering it valueless. As steel is heated, it first assumes a dark red color; as it becomes hotter it is cherry-red; still hotter, it becomes yellow; hotter still, it becomes a pale color called a "white heat." The heat should never be raised beyond the yellow stage, except for welding, and when the metal has reached that point it should be worked and not be allowed to remain in the fire. In shaping drill bits, the blacksmith handles his steel quickly, and, giving the bit a few blows on one side, turns it over and gives a few on the other. This is to keep the grain of the steel straight and prevent it from becoming granulated. If iron be bent back and forth when cold, the fibers separate and the metal is soon broken, as any one can see for himself with a piece of wire. Blows on the steel, then, are struck so as to keep it going towards the point without its being bent back and forth.

(TO BE CONTINUED.)

GERMAN CEMENT manufacturers have adopted the following as the definition of the term Portland cement: "A hydraulic cement having a specific gravity when calcined of not less than 3.1 and containing by weight not less than 1.7 lime to each part of silica + alumina + ferric oxide, the material being ground raw, calcined to clinker and then pulverized to proper fineness."

Pan Amalgamation at Rosario, Mexico.*

NUMBER III.—CONCLUDED.

Written by A. E. DRUCKER.

The thickness of the pulp in the pans is a very important thing with pan amalgamation. If the charge is too thin, quicksilver will not be kept in suspension and will settle to the bottom of the pan, resulting in very poor amalgamation. The charge will also become cold, which should be avoided. On the other hand, if the pulp is too thick it will become too hot (caused by friction of the particles) and floured quicksilver will result. To attain the proper thickness for a charge, add water until the pulp will run with difficulty out of a dipper. Particles of quicksilver should be seen coming to the top and circulating all through the pulp. The mercury should always be added through a bag, so that it can be finely distributed throughout the pulp. By doing so it takes less to do the work and consequently there will be a smaller loss through flouring. If quicksilver is poured into the pans in a solid mass, it will all go to the bottom and will have to be worked up through the charge gradually. This method takes longer for the particles of Hg to distribute and mix thoroughly with the pulp; also a greater quantity is required.

The temperature of the charge is an important thing, and if over 180° F., quicksilver becomes very active and thin, causing a large amount to be floured. The temperature is about right when a person can just stand the heat, when putting the hand into the pulp. When the temperature is low the mercury is less active and amalgamation goes on slowly.

The speed of the muller should not exceed 75 revolutions per minute. A greater speed is sure to split up the quicksilver so fine that flouring will take place. Less than 65 revolutions will result in the charge becoming cold and steam heating must be applied, if the pulp is run thin. The higher the speed and the thicker the charge, the greater will be its temperature. If double discharge mortars were used with fine screens, so as to do as little grinding within the pans as possible, a great saving in quicksilver would result.

WORKING OF SLIMES IN THE PANS.—Slimes, if worked in the pans, take twice the amount of bluestone and salt required with the ordinary coarse sands. The same amount of mercury is needed. Slimes swell on adding water, and small amounts must be put in the pans. The muller is raised (no grinding) and the chemicals added and run for two hours; then Hg is added through a bag and run four hours. The loss of mercury with slimes is twice as great as with ordinary coarse sands. Slimes should be mixed with coarse sands to do good work.

RESULTS WITH TAJO ORES.—The average loss in quicksilver per ton of ore worked was 1.6 pound with very base ore containing large quantities of galena, zinc blende and some copper and iron pyrites. The value of ore was from 4 to 6 ounces of silver per ton and from 0.25 to 0.40 ounces of gold per ton. The extractions for silver were from 60% to 70%, and for gold 80% to 90%. This low-grade proposition was made to pay, and the loss of mercury was cut down from 150 flasks to 90 per month. Formerly the loss was 2.5 pounds of mercury per ton of ore worked and now the loss is 1.6 pound. It has been the practice to run the pans at 90 revolutions a minute, the settlers at 16 and 18 revolutions, while the amount of bluestone used was from 2 to 3 pounds. One gallon of mercury was used for each charge. The charge was ground for 1½ hours and amalgamated 3 hours. Formerly the ore was less base with higher values in gold and silver, the bullion being very base with half copper. The reason for this was the large excesses of bluestone used.

Now the pan mullers are running at 75 revolutions, the settlers 13 revolutions, and the amounts of bluestone for each charge varies from 10 to 14 ounces. Twenty pounds of salt are used in each pan, and a litte lime (1 pound per charge) to counteract the excess of bluestone. Sodium and zinc amalgam are used with the quicksilver to clean it and keep it active. These changes account for the reducing of the loss of quicksilver along with better extractions and the obtaining of almost pure bullion. The amount of mercury used in each pan was two quarts, added through a bag. The ore was ground for two hours and amalgamated for two hours more. The sixty stamps had a capacity of 180 tons in 24 hours, and 180 charges were run through the pans during 24 hours. Two agitators were formerly used to catch some of the lost mercury from the tailings. Now they are unnecessary and do not pay for themselves.

If the discharge boxes on the settlers are lined with copper sheets and amalgamated, almost all floured quicksilver escaping will be caught on the plates, and no agitation here will ever pay for itself. I believe also in lining the upper part of each settler with copper sheets, which would certainly catch a great deal of floured quicksilver, otherwise lost with the tailings.

The best form of shoes for the settlers, after experimenting with all shapes, are those made of cast iron, 4 inches high, as in Fig. 1, being hollow in the

* Abstract Cal. Jour. Tech.

center with no grinding surface at the bottom. These shoes give fine results and very little quicksilver was lost from the settlers. Wooden shoes of the same form, but having a grinding surface, did fairly well while they were 4 inches high, but as soon as they were worn below 4 inches the settler would not clean itself of the heavy sands and concentrates. If higher than 4 inches and the settler making 13 revolutions per minute, floured quicksilver would be thrown out and lost. The following forms of shoes do bad work and cause a large loss of quicksilver. No. 2 shoes may be used, when working heavy concentrates in the pans, for the settlers. They give excellent results, and very little floured mercury is lost after the speed has been adjusted. No. 3 shoes cannot be used, since they throw out large quantities of mercury. No. 4 is sometimes used with ordinary ores, but they have a tendency to keep the quicksilver up, causing floured mercury to escape in large amounts. Nos. 5 and 6 forms are not satisfactory and cause losses. No. 2. cannot be used on Tajo ordinary ores; they are only good with heavy concentrates.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

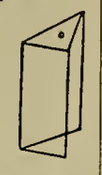


Fig. 6

The process of pan amalgamation is a very complicated one and requires skillful operators, if the loss of quicksilver is to be kept at a minimum. One must know what chemical reactions take place in the pans so as to know where to look for the losses of quicksilver.

Metallurgical Practice of the Witwatersrand.*

Written by H. S. Denny.

REPLY TO DISCUSSION.

In July last, when I presented my "Observations on the Metallurgical Practice of the Witwatersrand," I took occasion to remark in my conclusion that I had laid myself open to severe treatment at the hands of my critics.

In my replies to the many points that have been raised in criticism of my paper, I propose to deal with each member's remarks in the order in which they appear in the Society's Journal.

J. R. Williams begins, under the heading of "Sorting," by taking exception to my use of an all-round figure of 80% extraction from all sources.

He does not say that he objects because such a figure affects the comparison which I am trying to make, but he takes it on the specific ground that 80% is too low a figure, and one likely, therefore, to be misleading. He admits that later, in dealing with extraction by the cyanide process, I take a higher and correct figure, and he would have me take something nearer 90% in the comparison of sorting versus non-sorting.

For the purposes of comparison it would have been misleading to base it on a 90% extraction, as my figures are drawn to deal generally with the averages of the majority of the mines, and this majority does not treat its slimes, and certainly does not average 90% extraction.

In proof of this statement, I need only point out that in 1899, out of seventy-three producing mines, only twenty-two were treating slimes, while to-day, if all the companies with milling equipment were running, the disproportion would still be very great.

The following statement shows approximately the relative extraction as between the treatment and non-treatment of slimes on a basis of 100 tons of ore giving a 10 dwt. value at the screen:

NON-TREATMENT OF SLIMES.

Extraction by amalgamation, 5 dwts. per ton equals	500 dwts.
Extraction from sands—assume:	
No. 1—75 tons of sand treated carrying 400 dwts. = 5.3 dwts. per ton.	
No. 2—80% extraction equals	320 dwts.
Total	820 dwts.
Equals 82% extraction.	
Recovery by amalgamation, 63%.	

TREATING SLIMES.

By amalgamation as above, equals	500 dwts.
By sand treatment, equals	320 dwts.
By slimes treatment:	
25 tons at 4 dwts. and carrying 100 dwts., allowing 80% extraction, equals	80 dwts.
Total	900 dwts.
Equals 90% extraction.	

Naturally, the relative extraction by the three processes would vary considerably according to the particular mine from which the ore was taken. I have based the figures on a recovery by amalgamation of from 60% to 66%, independent of recovery from slimes. In both cases allowance must be made for losses in retorting, smelting and the handling of zinc slimes.

It is clear that in the foregoing comparison there is much to be gained in percentage extraction by the treatment of slimes. The question is, however, to gain that increased extraction in a plant that gives low initial outlay and low working costs. This point I touch upon in my original paper.

The point, however, which I wish to emphasize is that my figures are taken to represent more the general than the individual aspect, and I do not think it correct to take either the best or worst returns from the producing mines, but something midway that can be used as a framework on which to establish any variation, but not one that necessarily applies in particular to every case.

I therefore think Mr. Williams is wrong in suggesting that I should have taken 90% rather than an 80% basis for my sorting comparisons.

To illustrate, however, what bearing 70%, 80% and 90% extraction would have on the above comparison of sortiug and non-sorting, I submit the following statement, which shows that the higher the percentage extraction the more favorable becomes the case for sorting:

NON-SORTING.

	Per ton.
No. 1.—70% extraction.	
Working costs	24s
Value	50s
Extraction	35s
Profit	11s

Profit on 4,000,000 tons = £2,200,000. Present value of that amount at 5% c. i. over 22.2 years, £751,520.

	Per Ton.
No. 2—90% extraction.	
Working costs	24s
Value	50s
Extraction	45s
Profit	21s

Profit on 4,000,000 tons = £4,200,000. Present value of that amount at 5% c. i. over 22.2 years, £1,434,720.

SORTING.

	Per Ton.
No. 1—70% extraction.	
Working costs	28s 10½d
Value	60s 00
Extraction	42s 00
Profit	13s 1½d

Profit on 3,200,000 tons = £2,100,000. Present value of that amount at 5% c. i. over 17.7 years, £885,675.

	Per Ton.
No. 2—90% extraction.	
Working costs	28s 10½d
Value	60s 00
Extraction	54s 00
Profit	25s 1½d

Profit on 3,200,000 tons = £4,020,000. Present value of that amount at 5% c. i. over 17.7 years, £1,695,435.

The figures for 80% on the above basis are given in my paper. Summarized, we have the following:

PROFITS—NON-SORTING.

No. 1—70% extraction	£ 751,520
No. 2—80% extraction	1,083,520
No. 3—90% extraction	1,434,720

SORTING TWENTY PER CENT.

No. 1—70% extraction	£ 885,675
No. 2—80% extraction	1,290,585
No. 3—90% extraction	1,695,435

DIFFERENCES IN FAVOR OF SORTING.

No. 1—70% extraction	£134,155
No. 2—80% extraction	207,065
No. 3—90% extraction	260,175

Milling.—Under this head Mr. Williams states that there is every special differentiation of feature in Witwatersrand ores, from the Robinson to the Heriot, necessary to warrant extraordinary variation in the mesh of mill screening, and he cites as an instance the Ferreira Deep, where, after many experiments, 1000 mesh has been finally adopted as the most suitable.

I feel certain that in the case under notice, with the assistance of a simple classifier, after the mill pulp has passed over the plates, and fine grinding and cyaniding of the heavier product, the necessity for reducing to 1000 mesh in the mill could be avoided, while simultaneously the mill capacity would be largely increased and the total extraction quite as high, if not higher.

Mr. Williams says the gold was found to be encased, and that for this reason the finer mesh was employed. At the Meyer and Charlton the same difficulty was met with, and it was remedied by putting in a few settling boxes, the heavy product from which was subjected to cyanide treatment for twice or three times the period adopted for the sands, with very satisfactory results. Fine grinding would doubtless improve these results, and this step will be taken eventually.

From the many investigations made by me into the condition of Central Rand residues, I think the case Mr. Williams cites is one that favors classification or concentration rather than finer screening in the mill, and I think he has confused the virtues of the two operations to the detriment of his results.

We shall only be in a position to definitely state what mesh the mill should be fitted with when we have determined the exact limitations of milling and grinding, and I regret that these two factors have not yet been ascertained, and therefore the point calls for further inquiry.

To Mr. Williams' query, "May not finer crushing be one of the necessary variations?" I say I think not. Fine grinding is what I pin my faith to.

I do not say that differences in mesh may not prove to be necessary, even when we have clearly defined on each particular mine the practical limitations of milling and fine grinding, but I do say that in view of our ignorance of these limitations to-day we cannot claim to have sufficient information on the point to determine definitely what the correct mesh should be. For instance, Mr. Williams uses, as before stated, a very fine mesh at the Ferreira, but I think that in the light of further knowledge on the virtues of milling and fine grinding it is probable that he will ultimately reduce it to something say from 200 to 400. I am certain that, even with fine grinding, the virtues of milling will vary as between a Roodeport ore and say a Central Rand ore, but I am equally certain that we shall never find it necessary to make the mill the means of reducing to anything finer than a 400 mesh.

To-day there is more than one flint mill actually erected on the Rand for the specific purpose of regrinding classified products from the mill, and this is taugible evidence that the whole question of slimiug by this means is to be put to practical proof.

Amalgamation.—Under "Amalgamation" Mr. Williams says that he would like figures to substantiate my statement regarding the percentage of extraction by amalgamation as from the west of the Witwatersrand towards the east, and the following table, grouped in three sections, will, I think, satisfy him on that point:

MONTH OF AUGUST, 1903.	Recovery.
From west going east to the Langlaagte Estate	69.24%
From the Langlaagte to the Geldenhuis Main Reef	63.76%
From the Geldenhuis Main Reef going east	60.97%

If the recovery from the slimes plant be omitted from the calculation, the percentage recovery by amalgamation would be in the same month:

	Recovery.
From the west going east to the Langlaagte Estate	70.35%
From the Langlaagte to the Geldenhuis Main Reef	66.13%
From the Geldenhuis Main Reef going east	63.34%

The amount of mercury used per ton of ore crushed is near .075 ounce.

Slimes.—The operation of our separation at the Van Ryn mines is conducted mainly in one conical-bottomed vat, 35 feet in diameter and 21 feet deep. The whole of the slimed pulp coming from the cyanide plant is led into the center of this vat, and from the bottom of it a product of 20% (dry slime) is continuously taken off and led to the slimes plant. I may say that this product occasionally runs up to about 30%. The original pulp coming into this vat runs about 3%, and it will be seen, therefore, that the bulk of our water is separated in one operation, independently of the slimes—that is to say, that if for any reason the slimes plant should be stopped, our water separation does not in auy way suffer.

At the Bonanza mine the first separation is made by a series of pointed boxes, the under discharge from which carries about 12% of dry slime. This product is then led into the first slimes vat, where further water is separated after settlement of the slime by decantation. If for auy reason the slimes plant should be stopped and out of operation, the only separation of water that is obtained is from the pointed boxes, which, it is obvious, is considerably less efficient than that from our main tank

If 1050-pound stamps were fed with ore not exceeding in average ½-iuch cubes; I believe that, without increasing either the speed or the drop, the capacity of such a battery would very nearly approximate the work done by 1250-pound stamps on ore averaging 3-inch cubes.

Under "preliminary breaking," I suggested that all the ore should be reduced to about ½-inch cubes before entering the mill, and this, I believe, will eventually become general practice, thus doing away with the necessity for the classification referred to.

On West Australian methods the tendency appears to be to slime everything and to treat the pulp after amalgamation by a simple agitation method in one operation. This is surely a less complicated procedure than our existing one. A good deal has yet to be learned of the possibilities of spitzlute work, and upon the acquisition of more definite data on this point will depend the termination of the advantages of sliming everything, as against sliming only a classified portion of the mill pulp.

H. Leupold suggests that sliming to 1600 mesh would be cheaper and just as satisfactory as sliming to 40,000 mesh. I can only say that my experience in my experiments, the results of which I have given you, does not support this view. In West Australia, in using flint mills, it is stated that the larger percentage of the product will pass through a mesh of 220 holes to the linear inch. No screens are used on the machine, and, once it is set, that product must be constant. In practice the slimes are passed through a classifier after leaving the flint mill, and anything closer than about 200 holes to the linear inch is returned to the flint mill.

Mr. Leupold goes on to say that the oscillating copper plates proposed by A. M. Day might be tried with advantage. In my experience thus far, any amalgamated plate such as that suggested shows scouring, and considerable flouring of amalgam and mercury results. The best amalgamator has so far been represented in the stationary plate.

In the matter of agitation, I think that revolving barrels can be dispensed with, and, in some interesting experiments in which the agitation was done in montejus, I have obtained results so satisfactory that it has been decided to dispense with the revolving barrel.

*Abstract Jour. Chem., Met. and Min. Soc., S. A.

Magnetic Separation.*

Written by F. T. SNYDER.

Everyone is familiar with the simple fact that a magnet will pick up small pieces of iron; many persons are familiar with the fact that sufficiently powerful magnets will attract a large number of materials in which the presence of iron is, at least, not in evidence, but few persons realize that the design of magnetic separators and the practice of magnetic separation have developed to a point where it can be stated that there is no material which cannot be moved by magnetism if the commercial conditions under which its movement is desired will permit of the necessary expenditure. For many materials this cost is usually prohibitive, but, as a curiosity, pieces of wood, apples and other things generally considered magnetically inert, have been moved through distances of several inches.

In the early days of magnetic attraction, previous to half a century ago, it was generally thought that the law of magnetic attraction was simple, and even quite recently it has been stated in text-books that the attraction of a magnet for a movable particle varied directly as the strength of the magnet and inversely as the square of the distance. This, in common with the other simple laws of natural phenomena, has proved to be simple only under theoretical conditions which are not secured in practice. However, the law of movement of a free particle in a magnetic field was understood and perfectly formulated at least half a century ago. In such formula the distribution of the field is assumed as known, while it is from this factor that the complications in the theory of magnetic attraction usually occur.

The early types of magnetic separators consisted of a straight-bar permanent magnet, or an equally simple electro-magnet. The material to be separated was either touched by one end of this bar or allowed to fall near it and in that way dragged out from the non-magnetic material. From this were developed uumerous types of machiues, similar in theory but better in mechanical form. Two troubles which developed were, first, the entanglement of non-magnetic material by the material attracted, and second, the question of getting the attracted material off the magnet again so that the magnet could operate continuously. Most of these machines were weak and applied to highly magnetic materials only and as the results were indifferent, the commercial growth of the industry was slow. During this time —that is, in the period of the last twenty years—the question of magnetism has come to be relatively very well understood in connection with the design of dynamo machinery, and as the necessity for magnetic concentration was urged with more and more persistency, it eventually fell into the hands of competeut dynamo designers. The result was magnetic separators of greatly increased power, and from them has developed a knowledge of the design of such separators which makes it possible to-day to build a separator which will handle practically all materials, the limit being that the more difficult the material is to handle the greater will be the cost of the machine, and consequently the less return commercially. This great advance in design was largely due to the conception of a magnetic field as made up of lines of force which are assumed to emerge from a pole piece of one polarity and pass through the air to a pole piece of opposite polarity. In the production of this magnetic field the conditions are similar to those in an electric circuit, the magnetism produced being the equivalent of the current. The magneto-motive force due, in electro-magnets, to the current circulating in the windings of the coil, is the equivalent of the electro-motive force in the electric circuit, while the resistance of the magnetic circuit is analogous to the resistance of the electric circuit. It was early seen that a large portion of the cost of exciting a magnet was due to the resistance of the parts of the magnetic circuit at which the lines of force were compelled to jump through the air, air having a very high magnetic resistance as compared with iron. In an endeavor to reduce this resistance, the air path was shortened by bringing the magnet poles close together. Iu the early types of machines the material to be separated was passed through the field in such a manner that both of the poles were on the same side of the material, so that in falling the material passed through the loops of the lines of force twice. It was this looping of the lines that led to the entanglement of the non-magnetic materials with the magnetic materials, and it was this entanglement that eventually led to the abandonment of this looped field type of machine for the type where the material to be separated passes between the poles and through the magnetic field but once, and, in consequence, escapes entanglement.

The freeing of material which had been attracted was at first secured by means of scrapers, and later by reducing the field at the point where the material was desired to be freed; but it is now generally obtained in the best machines by reversing the magnetism, produciug a neutral point at which all material of whatever attractability is dropped. So well have the principles of the design of a magnetic separator come to be understood that a difference of magnetic susceptibility now offers in many cases a way of concentrating minerals other than the customary way of taking advantage of the difference in specific gravity.

From its highly attractable property and from its low value, which prevented ordinarily any other method of concentration, iron ore has naturally been a special field for magnetic separation. This has been with two specific euds in view—one the enrichment of a low-grade iron ore for the purpose of reducing the freight to a furnace, and also the furnace cost of operation per unit of iron smelted. The other use has been to free the iron from deleterious materials, such as titanium, phosphorus and sulphur. Where these occur in separate crystals which can be liberated by crushing the iron ore, the resulting separation is one which frequently proves commercially feasible. In the case of sulphur, the success depends on the fact that the sulphur compounds usually found in iron are either more or less magnetic than the iron oxides of the ores.

The separation of iron has divided practically into the separation of magnetites—that is, iron oxide, which is naturally magnetic and can be picked up with an ordinary hand maguet—and the hematites and limonites which are less magnetic, usually so feebly magnetic as not to be attracted by a hand magnet.

In the enrichment of hematites the question has divided into two different sorts of separation—one, the separation of high grade hematites from a sandstone in which they occur as a conglomerate, having been deposited as detrital material from older iron beds along with the sand; the other, the separation of siliceous material which was originally deposited at the same time as the iron and usually in the form of intimately entwined crystals.

The question of the physical condition of iron ore with reference to its impurities is one of the more important in the magnetic concentration of such material. One of the first of the questions which are asked by a furnace man when approached on the subject of iron conceutrates is "the amount of fines." If it is uecessary to crush the material to such fine size that most of it will blow out of the top when put into a furnace, the purchase of any cousiderable tonnage of such material is evidently a matter to be approached with cautiou. Briquetting has made material advances, and large experiments are being carried on at present in the smelting of briquetted iron material. It should be noted that this matter of briquetting and the production of fines is entirely a question of the physical character of the ore. Magnetic separators now handle such feebly magnetic materials as hematite in chunks of practically any desired size, separators being constructed to concentrate material up to 1 inch in diameter. The cost of building and operating a separator increases about in proportion to the size of material which it has to handle. It is therefore a commercial matter as to whether the cost of briquetting, or the cost of concentrating at a larger size, outweigh one another. Almost invariably it is cheaper to build a machine capable of handling larger sizes than it is to briquette, as in general briquetting costs more per ton than the cost of separation, including interest, depreciation and royalties on the separator when handling material as large as 1 inch in diameter.

The need of briquetting iron ore for use in a smelting furnace is brought about by the high pressure of the modern blast. If this blast could be eliminated, within certain limits it would be a matter of indifference as to whether the material was coarse or fine. It would still have to be granular enough to permit the escape of the gases generated in the smelting operation. Electric smelting provides the required condition that there need be no blast. The magnetites, being iron oxides, need only be mixed with carbon in the shape of any clean fuel, such as coke or charcoal, and subjected to the heat generated by an electric current, to have the carbon join with the oxygen of the magnetite and escape as carbon monoxide, leaving the iron to be tapped off iu the form of pig. The St. Lawrence magnetites could probably be dredged up and conceutrated wet into an iron ore of high grade and delivered in the Ottawa valley for a cost not to exceed $1 per ton. Their commercial utilization by means of magnetic separatiou would appear to offer the promise of a very considerable industry when taken in connection with smelting by means of the water power of the Dominion.

Of next importance, commercially, from the standpoint of magnetic separation, is the separation of the mixed sulphides of lead, zinc and iron. This so-called "Leadville problem" has existed for many years. There was in this camp a large tonnage of zinc-lead ore which was too high in zinc to permit the lead furnace man treating it without getting into serious difficulty through the choking up of his stack from zinc accretions. and too high in lead and iron to permit the zinc smelter from treating it without the destruction of his retorts through slagging by lead and iron. The specific gravity of the zinc and iron was too close to permit of commercial water separation. Through zinc iuterests who were looking for an additional supply of zinc ore, this problem was attacked along the lines of maguetic separation, and in its solution was secured much of the data which now forms the basis for an established magnetic separation industry. A parallel problem existed at Broken Hill, in New South Wales, Australia. Here the lead and zinc were so intimately mixed that, when crushed to the proper mesh for separation, a large amount of the lead was lost by sliming, and the zinc concentrates which were secured were too low in grade to stand the freights to a European smelting point. Here, as at Leadville, the introduction of magnetic separation has resulted in the utilization of a very large tonnage of what was heretofore waste material. In British Columbia there exists a similar problem. It might be pointed out that there existed two different ways of handling this problem. The mixture of zinc and iron sulphides which may be roasted to reduce the iron sulphide, which normally is almost entirely non-magnetic, to a form of a highly magnetic sulphide, or it may be roasted further to bring the iron to the condition of a magnetic irou oxide, in either of which conditions it may be removed as the magnetic product. Operating in this way the cost of roasting is involved, and au additional loss due to the fact that if such roasting be deferred until the zinc smelter is reached, the sulphur can then be utilized in the manufacture of sulphuric acid. At Leadville and at Broken Hill the ore is uot roasted, it being the zinc that is pulled out as the magnetic product, the iron sulphides remaining behind as the non-magnetic product. There is reason to think that this would be the better commercial way of doing it in British Columbia in those cases where the zinc sulphide is sufficiently ferruginous to permit it. Such is usually the case where the zinc is black, or, as the miners speak of it, "black-jack."

Third in commercial importance has been the separation of manganese. Manganese, as is generally known, is used in the manufacture of Bessemer steel to which it is added in the form of ferro-mangauese or speigeleisen for the purpose of reduciug the oxides formed by overblowing the charge. For the purpose of making ferro-manganese the commercial requirements are for an ore that carries 50% of manganese. The tonnage of ores of this class is rather limited, while there is an enormous tonnage which carries from 5% to 15% of manganese. This is too much manganese to permit the ore being used as au iron ore, and it is not enough manganese to enable the ore to be used for the production of ferro-manganese. The magnetic separator enables the owner producing material of this character, to separate it into two products, one a 50% manganese ore, aud the other an iron ore carrying 2% to 3% in manganese, so making out of an unsalable product, two products, both of which find sale. In this separatiou either the manganese or the hematite may be the more magnetic product, depending on the local peculiarities of the ore handled.

The magnetic separation in which Canada is especially represented is the cleaning of corundum. A commercial sample of Canadian corundum purchased in Chicago was found to contain something over 10% of magnetite. Passing this over a magnetic separator, the magnetite was reduced below 3%, the change representing an increase in the corundum contents from 89% to 97%. Further experiments along this line seem to indicate that if desired, the iron could be sufficiently removed from the aluminum oxide to render corundum a possible ore for the smelting of aluminum.

The attractability of hornblende has been utilized in connection with the concentration of metallic copper. In ores of this character the gangue, which was almost entirely hornblende, was pulled away as a magnetic product from the copper, leaving a copper ore which was sufficiently rich to smelt directly for copper, although the original ore carried less than 1% of copper.

Another interesting separation has been the handling of mica as a magnetic product. This may be utilized in two ways, for the extraction of mica from other material as an impurity and also for the concentration of mica for use in making mica insulating materials.

Of all recent developments of the magnetic separating methods, the more important is the fact that the cost of such separation is now generally below that of the equivalent water concentration, so that even in cases where water concentration is particularly adapted technically, as in the separation of chrome ores from serpentine, the magnetic method still proves the better commercially. It was this very low cost of magnetic separation that enabled concentration to succeed in the enrichment of hematite after water methods had failed commercially. One fact of advantage in magnetic separation is that it can be made, as desired, either wet or dry. It occasionally happens that the freight on moisture contained in an ore shipment to a smelting point is a sufficient item to warrant drying it. Iu this case if the ore is sufficiently dry as it comes from the mine, the maguetic separatiou can be made dry, saving the cost of drying. On the other hand, if moisture in the ore is immaterial, either from freight cousiderations or from the smelter's standpoiut, and it occurs in a wet mine, it is possible to put it through the magnetic separator without drying, shipping the product as it occurs. This is of special importance in counection with the St. Lawrence magnetite sands. The cost of drying that material before separation would

*Abstract Trans. Can. Min. Inst.

probably prohibit its commercial utilization. As it is, such sands can be dredged up by any economical form of suction or dipper dredge and sluiced through a machine with an adequate supply of water, and produce a concentrate which can be drained to less than 15% of water without artificial heat.

As illustrating the results which are being obtained at present by means of magnetic concentration, there are examples of separation on the magnetite ores of Cornwall, Pa., of iron pyrites and talc from magnetite, representing a reduction of sulphur from 21% in the original ore to less than ½% in the cleaned ore. Samples of magnetite extracted from the St. Lawrence sands show an iron content of 69.3% with a trace of titanium, leaving a sand tailings carrying 2.8% iron.

As illustrating the enrichment of hematites, are the separation of hematite and sandstone, producing an iron concentrate carrying 65% in iron and .008% in phosphorus, and a sandstone tails carrying 8% in iron, .04% in phosphorus, showing a most interesting elimination of the phosphorus from the iron compound, and the separation of hematite and jasper, the hematite product carrying 50% iron, jasper 13%.

As illustrating the iron-zinc separation at Leadville, samples are shown, assaying for a zinc product 46% of zinc and 3.2% iron, and for the iron product 37% iron and 7.3% zinc. The equivalent samples for the Broken Hill ores were tails carrying 8% in zinc and heads 48% zinc.

From the manganese industry samples are shown representing the concentration of Utah manganese from silica and gangue, the manganese being enriched from 15% to 41.8%.

From the field of corundum cleaning two samples were shown, one being material at 20 mesh, showing cleaned corundum having .05% of iron and a magnetite which had been taken from the corundum carrying 65% in iron. Corundum at 100 mesh showed only a trace of iron after having been cleaned and produced heads running 63% in iron.

Another sample of the concentration of maguetite was shown in the concentration of black sands from placer workings. In this case the concentration was 20 to 1, ilmenite and some of the rare metals being pulled away from the gold and other sands, leaving a concentrated product which would stand shipment to a smelter.

Pneumatic Hand Drill.

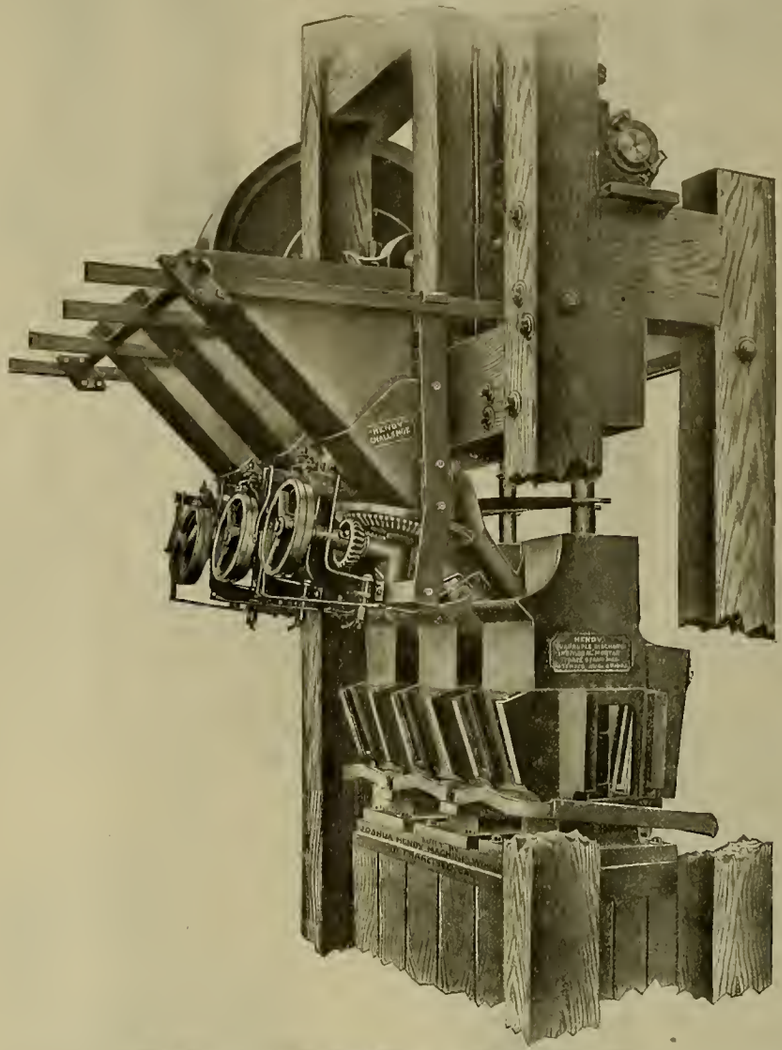
One of the latest devices placed on the market for rock drilling is the Shaw Eclipse air hammer rock drill, illustrated herewith. It is claimed by the manufacturers that this machine, including hammer and drill, weighs but 16½ pounds and requires to operate same but 17 cubic feet of free air per minute at a pressure of 80 to 100 pounds. This machine is portable, and was designed with that idea in view. It can be handled by one man and can be operated without tripod or column. The machine, including column arm and clamp, weighs but 83 pounds. The drill is supplied with an automatic feeder which is released by a ¼-inch valve. By opening this valve, which is attached to an air hose, the air forces the drill against the rock. The hammer is operated by another ¼-inch valve. When this valve is opened it allows the air to enter the machine, which starts the hammer in operation. Then as the hammer forces the drill bit into the rock, the exhaust air from the drill goes through a hole running lengthwise of the drill bit and forces the dirt and dust from the drill hole. This dust is overcome by a water attachment, which consists of a tank 10 inches in diameter and 30 inches high, filled with water. Air is forced into the top of the tank, which gives it pressure. By releasing a ¼-inch valve attached to a water hose (which is also attached to the drill), the water is thrown against the rock and dampens the dust. This attachment can be used or not, as desired by the operator. The machine consists of but four pieces, viz., handle, piston, barrel and nut. No valves or springs are used in the mechauism of the drill. The drill bit, which is known as the "wagon wheel" bit, has fourteen cutting edges. Capacity of the drill depends entirely upon the character of the rock. It is asserted by the manufacturers that this drill, operated by one man, will do as much work in eight hours as ten miuers, or cutting from 100 to 150 feet per day. The machines are being manufactured and sold by the patentee, the C. H. Shaw Pneumatic Tool Co., Thirty-fifth & Wazee Streets, Denver, Colo.

Hand Drill Operating With Water Spray Attachment

Hand Drill Operated Without Water Spray.

The Hendy Suspended Feeder.

The accompanying illustration of the Hendy quadruple discharge individual-mortar 3-stamp mill is familiar to all mining men, but the Hendy improved suspended Challenge ore feeders that are supplied with this mill have not previously been illustrated, and the manufacturers wish to call attention to these feeders as here illustrated. The illustration also shows to advantage the individual mortars that form an important part of the Hendy 3-stamp mill.



The Hendy Triple Discharge Mortars With Suspended Feeders.

As will be seen, these feeders are suspended at the rear of and above the mortars, and are so constructed and placed that they feed automatically and directly to the stamp in each mortar; each feeder is provided with a regulating device, easy of adjustment, to insure suitable and regular feed of ore to each stamp.

A Gasoline Rock Drill.

An innovation in rock drills has been introduced by the Automatic Gasoline Rock Drill Co., of 516 Crossley Building, San Francisco, Cal., in the form of a drill operated by gasoline. The principle upon which the machine works is similar to that which actuates gas engines generally—the explosion of gas in a cylinder which drives the piston forward. The drill is fixed in the usual manner in the chuck, being secured by the customary "U" bolt. The piston of the drill, rotating bar and chuck are all of one piece of steel, being turned down to the proper size and form. The drill has already passed through the early stage of experimentation, and many changes and improvements made since the original drill was turned out The suggestions of practical and experienced drill runners have been solicited and alterations made in accordance with these suggestions, until the drill now runs for long periods, drilling the hardest granite and affording a practical demonstration of the utility of the machine. The necessary provision is made for taking care of the exhaust, and the heat generated by the gas explosions. The chief claim which the manufacturers of this drill make for it, is, that by its use, an expensive compressor plant may be dispensed with.

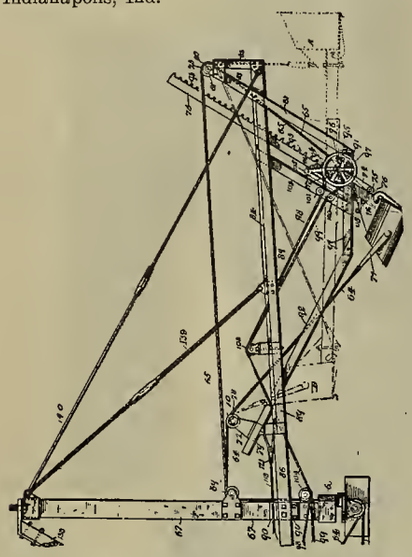
Efforts are being made to have the mint at Denver, Colo., raised to the dignity of a full coinage mint by the first of September. The building is nearing completion and the machinery is ready for shipment as soon as the building is prepared to receive it.

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 14, 1904.

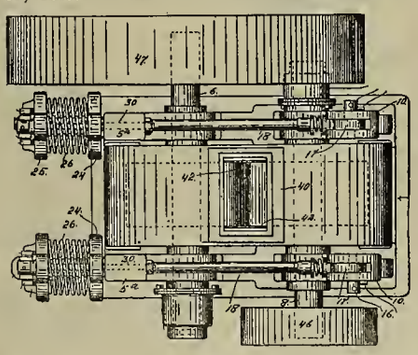
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

EXCAVATING MACHINE.—No. 762,352; J. L. Scanlan, Indianapolis, Ind.



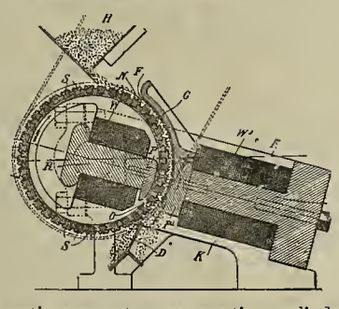
In excavating machine, combination with scoop or dipper, and dipper beam, of revoluble mast inclined upwardly, boom extending from mast, boom comprising two guide members, horizontally extending guides situated beneath and in vertical alinement with upper guide members and between which dipper beam is adapted to work, shaft mounted on lower guides, beam guide pivoted on shaft, pinion and rack on dipper beam whereby dipper beam is traversed in beam guide to elevate or lower scoop, drag ropes for dragging scoop either forwardly from or rearwardly toward revoluble mast.

PULVERIZING ROLLS.—No. 762,859; W. C. Davis, Denver, Colo.



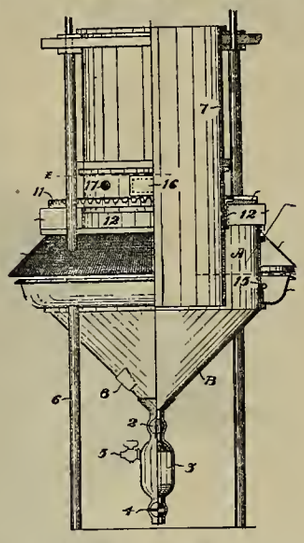
Combination with swinging arms and tension rods, of spindle journaled in upper extremity of each arm and having an eccentric which the eye extremity of arm engages, means for adjusting spindle to throw maximum point of eccentricity out of line with longitudinal axis of rod, collar slidably mounted on each rod adjacent its eye extremity and engaging swinging arm, stop on rod and spring interposed between stop and sliding collar.

APPARATUS FOR MAGNETIC SEPARATION.—No. 762,752; C. Q. Payne, Stamford, Conn.



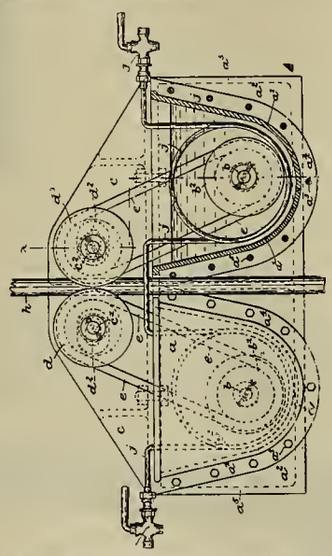
In magnetic separator, separating cylinder movable between two opposing magnetic surfaces, both surfaces being placed below horizontal diameter of cylinder, in combination with means for retaining material in close proximity to cylinder, along considerable segment of cylinder below horizontal diameter and within magnetic field.

GOLD SEPARATING AND RECOVERING APPARATUS.—No. 762,174; W. Laudahn, San Francisco, Cal.



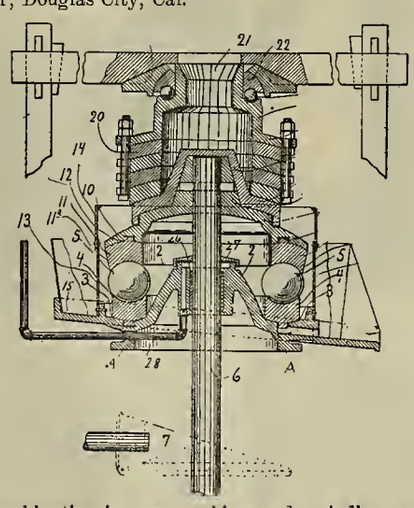
In apparatus of character described, combination of mercury containing chamber having low portion with steeply inclined walls, and means for submerging gold-bearing sand in chamber, receptacle secured to lower end of mercury-containing chamber, inlet and outlet cocks at opposite ends and intermediate air supply cock, conical end of mercury containing chamber having manhole in lower portion through which heavy material may be removed.

APPARATUS FOR AUTOMATICALLY GREASING HOISTING OR HAULING ROPES.—No. 762,329; P. Macadam, near Johannesburg, Transvaal.



In apparatus for greasing hoisting or hauling ropes which travel in vertical direction, combination of two grease tanks arranged to form passage between them, pulley mounted inside each of tanks, two pulleys mounted on adjustable spindles above tanks, and two endless belts arranged round two pairs of pulleys, between which rope passes.

CRUSHING AND GRINDING MILL.—No. 762,580; J. M. Dyer, Douglas City, Cal.

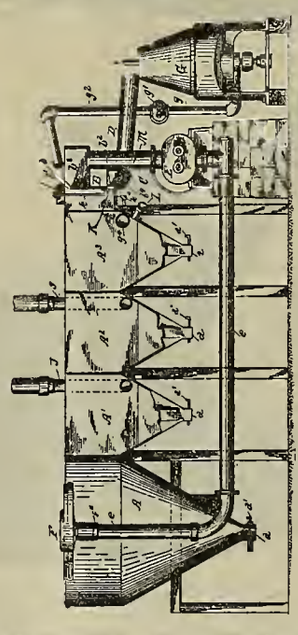


Combination in ore crushing and grinding apparatus, of cone carried by vertically turnable shaft and having spherically curved base flange; cylinder supported thereon and having base concaved to fit cone flange; tubular extension of upper part of cylinder with surrounding grooved raceway; balls fitting raceway; ring surrounding cylinder extension, ring having raceway in its lower surface resting upon balls and upper convex surface; concave plate fitting and movable upon convex surface of riug, and means for moving plate in horizontal plane to tilt cylinder with relation to cone.

UNDERREAMER AND DRILL—No. 762,435; T. A. O'Donnell and A. G. Willard, Los Angeles, Cal.

Underreamer comprising stock provided with two tapering sockets in lower end, vertically slotted wedge-shaped partitions between sockets, and having bolt holes opening from slot axially in line with each other below top of such sockets, such stock being also provided with spring chamber above partition; jaw member provided with tapering shank to fit in one of sockets, aud also provided with shoulder to fit against lower end of stock when tapering shank is seated in its socket, shank being provided with cross head socket in the extended plane of said slot; like jaw member having its shank seated in other socket of stock; cross head to play in slot and having its oppo site ends seated in sockets of shanks, respectively, and having stem extending up into spring chamber; spring in chamber for normally holding up stem, cross head and jaws; spring-pressed bolt normally extending across slot in path of cross head to lock cross head against lowering, bolt having at upper side of its end, beveled portion normally chambered in partition; spring for normally holding bolt in locking position; and bolt-retracting pin mounted in bolt hole and normally projecting from side of stock to be thrown by well casing to bring bolt into position with beveled portion of bolt in path of cross head.

APPARATUS FOR THE CONCENTRATION OF MINERALS BY MEANS OF OIL.—No. 762,774; J. W. Van Meter and M. P. Boss, San Francisco, Cal.



Apparatus for concentrating minerals by means of oil, comprising channel through which oil flows, means for supplying pulp and water to oil at head of channel, means in channel at intervals for drawing off settled gangue and water, means at foot of channel for separating relatively upper and lower portions of oil, and means for returning separated upper portion of oil to head of channel.

Mining Summary.

SPECIALLY COMPILED AND REPORTED FOR THE MINING AND SCIENTIFIC PRESS.

ARIZONA.

Coconino County.

(Special Correspondence).—A plant has been built for the Anlta C. Co., near Williams, sufficient to sink to 2000 feet, to which depth it is intended to go. The plant consists of a 90 H. P. steam hoist, a 6-machine compressor, a 40-inch suction blower and a 250-light electric plant. The company is composed of Boston, Mass., men. W. H. Hill is general foreman.

Williams, June 21.

Cochise County.

The Lake Superior & Pittsburg Dev. Co., operating near Bisboe, has been reorganized. The company will increase the size of its two shafts to afford better facilities for handling minerals. Nos. 2 and 3 shafts are at present but one and one-half compartment. To raise these shafts from bottom to top so as to increase the size to four compartments is proposed. The company will put in heavier machinery for hoisting. They are also planning to sink a 1000-foot shaft 500 feet distant from shaft No. 2, and in the direction of the Oliver shaft of the Calumet & Arizona.

Gila County.

Superintendent N. S. Berray of the United Globe M. Co. at Globe says there were shipped last month from the several mines of the company operated 3500 tons of ore. Most of the ore came from the Gray, Josh Billings and Buffalo, and was shipped to the Copper Queen at Bisbee and Douglas, some also going to the Old Dominion. Work at the Gray is at present confined to drifting at 1140 feet. The ore is chalcopyrite, occurring in a lenticular body. The workings on the Gray are said to be the deepest in the district.

Asbestos has been found 20 miles west of Globe by M. L. Shackelford. The fiber is said to be long and fine. The asbestos is found in a dyke of serpentine about 50 feet wide.

Graham County.

The Detroit C. Co. at Morenci has additions under way to its plant. The concentrator, which has a capacity of 500 tons per twenty-four hours, is being doubled. One-half of the plant will be remodeled and increased at a time, while the other half continues in operation, says the Standard. It will require eighteen months to complete the change. The concentrator will have a floor area of 166x240 feet. When remodeled there will be a total of 120 concentrating tables, 40 jigs, Chile mills, 6 sets of rolls 16x42, and 28 revolving screens for sizing. Power to operate this plant will be furnished by gas engines with a total of 600 H. P. in 150 H. P. units. The concentrates will all be handled mechanically. An important feature of the improvement will be separation of the crushing plant from the concentrator. The crushers will occupy a building west of the concentrator and will have capacity of 100 tons per hour, and all the crushing for the day will be done in ten hours. The sampling mill will be located above the concentrator and ore will be conveyed to it from the latter on a belt conveyor 400 feet long. Crusher and sampler will both be operated by electric motors. In concentrator, smelter and converters, gas engines furnish the power, the only exceptions being steam power used on locomotives, mine hoists and at the ice plant. New Mexico coal is used in the manufacture of the gas. All power, with the exception of the 600 H. P. at the concentrator, will be localized at the new power house, about completed near the smelter. At present there is developed there a total of 825 H. P. by gas engines, and this will be increased by 500 H. P., giving a total of 1925 H. P. for both plants. Bins of 2000 tons capacity will be built at the smelter and steel trestles. In this and the concentrator a total of 700 tons of steel will be used.

Maricopa County.

The Vulture mine, near Wickenburg, has been "jumped" by C. L. Kingsley and G. E. Sanders, who allege non-performance of the annual assessment work for 1903. The records of county recorder's office, however, are said to show filing of affidavit on Jan. 4, 1904, for performance of the 1903 annual labor. The first ore from the Vulture mine was worked in 1864 in an arrastra.

It is reported the National C. & G. M. Co. of Arizona has a bond on the Rogers Springs group of copper mines, 30 miles north of Phœnix, for $60,000, and will begin development work on it before July 1st. Manager Fowler says he proposes to develop the property at the rate of 100 feet per month. The National Co. has also located surrounding claims that their holdings may not be interfered with. The company is composed of Eastern men.

Mohave County.

W. Mack, owner of the Ruby group of mines below Bill Williams Fork, on the Colorado river, reports he has made arrangement with B. Blanchard for the sale of the Ruby group, and twenty-five men have been put to work. The mines have been opened to a depth of 200 feet by drifts and shafts and ore is showing, carrying values in gold, silver and copper. There is a pit of tailings at the mill that will pay for reworking it. It is intention of Blanchard to open the mines to a depth of 700 or 800 feet and block out the ore while awaiting the building of the Arizona & California railroad to Parker, a few miles from the group.

Ore is being shipped from Stockton Hill from the Indian Boy mine of the Fletcher Co. to the company's smelter at Needles, Cal. The ore is of lead, carrying values in gold and silver. This will be followed by steady shipments from the other properties of the company. There are twenty-five men at work on the mines and the Star Spangled Banner, Infallible (Indian Boy), Alta and Alpha are showing up. At the Alta, in sinking below the old level, a fine body of lead ore was struck. The shaft in which this ore was found was formerly used for a water shaft and from which practically all the fresh water used on the hill was obtained, says the Mohave Miner. In sinking a shaft below this point on the vein the water was drained from the shaft, which necessitated sinking deeper to get a supply, and it was while doing this work that the ore was opened up. Ore is being taken from the Star Spangled Banner, where a 30-inch body has been opened in the lower drift. In the Infallible the old stopes have been reopened and are producing smelting ore. At the Alpha mine at Layne Springs several men have been put to work and an adit will be run in from below the iron springs to tap the copper body struck in the old workings. It is expected this drift will tap the ore body below the waterline and show the sulphide ores in place. All the copper ores on the dumps will be shipped to the smelter and a road will be built from the mine to Mineral station, on the A. & U. Railroad.

D. Slocum of Monrovia, Cal., who has a bond on the Mossback mine in San Francisco district, near Acmo, will begin work in August with men and machinery. He has put in a hoisting plant.

Yavapai County.

The Pfau G. M. & R. Co. proposes to build a 100-ton reduction plant. The company's properties are 4 miles from Cherry in the Black Hills mountains.

The Bryan quartz claim, 7 miles from Prescott, in Hassayampa district, is owned by C. Wallace of Prescott, who has done 700 feet of development work on it. He reports a strike of ore assaying 2 ounces gold and 140 ounces silver. He had driven a tunnel 475 feet under the mountain on which the Bryan claim is located. When 350 feet from the mouth of the tunnel and 275 feet from the surface, the top of a seam of quartz was cut in the bottom of the tunnel. A winze down about 15 feet on this narrow seam of quartz opened into ore. There is plenty of wood and water on the property and conditions are said to be favorable for working.

The Tiger Gold Co., in the Bradshaw mountains, has been added to the list of producers, says the Prescott Journal-Miner. The claims owned by the company are the Oro Belle, the Grey Eagle and a half interest in the Cleveland, 3 or 4 miles from the Crown King mine, 1½ mile from the Tiger, and a mile from the Eclipse. Development work is being concentrated at two points. One is on a tunnel which starts on the Cleveland ground, and which follows the ledge through it into Grey Eagle ground. This tunnel is in 1150 feet and has been in ore its entire distance in the Grey Eagle claim. The ore body varies in width from 6 to 9 feet, and the ore has value of $10 per ton. It is proposed to continue this tunnel to the south end of the Grey Eagle location. There are numerous workings over the tuunel nearer the surface, and all the ore from these can be taken to the mill through this tunnel. The depth from surface, at face of tunnel, is 700 feet. A shaft is being sunk from the tunnel near point of union of the Grey Eagle and Cleveland claims, the shaft being on the Grey Eagle claim. There are two parallel ledges on the claim, and the shaft is being sunk on an incline between them, and the ground will be crosscut from it to each of the ledges.. The shaft is down 225 feet. It is hoped that at depth of 500 feet permanent water supply will be obtained, by crosscutting from the shaft to each of these ledges. Fifty-five tons of ore per day are treated in the mill. The higher grade and the lower grade ores are mixed so that the ore as it is milled averages $20 per ton. Half of this value is saved on the plates, the other half in concentrates. From May 22 to May 31, four cars of concentrates were shipped, this being the average regular product of the mill.

At the Pickaway mine, 3 miles from Turkey Creek station, southeast of Prescott, owned by Parkor & Co., the shaft is down 100 feet, the depth limit of the whim. A steam engine has been set up for sinking the three-compartment shaft.

CALIFORNIA.

Alameda County.

It is reported negotiations are under way for sale to the Mountain C. Co. of Keswick, Shasta county, of the plant of the San Francisco Chemical Works at Flemings Point, near Berkeley. It is said the copper company seeks to acquire the chemical plant so that it can use the output in connection with its smeltor at Keswick. By doing this it will avoid bringing raw materials used for its purposes from tide water to Keswick and then returning the finished product to tide water. A large amount of money will be thus saved in freight charges. If the deal is closed the plant at Flemings Point will be enlarged. It is reported the copper company is also negotiating for a chemical plant near Martinez, Contra Costa county, which will be consolidated with the one at Berkeley.

Amador County.

(Special Correspondence).—At Electra an additional transformer bank has been put in place. The five 2000-K.W. alternators are generating from 2150 to 2300 volts. This voltage is raised to 17,000 for the Amador and Calaveras county line, and to 40,000 volts for the Bay Counties line. The effective running head with a 3¼-inch nozzle is 560 pounds pressure.

The Oneida mine, near Jackson, is still drifting south on the 1200-foot level, being in 900 feet. On the 2000-foot and 2200-foot levels they are drifting north. Timber is being framed at the surface and put in place as fast as it arrives. The company is spending $1400 a month in timber. They are pumping about 800,000 gallons of water per week. There is no intention of sinking deeper for some time to come. E. Hampton is superintendent and B. C. Austin assistant superintendent.

The Kennedy mine at Jackson is down 2632 feet and the management intends to resume sinking. Superintendent Webb Smith states that there has been no change in the general geology of the vein or country with increase of depth below the 1400-foot level. The ground south of the 60-stamp mill at the East shaft has been graded and excavated and concrete blocks are being built as foundations for the old 40-stamp mill at the North shaft, which is being hauled to the East shaft. This will make a 100-stamp mill equipment at the East shaft.

Jackson, June 21.

(Special Correspondence). — The two No. 160 Griffin mills at the Keystone mine at Amador City have been running over a month. The tests for crushing capacity, wear and tear and power cost have not yet been completed, but it is estimated that each is crushing thirty to thirty-five tons per day. The screenings from the grizzlies are fed to these mills by Hendy Challenge feeders, while the richer rock from the crushers is run through the old 40-stamp mill and the poorer rock through the new 20-stamp mill. If the tests with the Griffin mills prove satisfactory, two more will probably be put in. Compressed air, produced by a 300 H. P. induction motor, is used for hoisting, pumping and drilling. E. Lynch is superintendent.

The 20-stamp mill built by Knight & Co. of Sutter Creek for the Bunker Hill mine, north of Amador City, has been running since February. Noteworthy features are the concrete foundations and retaining walls. The mortars rest on wooden beams bolted to concrete. There is little vibration. Concentrators and stamps are electrically driven from the same prime mover.

Amador City, June 22.

(Special Correspondence).—Operations have begun in the Lincoln mine, catching up the caved portion of the shaft. The Wildman-Mahoney mine will be reopened through the Lincoln shaft, which Superintendent J. Ross, Jr., has men retimbering. The Lincoln workings are partially flooded, and it will probably require several weeks pumping to unwater it. After that is done, drifting southeasterly toward the Mahoney shaft will be resumed.

Sutter Creek, June 22.

At the Madrone mine at Pioneer it is expected to have the mill in operation by July 1.

Calaveras County.

The Arent mine, near Copperopolis, was started up again last week.

The Chris Anderson gravel mine is closed down for enlarging and retimbering the shaft and making ground ready for the mill that will be built. One ton of cemented gravel washed in one sluice-box and a riffle without quicksilver yielded $18. A 20-foot sump is being sunk.

Fresno County.

The Standard Oil Co. has issued for Coalinga field a new scale of prices for crude oil, says the Oil Reporter. In the list of prices which follows oil 22°-24°, Baume gravity has been cut 2½ cents:

Gravity at Temp. 60° F.	Price per Barrel.
22° to 24°, not including 24°	22½c
24° to 25°, not including 25°	30 c
25° to 26°, not including 26°	37½c
26° to 27°, not including 27°	42½c
27° to 28°, not including 28°	47½c
28° and upwards	special contract.

Kern County.

Development work is being done on the Rustler mine, near Randsburg, with J. O'Leary in charge.

The Yellow Aster mills at Randsburg are reported crushing an average of 520 tons of ore per day. There is no scarcity of water, but in view of the probable increase in milling capacity they are developing more water.

Nevada County.

Rosenfeld & Uren are increasing operations at the White Oak and adjoining mines near Nevada City. Superintendent Brockington reports progress in work sinking shafts along the vein to ascertain its length and continuity, pitch, etc. The mine will be operated by electricity and compressed air. A 75 H. P. compressor will be used and the Cornish system of pumping installed, which, with the hoist, will enable the company to sink to depth of 1500 feet. Connections will be made with the power line which has been run across that section for electricity. The shaft which will be started will be sunk on the lodge. From a point 200 feet below the site selected for the machinery a raise will be driven from a tunnel on the ledge, instead of sinking the shaft to that depth. This double work will be done at the same time, giving the company a shaft of the depth mentioned when the machinery is ready for operations. At the White Oak, also operated by Rosenfeld, work continues steadily. The shaft has been sunk 75 feet.

The Blue Ledge G. M. Co. has been incorporated at Nevada City by J. R. Tyrrell, W. T. Jones, J. Coan, W. L. White and P. Bliss. The Blue Ledge mine is in Willow valley, 3 miles above Nevada City. It is a full sized claim, patented, but has been idle for thirty years. Fire destroyed the surface plant. It is said a ledge is shown at base of shaft and in one of the drifts carrying free gold. Manager J. R. Tyrrell of the Blue Ledge M. Co. says he will put a plant on the mine.

Plumas County.

(Special Correspondence).—Dunn Bros. have struck a high-grade shoot of ore in their White Lily quartz mine on North Fork of Feather river, near Seneca, 15 miles from Greenville. They have been operating a 2-stamp triple-discharge mill and are adding six more stamps. The main ore body is 25 feet wide, averaging $8 per ton free gold. The shoot shows 6 inches of specimen rock.

Greenville, June 22.

It is reported Droege Bros. of Covington, Kentucky, have closed the deal for the Standart & McGill mine, near Greenville, together with the mill thereon, built by the Plumas G. M. Co. last year. Droege Bros. also owns the Johnny Bull mine, and have done considerable development work on it. The two properties will be consolidated, the Johnny Bull mine being below and adjoining. By means of a tunnel on the last named the Standart & McGill ledge can be tapped at depth. The sale also includes a one-half interest in the Round Valley Reservoir water right, which will furnish power for operating the machinery.

San Bernardino County.

Drilling the oil wells at Kramer and north of Hinkley is reported progressing. The Hiawatha Co. has struck oil at 1410 feet, but by reason of insufficiency of present machinery, a new rig will be set up before greater depth can be reached. North of Hinkley, near Black's ranch, a well is into shale for 50 feet.

Santa Clara County.

The Manganese M. Co. has been incorporated, with San Francisco as principal place of business, by J. J. and A. Cummings, A. C. James, G. H. Cavanaugh and G. S. Wright, directors. The company purposes to work a group of manganese claims in the Red Mountain district, east of Mount Hamilton, east of San Jose.

Shasta County.

Pugh & Menzel, of the Reno group, near Shasta, have made improvements. ——Manager Schroter has 800 feet of tunnel in the Keno group north of the Mount Shasta mine, near Shasta.——C. H. Behrens has bought the interest of his partner in the Oro Fino mine, near the Mount Shasta, and will put in a gasoline hoist.

——Parmley & Gladwin have opened up the Mountain Lion group, enough to justify erection of a mill, says the Shasta Courier. The group consists of several claims, with ore in sight. The mine is northeast of the Mount Shasta.

The Original Quartz Hill mines, ownod hy the Original Quartz Hill G. M. Co., at Quartz Hill, 5 miles north of Redding, have been reopened and increased operations planned. M. Mariansky is manager, and W. J. O'Donnell is superintendent. Twenty miners are employed. There are a number of drifts on the oro body, the largest heing the main working tunnel and having 100 feet of hacks. Considerable work is being done in this drift, and the ore taken out is shipped to the smelter at Keswick by wagons. Carpenters are building the two ore bins at the mouth of the main tunnel for storage of ore taken out for shipment. Each bin will have capacity of 200 tons. Two rock-breakers, one for each bin, will be set up to crush the rock before it is placed in the bins, from whence it will be loadod hy gravity into the wagons. Application was made hy the company to the board of supervisors of Shasta county for a franchise to build a steam tramway from the Quartz Hill mines to a point on the Sacramento river, near the Keswick bridge, but the franchise was refused. The company, however, has not abandoned the plan for a tramway, and it is thought rights of way can be secured over private property.

Sierra County.

Operations have been resumed at the Columhia gravel mine, near American Hill, above Forest City, says Manager J. M. Harper. Harper had considerable work done at the Columbia last summer and fall and expects to reach the gravel channel before winter sets in. The tunnel will be driven ahead and 400 feet will have to be run before the gravel is reached.

Ore is reported struck in the Elmore mine in Ladies canyon, near Downieville, showing free gold. G. McGee is in charge for the Sovereign G. M. Co. of San Francisco. Considerable development work has been done on the mine, there being a shaft 100 feet deep and several drifts. The ledge is 3 feet in width. Work was discontinued last winter due to lack of machinery to handle the water. It is intended to put in machinery to pump out the shaft and resume development work.

Trinity County.

Superintendent J. Porter, of the Fairview mine, near Trinity Center, says the mine is looking well and further improvements will be added. Ten stamps will be added to the ten now dropping. The mine has a large body of low-grade ore. Macbine drills run by an air compressor will be used in the mine.

Tuolumne County.

(Special Correspondence).—The Kodak mine, 1½ mile from Carters, has been bonded by L. F. Walker, of San Francisco, for a term of three years. Walker will put a mill on the property within ninety days and production and development will be increased.

Carters, June 22.

La Fiesta G. M. Co. has bought the Kanaka mine, 5 miles south of Groveland, together with mill site, 10-stamp mill and 100 inches of the water of Indian creek, also Kanaka No. 2 and the Indemnity mines with all machinery and appliances, says the Banner.

COLORADO.

Chaffee County.

B. Ross of Denver, manager of tbe Homestake M. Co. in Cripple Creek district, is arranging to build a 100-ton concentrating mill at the Sedalia mine, near Salida. Ross is manager of the American C. M. & R. Co., which has bought the Sedalia mine. He says his company intends to begin work on tbe concentrator by July 1st. The Sedalia is a copper mine and is shipping two cars per week to the local sampler.

At a depth of 116 feet a vein of galena has been struck in the Buena Vista tunnel in the Hancock mining district, near Camp Sherrod, says Buena Vista reports. The vein was a blind one. It is 3 feet wide.

Clear Creek County.

(Special Correspondence).—A. B. Montgomery, treasurer of tbe Red Oak G. M. & M. Co., reports a strike in the Scepter tunnel, 2500 feet from the portal, and wbich cuts the vein 700 feet below the surface. The ore assays without lead values $398 per ton. Heretofore most of the ore taken from the Scepter on the Georgetown side of the mountain has been mill dirt, but the ore now being taken out will be shipped direct to the smelter.

Considerable activity is being shown this summer in the upper Clear Creek district and it is expected by the operators this will be a profitable season.

Georgetown, June 19.

At least one, possibly several, cyanide plants will be built in Idaho Springs this summer, says the Record. The Ward mill will be the first to use this process, it being their intention to cyanide the tailings from the mill. On the same vein on Santa Fe mountain is the Coming Nation mine, the owners of which have plans drawn for a cyanide mill, and it is said negotiations are under way for consolidation of several of those low grade Santa Fe propositions and the erection of a large cyanide plant. A cyanide annex is also proposed in connection witb the 1000-ton mill which the Con. Gem M. Co. will build at the mouth of tbe Newhouse tunnel. H. T. McNeil, of Idaho Springs, says the widest field for the process in the district will be as a secondary treatment, as the tailings from the so-called free milling ores and those from a large proportion of the concentrating ores may he profitably worked over by this method.

At Georgetown the Pay Rock Extension M. M. & D. Co. has arranged for resumption of work. Men are being put to work driving the tunnel on tbe Pacific lode, which is in 425 feet. There are 3 inches of solid lead ore exposed. The tunnel is being driven in soutbwesterly direction and it is thought the Pacific lode is an extension of the Pay Rock. The Pay Rock Extension company owns nine claims, three of which are patented. The mine is ready for plant of machinery. A storage tank holding 12,000 gallons of water has been built near Bridal Veil stream and it is estimated there will be sufficient water to run eight power drills. J. H. Robeson is manager and D. W. Hartshorn superintendent.

Fremoot County.

(Special Correspondence).—C. M. Meyer has leased tailings from the United States R & R. Co. of the National mill at Florence, and has put in concentrating tables. He has made several shipments of concentrates.

Florence, June 19.

Gilpin County.

At the Protection shaft of the Roderick Dhu G. M. Co., on Quartz hill, near Central City, operations are carried on steadily and the daily production averages 5 cords (40 tons) which is being hauled by teams to the New York mill at Black Hawk. This tonnage is coming from the 234-foot stope, and the company is getting the same ore chute in shape for stoping in the 334-foot level. At the 400-foot level, after crosscutting 20 feet, they have cut the Roderick Dhu vein, which is 6 feet in width. The company will also ship the entire dump matter, as it carries values. This will add 20 tons daily to the production. The company will put up a shaft building and plant on the Roderick Dhu No. 485, lying to the east, tbe plant to consist of a 10x14 hoisting engine, two 60 H.P. boilers, a 4 drill air compressor and an electric dynamo for lighting the top plants as well as the underground workings. This shaft is of three compartments 8x20 feet and is down 400 feet, and it is intended to sink it 200 feet deeper and continue it down as a two compartment shaft 8x16 feet. This shaft is to be the main or central working shaft of the group. It is connected with the Quartz hill tunnel. Manager J. C. Fleischutz has 25 men employed, but this number will be increased. H. Armfield is superintendent.

The Stanley M. Co. has been incorporated by A. G. Brownlee and W. E. Humphries of Denver, and C. H. Johnson, C. W. Comstock and J. P. H. Cunningham of Pennsylvania. Tbe papers cover the purchase of the Con. Stanley M. Co. and the Salisbury M. Co. holdings, near Idaho Springs. The work of unwatering the shaft is under way. Tbe water was within 190 feet of the collar of the shaft and is 800 feet in depth. The Stanley is equipped with plant of machinery.

The Eldorado M. Co. has been incorporated, with S. T. Harris, H. P. Lowe, J. C. Reagan and H. Maruchi as directors, to operate near Central City.——Eastern owners have started operations on the Gold Nugget property, in Illinois-Central district, under management of A. C. King of Idaho Springs. The water has been lowered in the main shaft, which has a depth of 250 feet, and the work of drifting west is under way at depth of 200 feet.——The New National T. M. Co. expects to resume operations on its Caledonia mine, in Lake district. The shaft is 420 feet deep and the company will sink it 200 feet deeper. They will also start drifting and stoping, and Superintendent G. W. Adams says they have lead concentrating ores to work on. The shaft has been overhauled and there is a 12 H. P. gasoline engine in operation.

W. Mitchell & Sons are putting in equipment for their Gulch mines, near Central City, consisting of a 50 H. P. engine and a 70 H. P. boiler. They have heen taking out smelting ores running $100 per ton and they have a good tonnage of milling ores in the hins ready for shipment.——Local parties have started work in the Hawley Gardner group on Quartz hill, under a lease. W. Nicholas of Central City is superintendent. The work as mapped out will consist in extending the levels at a depth of 700 feet. The property has been idle for several years.——The Blair, formerly the Annex property, in Lake district, is being worked by its Denver owners, and, after crosscutting at a depth of 150 feet, ore has been opened up. At the point where they crosscut there are two veins coming together, which makes 6 feet of vein matter, says the Register-Call, and they are taking out concentrating and smelting ores, the latter showing gray copper and lead.

Lake County.

The Resurrection mill at Leadville is handling nearly its capacity of ore and is turning out a good grade of concentrates. The mine is shipping steadily a small tonnage of ore, but most of the product is being handled in the mill. The numher of men in the Resurrection properties has heen increased. Heretofore the mill bas been supplied with water, which was brought from the gulch to the mill by pumps. The mill is on an eminence on southern slope of the gulch at considerable height above bed of stream and level of lakes in the gulch. The pumping of the water necessary to run the mill has been an expensive feature of the work, and Manager Carnahan has arranged to secure a water supply which would be less costly. It is reported he has water rights in the gulch and is digging a ditch which will carry the water from the head of the main Evans gulch directly to the mill. The route of the ditch lies southward from the water company's reservoir above the Diamond and will carry the water by a natural grade from the base of the Mosquito range to the Resurrection mill.

Montrose County.

A carload of high-grade copper ore was shipped to the smelter last week from the Lasalle copper mine, near Montrose. One piece of 655 pounds was native copper. Another slab of 1000 pounds had to be cut in three pieces to get it out of the collar of the shaft. Mixed with the sbipment were several tons carrying native silver. This shipment was taken out of 11 feet in the shaft.

San Miguel County

An ore strike is reported made on the Lucky group of mines in Bridal Veil basin, near Telluride, owned by Chadwick, White, Adams & Silgenhaus of Telluride. The quartz carries flakes of free gold, mixed with black tellurides. The rich streak is 4 inches thick, but the entire vein of 4 feet is bigh-grade milling gold quartz.

Teller County.

The United G. M. Co. at Cripple Creek, according to the annual report of H. E. Woods, treasurer, made production for the first five months of the year aggregating $283,683.21. Of this $63,337.32 was mined in the Jerry Johnson and the Arapahoe claims, in which the company has a three-sixteenths and two-ninths interest, respectively. Royalties received by the United G. M. Co., exclusive of $2514.38 in bank by stipulation, was $59,360.16. Receipts from this source are increasing, the sums turned in for May being in excess of $16,000. W. Woods is president.

C. Tillery & Co., operating a lease on the C. O. D. property up Poverty gulch, near Cripple Creek, have put two machine drills at work in tbe tenth level 700 feet northwest of the shaft. A paying proposition is reported opened up by Tillery & Co. on the fifth level of the C. O. D. About 250 feet north of the shaft a vein varying in width from 2 to 3 feet has been uncovered from which assays give values of $30 in gold. Bad air has been troublesome.

At a special meeting of the board of directors of the Portland G. M. Co., on the 20tb inst., the action of President J. F. Burns in asking the Federal Court at St. Louis, Mo., for an injunction prohibiting the State authorities from interfering with the operations of the mine was repudiated and the suit declared off. The board also passed a resolution requiring Superintendent Currie of the Portland mine to resume operations as soon as possible witbout employing men affiliated with the Western Federation of Miners. The Portland mine, at Independence, was virtually the Federation's only foothold in the Cripple Creek district at the time of the action. It is expected the mine will be in full operation by the end of the week. A few men were put to work on the 21st inst. The military commission, which determines who may live and work in the Cripple Creek district, met at the Portland shaft bouse to pass on the applications for cards from the Mine Operators' Association, which all miners are required to take out before work is given them.

President C. H. Moyer of the Western Federation of Miners bas been arraigned on the charge of murder hefore a justice of the peace at Cripple Creek.

IDAHO.

Boise County.

E. H. Dewey of Nampa, in speaking of the recent fire on the Checkmate mine at Pearl, says it is intended to fully equip the mill with larger and botter machinery. Men are pumping the water out of the mine.

Elmore County.

There is a 20-stamp mill on the ground for the Mammoth and Rico mines at Black Warrior. Work on tbe road from Rocky Bar to Black Warrior has started. More stamps will be added during the summer.

Idaho County.

(Special Correspondence).—At Buffalo Hump, in Robbins mining district, the largest amount of development work has heen done on the Jumho mine at the extreme south end of the belt on Deer creek. This claim is opened hy three tunnels on the lead, aggregating 2200 feet of work, and connected hy raises. Tunnel No. 4 at the mill level is in 580 feet. The property is equipped with four 5-stamp batteries, two 2-stamp batteries, concentrators, sawmill, electric lighting plant, Gates crusher and cyanide tanks. Water power is used. The lead is 19 feet between walls and three ore shoots bave been opened up, one 250 feet and another 320 feet in length. Tunnel No. 4 will give a depth of 950 feet on the vein.

The Crackerjack mine is developed with two tunnels and 2800 feet of work, and 450 feet of depth has been gained. Two blind leads were cut in the lower tunnel, one 12 feet in width and the other 26 feet, both hearing toward the main ledge. The property is equipped with electric power and a 10-stamp battery.

The Concord M. Co. has sixteen claims at Concord, in the center of the camp. The Ajax has a shaft down 200 feet, with 340 feet of drift north and south, with a lead of ore in sight. Work is heing concentrated on the Motber Lode No. 2. This property shows an ore body 24 feet between walls. Sixty-three feet has been sunk and 2½ feet per shift is being gained in depth. W. Q. Brown is manager.

The Atlas is a nortb extension of the Ajax and is owned by Spokane, Wash., men. It is developed by 850 feet of tunnel and 200 feet of shaft. Drifting is in progress from the 200-foot level and 60 feet have been driven in ore. Tbe tunnel 100 feet above is said to show a continuous ore shoot for its 850 feet.

The Colonel has a tunnel in 380 feet and has 16 feet of high-grade ore. Joining this, between it and the Mother Lode, is the Lost Lake, with 50 feet of shaft showing 16 feet of ledge matter with values in gold and silver.——The Lucky Lad Co. is working on two claims, 1 mile from Hump, and has a shaft down 135 feet, with 320 feet of drifts and crosscuts, showing a lead. The company intends to go on to the 200 level before doing any more drifting. The mine is equipped with a 2-stamp prospecting mill.

At Crystal Lake work is being pushed on the Liberty Bell group of two claims. The tunnel on tbe Rob Roy is in 73 feet and sbows full face of ore.——The Wise Boy is at extreme north end of the belt and has 1800 feet of development work and a 10-stamp mill.——The Oro Fino or Big Buffalo Co. has its tunnel in 885 feet and is making 2 feet per day with one shift.

Beside these properties are a number of prospects partially developed, chief among which comes the Hamilton group, Solo, Mother Lode, San Francisco, Granite, Buffalo Chief, Wall Street, Old Bill, Dewey and Little Giant. The Jumbo has turned out $1200 per stamp per month since it was started, as has also the Crackerjack.

The camp can be reached by wagon road from Stites via Grangeville, the county seat, and thence to Hump, 53 miles in three days, or from Stites via Elk City.

Hump, June 15.

O. Abeling, manager of the Dewey Con. M. & S. Co., operating at Roosevelt, is preparing to put in machinery for a 100-ton cyanide mill to be built this summer. The mill is to be built by the rivor, where the power from the dam is used directly without any intermediate transmission. Excavation for the mill has been carried on this spring. But for losing the dam during the high water of a month ago the work would be further along. The ore will be brought from the mine, which is 200 yards distant, to the mill by a gravity tramway.

F. E. Davis, manager of the Idaho C. M. & S. Co., operating on the Salmon river, near White Bird, has teams hauling the heavy machinery for the company from Stites, where it was stored all winter. There is an air compressor and a

complete outfit for mining. The 90 H. P. boiler was rakon down while the snuw was on tho gruund. A road will he oponed up to take the machinery from the foot of the grade to the property, abuut 4 miles. It is said there is ore on the surfaco which will pay to smelt on both sides of thu river, including tho ground of the Cape Horn, Idaho Con., Cuppor Zone and Salmon River C. Co. properties. Much of tho ore of that section is claimed tu be self-fluxing.

It is estimated that the average cost of freight in Buffalo Hump for the whole year is approximately 7 cents a pound. A guod road into tho camp is needed.

Kootenai County.

Troy, Mont., reports say a coppor strike has been made on the north fork of Callahan creek, 3 miles from the Montana-Idaho State line in Idaho. Excepting to tho trappers who in the winter months visit that sectiou of the Cabinet mountains, tho district is little known. The strike is 10 miles from the B. & B. mine, and 16 miles from Troy, Mont. It is 5 miles from the copper properties owned by the Ross Brothers of Libby, Mont. The strike was made by W. A. Raymond and J. M. Roberts of Troy. They fuund an iron capping on top of a mountain, and following down the sides of this mountain they struck a vein of ore 8 feet wide. As a result of four days' work with prospecting tools they have three tons of ore on the dump, assays of which showed 4¼% copper and two and one-half ounces in silver with some gold. Much of the ore is said to contain native copper. Trail builders are at work cutting a trail from the B. & B. mine, and as soon as this is completed supplies and materials will be taken in and development work started.

Shoshone County.

Secretary of the Interior Hitchcock has allowed the classification as mineral, by the mineral land commission, of over 600,000 acres of land embraced in twenty-seven townships lying south of Wallace, says the Spokesman-Review, reversing the decision of the Cœur d'Alene land office in favor of the land department of the Northern Pacific Railway. Many mines and prospects were located within the territory involved, and had the Secretary of the Interior sustained the findings of the General Land Office, which overruled the classification of the mineral land commission, and held the lands to be non-mineral, every alternate section would have become the property of the railway company, and the mining locations made thereon would have been void. The Secretary of the Interior finds that the hearing before the officers of the Cœur d'Alene land office, which resulted in the mineral classification being rejected, was unauthorized.

Wallace reports say a leaching plant of 250 tons daily capacity is being put in by leasers of the upper workings of the Snowstorm mine. This, with the 50-ton daily shipment to the smelter, will give them an output of 300 tons per day. The leaching plant will go to the owners of the mine at expiration of the lease.——The Champion C. M. Co., near Stevens Peak, has concluded negotiations for sale of the property and operations will he begun by Aug. 1st.——A shaft house is being built on the Evolution mine to replace the one destroyed by fire. The company will continue sinking on the ore in the shaft.

The Alma M. Co. at Mullan has started operations, running a long tunnel. The new compressor and drills are in operation.

Washington County.

Ford Bros. at Black Lakes, near Council, have excavated the site for their cyanide plant at the Gold Coin mine, to be located near the site of the one destroyed by fire last fall. The machinery is being hauled to the mine. The plant will be of 100 tons capacity.

MICHIGAN.

The reports of several of the Lake copper mining companies for the output for month of May is shown below. They show some increase over the April figures, but the changes are small. The Adventure and Mass report decreased outputs. Isle Royale made the largest percentage of increase. The three Copper Range Con. mines show 2269 tons produced in May, as against 2249 tons in April, the increase said to he due wholly to the Champion mine:

Mine.	May.	April.	Since Jan. 1.
Adventure	60	65	265
Calumet	3,250	3,225	16,225
Mass	140	155	750
Osceola	1,265	1,225	5,870
Isle Royale	100	85	452
Tamarack	565	520	3,045
Wolverine	502	502	2,461
Mohawk	508	500⅔	2,203
Atlantic	308	310	1,591
Quincy	1,123	1,119	4,980
Franklin	337	352	1,688
Winona	28	47⅓	202
Baltic) Copper	744	780	3,010
Champion) Range	784	718⅓	3,033
Trimountain.) Con	741	750	2,801

In the Daily Mining Record, H. J. Stovens of Houghton says the mines of Lake Superior region aro making more copper than evor hofore in history of the district. The mines have adjusted their operations to the metal market prices, aud are making money, with few oxceptions. Barring accidents uf a serious nature, ur severe laber troubles, the 1904 production of copper is expected to oxceed 200,000,000 pounds. The all-rail shipments of refined copper continue, owing to tho strike that has tied up lake traffic. The shortage of coal for the operation of the mines remains a disquioting factor. A few cargues have been received and none of the mines or mills have been forced to suspend, oven temporarily, by reason of a shortage of fuel, hut tho availablo supply at local ports is small, and it is imperative that coal be secured during the open season for the requirements of next wiuter and spring. The lako strike has also caused a shortage of mineral supply for tho Buffalo smelter of the Calumet & Hecla C. Co., which ran out of unsmelted mineral several weeks ago.

Houghton County.

The Osceola mine at Opechee, uear Calumet, has begun exploratory work for the southern extension of the Kearsarge lode. The North Kearsarge and South Kearsarge mines of the Osceola Con. C. Co. are the principal producers of that property, hut tho recent development work of the Calumet & Hecla has shown that the Kearsarge lode may possess mineral values on the tract of the Osceola mine proper. The Osceola has a full equipment of mining machiuery on the ground.

The sale of the 1-stamp mill of the Centennial mine, near Calumet, and its dismantling, mark the close of the Schoolcraft-Centennial mine, on which unsuccessful efforts, entailing expenditure of $2,000,000, were made to open paying mines on the Calumet conglomerate, says the Daily Mining Record. The present Centennial mine is opened on the Kearsarge lode and no attention whatever is being paid to the old openings of the Calumet and Osceola beds.

Seven eighths of the production of the Franklin mine, at Hancock, is secured from No. 5 shaft, though some rock is still coming from No. 3 shaft. The second shaft at the Franklin Junior will relieve the pressure on the single shaft now in operation.

The remodeled section of the Hecla mill of the Calumet & Hecla C. Co., at Lake Linden, is reported giving satisfactory results. About three years more will be required tu complete the work of remodeling the other half of the Hecla mill and the 11-stamp Calumet mill.

Keweenaw County.

At the Ahmeek mine at Kearsarge, near Allouez, concrete stringers and ties are being laid for the skip track. The question of linding timber for the mines is reported one of increasing importance, and the cost of mine timber is rising steadily. The forests of pine that covered perhaps half of the upper peninsula of Michigan forty years ago have been reduced to limited patches, and it is now necessary for the mines to secure their heaviest timbers from the Pacific coast. Smaller pine, hemlock and cedar timber is still obtained ou the southern shore of Lake Superior, but the supply is growing smaller. The Calumet & Hecla Co. is making increased use of hardwood timber, and as there are maple and other hard woods remaining within 100 miles of the mines, some relief can be afforded by the partial substitution of hardwood for pine and hemlock. This, however, is hut a temporary relief, and if cement and steel construction can be economically employed in the mines it will solve the problem. Concrete should prove successful for certain uses, but the availability of steel remains to be proved, as the acid mine waters are corrosive.

MONTANA.

Flathead County.

The Cherry Creek M. Co. has been incorporated to operate mining properties in Libby district. Its principal place of business is Seattle, Wash., and the directors are J. Y. Terry, O. C. Jansen and B. Y. Terry of Seattle. The company owns seven placer claims on Big Cherry creek. Each of these claims contains 160 acres. The ground extends up stream from the point where the road from Libby to the Snowshoe mine crosses Cherry creek. The company has made tests of ground. There is an ahundance of water for mining purposes in Cherry creek.

S. D. McCarthy, manager of the Libby Placer M. Co., operating on Libby creek near Libby, reports work progressing. He is working twelve men, eight of whom are on the day shift and four on night shift. They are working ten-hour shifts. The hydraulic hoist was set up in the spring. It will handle five times as muoh rock as the hand-power arrangement used last season. The cleanup will be made in tho fall. They have already added 150 feet of sluice hoxes to the flume.

NEVADA.

Esmeralda County.

C. McCarthy has a bund un the Chiatuvich's Mary mine, tunnel site, mill and cyanide plant, and tho Homestead claim, carrying the apex of the vein, and also a water right, at Silver Peak.

Another rush to Goldfield is on as thu result of reports that high-grade ore has been uncovered in the Jumho mine. The rock is free-milling gold ore. The first n ill at the camp is in operatiun.

Lincoln County.

At Good Springs, near the line of the San Podro Railroad, the ownors of the Red Cloud group of mines are reported producing ore which shows a valuation of $250 por ton, says W. H. Wilson, manager of the Frederick Warde M. Co. The Red Cloud mines promise, says Wilson, to develop into producers of quicksilver. Cinnabar is piled up which carries valucs in gold. It is intended to equip tbe minos with retorts.

Nye County.

F. A. Barrett, of Seattle, Wash., has bought three claims at Lone Mountain, near Tonopah, between tho Nevada-Alpine and Tonopah-Alpine mines. The claims have surface showing of silver-lead ore.

Washoe County.

An engine has heon set up hy W. C. Williams on the Addie C. mine, near Wadsworth. It will he used till the shaft is 400 fect deep.

White Pine County.

Thirty thousand feet of lumber has been ordered for the concentrator to be built at the Ruth mine at Ely.

The Bay State mine at Newlands, 20 miles northeast of Eureka, in White Pine county, has been sold to the Newark M. & M. Co., organized at Boston, Mass., with C. M. Perry of Boston president. T. Robinson of Eureka is manager. He has made arrangements to reopen the mine. The value in the ore is mostly silver.

NEW MEXICO.

Otero County.

H. S. Anderson, G. French and J. H. Eddy, of El Paso, have located soda beds in the sand hills near Alamogordo. They have put in experimental machinery on the deposits and have started to develop them.

Sierra County.

The placers at Shandon are increasing their output of gold, says the New Mexican. Fifty men are at work, several on their own ground, while the others are leasing. The district has produced $8000 in gold since its opening, six months ago. Many farmers have gone to digging gold since the drouth set in, which made it difficult for them to make a living from the farms owing to lack of water for irrigation purposes.

The shaft of the Treasure mine, near Hillsboro, at a depth of 70 feet, has a showing of high-grade ore.——Development work on the Good Hope Bonanza mine, near Hillsboro, has opened a parallel vein that is producing ore. A shipment has been made.——W. H. Williams reports having fmished a satisfactory cleanup after a five weeks' run of Wicks ore at the Porter mill, near Hillsboro.

Valencia County.

(Special Correspondence). — Copperton is a new camp 110 miles west of Albuquerque, in the Zuni mountains, at an altitude of 9200 feet. It was discovered in 1901 by W. J. Skeed, the present manager of the Copperton M. Co. The formations in which the ledges occur are granite, hornblende schist, porphyry and diorite. The ores are copper (principally as carbonate), gold and silver. The country is well timbered. The veins are well defined and vary from 2 feet to 60 feet in width.

The camp needs capital for development. The Copperton M. Co. is sinking a double-compartment shaft on the Compromise claim and has attained a depth of 65 feet, and is crosscutting the vein at 50 feet, which shows copper carbonate. The vein is 65 feet wide at this point. They have also made a strike in the Empress claim, 3 miles east of Copperton, showing 4 feet of copper carbonate.

F. E. Rogers, representing a New York company, has started a 7x9-foot shaft on the Santa Claus claim, 3 miles north of Copperton. It is intended to sink 500 feet, as a prospect drill is said to have cut an 18-foot vein of ore at 285 feet which runs 2½ ounces gold and 12% copper.

Crocker & Schell have made a gold strike assaying $8 in a well-defined vein 4 feet in width.

Whiteside, Jones & Co. have crosscut through 20 feet of carbonate ore, assaying 11% copper, 3½ miles north of Copperton.

Copperton, June 18.

OREGON.

Baker County.

A second power plant is being put in hy tho Beaver M. Co., owning the Baisley-Elkhorn mine, near Sumpter. A dynamo and electrical apparatus have been delivered 1½ mile below the site of the water power plant that runs the compressor. The electrical transmission plant will be put in, and the euergy generated will be delivered either at the compressor or at the mill above. As Pine creek drops rapidly between the compressor site and the site for the electrical plant sufficient head is secured. The Baisley has been delivering air from the compressor plant to the mine for running the pumps, hoists, etc., and found that there was not enough loft for the power drills in the face of the crosscut. As the air line was nearly 1 mile long, frictiun was a material loss. By delivering the electrical current direct to the mine, iu a transmissiun of not to exceed 3 miles, the loss will be slight, and all tho power of the first plant may be utilized for the compressor.

Crook County.

Manager L. Tillotson says he is opening up the ledge on the American Almaden Quicksilver & C. M. Co. claims, near Prineville. The ore carries gold, bituminous matter and 6% quicksilver. The ledge averages 15 feet wide. It is intended to build a plant for reduction of the ores this season. Tho property is 30 miles east of Prineville.

Grant County.

(Special Corrospondence).—Simpson & Graham have a working bond on the Gem mine at Susanville. The owners who had the land patented left it lie idle for several years after uncovering the ore body. —— Stevenson & Spaulding havo completed improvements on tbeir custom mill and it is in full operation.

Heaton Bros. are increasing development work on the Gold Bug mine, in which they havo bought an interest recently and the prospects are so far satisfactory.

D. Briggs is working his placer diggings on Deep creek and expects a heavy cleanup at the end of summer, to which time he expects the water season to last.

The Blue Channel Placer G. M. Co. has suspended drift work for the present, owing to unsatisfactory labor conditions and is devoting its energy to installing hydraulic pipe and giant plant.

Susanville, June 20.

Jackson County.

A deal has been closed at Gold Hill, whereby the Gold Hill Dev. Co., consisting of Milwaukee, Wis., men, has bought the J. J. Houck water and power privileges to conduct mining, manufacturing, etc. H. Schaeffer is manager for the Wisconsin men. It is intended to build a 100-ton smelter that will consume all its fumes and gases. The fuel will come from the company's coal mine in the Meadows district, and all power will be electrical. The smelter will be near the Rogue river mills, on opposite side of river. The company proposes to furnish electrical power for other purposes. The water power will he 8000 H. P. It will be necessary to build a canal 2100 feet long, 50 foet wide, and 8 feet deep, carrying 210,000 cubic feet of water per miaute, with 26-foot constant head, says the Courier. The company has bought mining ground near Gold Hill that it will develop.

Josephine County.

The Comstock G. M. & M. Co. is preparing to increase development work this year. The company has developed quartz mines at Mount Baldy, near Grant's Pass, and also a numher of claims on Canyon creek, near Kerby. J. M. Layman, manager of the company, will superintend operations.

For $50,000, the Gold Standard group of gold and copper claims of H. E. Booth, of Pickett Creek district, have been sold to Cripple Creek, Colo., and Chicago, Ill., men. Thoy will begin development this week. The Gold Standard group embraces eight full claims in one tract, on Pickett creek and Rogue river, 12 miles helow Grants Pass. Development work, in tunnels and drifts, has been done and a body of ore uncovered. Free gold is carried in the quartz, and in some of the veins copper predominates. The several adjoining claims will be operated conjunctively.

W. Gilmore of Medford, operating mines at Grayback mountain, 20 miles east of Waldo, reports a gold strike of high-grade ore. There is said to be a streak 10 inches wide in a vein traced for 2000 feet. The strike is near the California line and on the divide between the Illinois and Klamath rivers, where placer beds were found in early days.

W. P. Cope, former owner of the Yank group of copper and gold claims of the Galice district, has taken charge of the Lucky Cuss group of claims of the Mur-

phy district, near Grants Pass, and will superintend development for the Gold Point M. & M. Co. He is driving a deep tunnel.

The Gold King mine, of Josephine creek, near Grants Pass, is being developed hy W. Roe et al. of Fort Worth, Tex. Development work is heing done under direction of M. Marks.

The Mountain Lion mine, near Grants Pass, has been taken up by J. S. Crawford et al. of Duluth and Minneapolis, Minn. The Mountain Lion has been under development for several years.

S. Bowden, with Spokane and other Washington men, has taken up a copper property near Kerby, on the Illinois river, and is developing it.

Lane County.

G. E. Waggoner of Portland, manager of the Oregon Blue M. Co., operating at Blue River, says preliminary work has begun for building a 10-stamp mill at the company's mine.

Malheur County.

J. F. Meikle, manager of the Black Eagle mine at Malheur City, reports work progressing. The mine is on a porphyry dike 600 feet wide. A 20-stamp mill is running steadily and the values taken out are said to be satisfactory. Prospecting work on a large scale is being done and Meikle is sinking on the ledge. When the depth of the ore is fully tested the company will put on a larger stamp mill. A. Kime is superintendent.

Wallowa County.

La Grande reports say C. Christy has bought an undivided half interest in the S. Lynch placer claims, known as the Klondike and Pioneer. The mines are on the west side of the Imnaha river, 2 miles below the Hassee sheep bridge. Mr. Christy also bought a one-half interest in a water right which flows through the properties and has its source in the Imnaha river.

SOUTH DAKOTA.

Lawrence County.

Work on the plant for the Gilt Edge-Maid M. Co., near Galena, has been started. Excavation work is completed and the material for the structure is on the ground.

The Golden Reward, Dakota and Imperial cyanide plants in Deadwood were at a standstill last week, as a result of the recent flood. Railroads are necessary to these plants, for the delivery of both coal and fuel, and the suspension of railroad business cut the plants off for a time. Some damage was inflicted about the mills hy the high water, but this was not of a serious nature or of great extent. The Hidden Fortune M. Co. cyanide plant, 3 miles below Deadwood, on Whitewood Creek, had a similar experience, and was cut off from fuel and ore. The railroad companies have made repairs and communication will be re-established this week.

Excavations have heen completed for the cyanide mill of the Gilt Edge-Maid M. Co. in Strawberry gulch, near Galena, and the timbers are on the ground for the frame work, most of it coming from Oregon.

Work is progressing and the fourth tunnel is being driven on the Fairview mines, near Mystic. This has reached a length of 115 feet from its portal, and has tapped the 30-foot ledge towards which it was being driven. This ledge, which runs parallel to the main ledge, at the surface has proven a free-milling proposition, assays giving $6. All the work has been in tunnels.

UTAH.

For the lead contained in Utah ores Manager C. W. Whitley of the American S. & R. Co. at Salt Lake City says his company will pay $4.25 per hundred pounds, an advance of 75 cents over the figures that ruled till recently. On the production of lead in the valley last month, which amounted to 8,400,000 pounds, the gain means approximately $30,000, says the Tribune. The advance concerns principally producers of Park City, Summit county. The Daly West last year produced 34,000,000 pounds of lead, the Silver King 33,500,000 pounds, while the others contributed sufficient to create a total of 50,000 tons, for which the producers recoivod $3,500,000. Manager Whitley says owing to conditions existing in the East which had prevented the increase, and the large number of contracts that prevented having expired, the company now finds itself in a position to establish "the new settling price, based upon the actual average weekly selling price of finished, desilverized domestic lead in New York City for lots of fifty tons or more, deliverable within thirty days." Tintic and Bingham districts will also profit by the raise.

Grand County.

The cyanide plant with which the Interstate M. & M. Co. is equipping its properties at Gold Basin, near Basin, will he put in operation hy August 15, says J. H. Clark. The crushers will hegin grinding on ores that afford average of $7.50 gold per ton. The hoilers are being set, and the sawmill is in steady operation.——The Grouse Mountain group, on which W. H. Wheet has been directing work, will also he equipped with a mill this season, the management having blocked out ore of milling quality.——E. Borene and partner report having found the lode from which the float scattered over Wilson mesa has issued. The ledge has been followed to a depth of 30 feet.

Iron County.

With the water under control and the management again taking out ore on the 300-foot level of the Johnny mine at Stateline, ten stamps are crushing daily twenty-seven tons of ore. With the larger pump in position and the element which has retarded developments under control, the opening of the lower workings is expected to progress.

Juab County.

The Uncle Sam mines of Tintic district, near Eureka, during the year that closed on the 7th inst. marketed ores of the value of $61,693.33, and begins its new year with a cash balance of $10,483.94, without reference to a consignment of four carloads of ore from which $4000 will be derived, says the report of Manager J. Chipman. The mine has not only been productive of considerable high-grade ore, hut it has supplied the mill with a steady volume of second class rock. In concluding his report Manager Chipman says the mines are in about the same condition for producing as they have been for the past year. However, one of the leasers has opened up a shoot of rich ore in the Humbug mine. This part of the property is being worked on lease by four separate companies of lessees. So far the company has found that leasing is profitable, and Manager Chipman thinks that hereafter the leasing of the Humbug will prove more profitable than the working of the property by the Uncle Sam Co., providing the work is done under a competent superintendent, who visits the mine daily and who knows the condition the mine should be kept in and sees that it is kept in that condition.

Piute County.

The mining districts surrounding Marysvale are being worked. The Bully Boy and Webster leases are making shipments. Merriam & Tinsman are lessees. The ore runs in lead, gold and silver values.

Sevier County.

The Wild Bill group of mines, near Richfield, has been made the foundation for Chicago M. & M. Co., incorporated by F. T. McGurrin of Salt Lake City, T. Keeley of Chicago, Ill., M. Cullen, E. Keeley, P. Ryan and C. Hennessey directors. The Wild Bill group of mines has been productive of ore and will be further developed.

Summit County.

Park City reports say No. 2 hoist on the Ontario mine, near there, was destroyed by fire on the 20th inst., throwing 200 men out of employment and causing a loss of $60,000.

Manager C. L. Rood of the Daly, Ontario and Naildriver mines at Park City reports work progressing on the properties under his control. The quicksilver deposits are being profitably worked. At the Daly, work in the shaft is progressing, the water having been pumped out last week. No further trouble is anticipated from the surface water. Regarding resumption of work in the Federal tunnel, Rood states no definite steps have as yet been taken. Development work goes steadily ahead at the Naildriver. The power house near the mouth of the Ontario tunnel, which furnishes the city with light, will be moved farther down the canyon. Since the new mill started up the demand for electricity has been greater than it was before, and the local plant and the one in question have been running to full capacity. By moving the plant farther down the canyon, a greater fall of water can be obtained and the capacity of the works will be doubled. This will insure more power at the mill, and for the Mazeppa and Ontario mines.

Utah County.

The Tidal Wave M. & M. Co. has been incorporated at Provo. The company owns ten claims midway between Provo and Springville and 1 mile east of the county road. The incorporators are J. & W. A. Pierce, G. Elliott, D. Christensen, J. M. Pierce, R. Skelton and A. L. Booth. The property has been worked off and on for two years and a half. Assays show values in lead, gold and silver.

Washington County.

A deal was made last week by which a one-third interest in the Little Johnny group of mines, 18 miles west of St. George, passed to F. Higgins, who already owned a third. The remainder is held by A. Empey of Dixie. The Little Johnny is a copper prospect in early stage of development. A couple of shafts have been sunk—one 63 feet and the other 40 feet—and a crosscut 50 feet below is showing 100 feet of ledge matter.

WASHINGTON.

Ferry County.

Work will be resumed on the Quilp mine at Republic this summer, says E. L. Tate of Spokane, manager. The Quilp Co. wants to get a contract with some smelter for at least 10,000 tons of ore, to be delivered as fast as the company can mine it, and wants to get such a contract before work is resumed.

WYOMING.

Albany County.

E. P. Kester, of Towanda, Pa., and W. J. Greevy, of Omaha, Neb., interested in the American C. Co., of Albany county, report work progressing on the company's holdings 40 miles west of Laramie. Other property interests in that section, including the Cuprite and the Maud M. mines, in which W. Benton and T. M. B. Hicks are interested, also the Keystone mine, Blue Jay and the Florence, together with the mill privilege on the Keystone ground, which has passed into tho hands of the Ideal M. & I. Co., are being operated. The Laramie, Hahn's Peak Pacific Railroad Co., when completed, will do much toward the development of the section of country in which are situated these mines. The company is laying rails and it is expected at least 33 miles of the road will be built and in operation by October 1st next.

The Rambler mine and smelting works at Rambler, near the Colorado line south of Laramie, are to be reopened this week by the Greene Co. of Chicago, Ill. The mine and smelter have been closed down for six months. Ore from mines in the Pearl, Colo., district will also be treated at the Rambler smelter.

Bighorn County.

Ore shipments from the Sunrise iron mines to the smelters of the Colorado Fuel & Iron Co. at Pueblo, Colo., have been resumed via the Colorado & Southern Railroad. These shipments ceased after the flood on May 20. Four trainloads of ore will go from Sunrise to Pueblo each week.

Carbon County.

R. Deal et al. have incorporated the Alameda M. Co. to develop tbe Alameda group of three claims south of the Home Fraction and Charter Oak mines, 5 miles from Grand Encampment. R. Deal is president, J. C. Rankin vice-president and P. J. Winters secretary. The principal work has been done on the Alameda, where a shaft has been sunk 30 feet and a tunnel driven 85 feet. On the Bessie claim a shaft has been sunk 20 feet and on the May Bell a 30-foot tunnel. The company expects to develop the group by extending the Alameda tunnel to 480 feet, which will give a vertical depth of 350 feet. From this tunnel the lead, 12 feet wide on the surface, will be worked. Values are in gold.

FOREIGN.

AUSTRALIA.

Western Australia.

On the 1600-foot level of the Lake View Consols mine at Kalgoorlie recent developments have shown tellurides in the ore. This is said to be the first occurrence of telluride found below the 1200-foot level. The self-dumping skips are in successful operation and the new mill has been completed.

BRITISH COLUMBIA.

Vanconver Island.

(Special Correspondence).—During the month of May the Tyee C. Co.'s smelter ran eighteen days and 4040 tons of Tyee ore were smelted, giving a return, after deduction of freight and refining charges, of $47,028.

Duncan's Station, June 18.

CANADA.

Ontario.

Wabigoon reports say mining work is increasing in the Dryden belt. J. Herrington has put men to work to resume operations on the property of the Ideal M. Co. of Detroit, Mich.——Manager Halstead of the Summit Lake G. M. Co. at the Little Master mine says he has been overseeing a number of alterations on the surface and mining operations have been resumed. Instead of sinking the main shaft at once to 300 feet, it has been decided to crosscut at 150 feet each way to explore the other voins, particularly the black quartz vein.

The reduction works and docks, near Tunnel island, Rat Portage, have been sold by the Dominion G. M. Co. to the Traverse City G. Reef Co., an Arizona company. They own properties on the Lake of the Woods, and propose to take the ore there for treatment. They have already a large quantity of ore on the dump.

MEXICO.

Chihuahua.

At Parral the Parral M. Co. is crushing and treating seventy tons daily.——The Guggenheim Exploration Co. has started work on its Veta Grande mine in Minas Nuevas district, the work being in charge of E. Stalknecht.——W. H. Mealy of Monterey is preparing to start work on a group of mining properties at El Portrero, 16 miles south of Parral.

S. Lawrence and G. B. Jacobs have started operations on the Dolores mine in Santa Eulalia, on which they have a lease and option. Lumber and materials have been shipped out and work begun to set up a crusher of forty tons daily capacity, and a hand jigging apparatus for concentration of the ore. The crusher and jig will be run by power from a gasoline engine. The values are in the lead with a quartz gangue. The Dolores mine adjoins tbe San Antonio mine of the American S. & R. Co.

The Santa Eulalia Ex. Co. at Santa Eulalia, R. D. Jackson, manager, is down on its shaft 350 feet. The work has been proceeding slowly, as it has all been done by hand. A site for the machinery and air compressor plant has been made and machine drills will be in use next month. In the meantime, ore is being taken out through the shaft of the American S. & R. Co. as heretofore.

Durango.

At Topia deep mining is under way, particularly in the Madrugodo mine, owned by the Miller & Sibley Co. of Bradford, Pa. The company has run a tunnel 1 mile in length and has struck a vein with a body of ore at 1800 feet in depth. It is to this camp, near the Sinaloa border and 6000 feet above sea level, that a railroad is proposed from the coast. It is a well mineralized district, held back by lack of transportation facilities.

Guanajuato.

It is reported New York and Pennsylvania men have bought La Lue silver-gold mine near Siloas for $300,000 (Mexican). The purchasing company is headed by C. V. Culver of New York City. It is claimed the company will build a 100-ton capacity mill.

Jalisco.

A boiler with capacity of 80 H. P. has been put in at the plant of the Keystone C. S. Co. at Tapalpa and the plant will be run to full capacity. Besides the smelter, the Keystone Co. operates a concentrating plant and stamp mill. A. L. Waters is manager.

Oaxaca.

O. Land, manager of the Santa Fe M. & M. Co. of Oaxaca, reports the mining industry showing satisfactory progress in the State of Oaxaca. Tbe city of Oaxaca is at an elevation of 5000 feet, which gives it a pleasant climate the year round. There are several mines in the State that are making regular shipments of ore to Aguascalientes, the United States and Swansea, Wales. Considerable English capital has gone into the mines there and these companies ship their oro by way of Vera Cruz to Wales. There has also been a large amout of capital placed in the mines of the State.—— The Paris mine, owned by Detroit, Mich., men, has a 20-stamp mill running on free milling ore. In addition to the development of the smelters, there are several short lines of railroad that are being built there, which will open up new agricultural and mining sections and prove feeders to the lines already in existence. One of these lines will be 25 miles in length when built and has been under construction for two years. The line is within 2 kilometers (1¼ mile) of being completed. This line will open up mineral camps in which there is a possibility of a smelter being built. This line is being constructed west of Ocotlan and the ultimate destination is said to be the Pacific coast.——The Santa Fe M. & M. Co. has bought forty pertenencias of ground of free milling ore. The Santa Fe mine, which is one of the properties, is an "antigua" Spanish mine. No great depths have been reached on any of the properties in that section, the deepest working being about 380 feet.

Puebla.

A group of gold and silver mines, near Tetela de Ocampo, has been bought by the Compania de Mexico, Ltd., and machinery will be put in.

Sonora.

It is stated that La Brisca M. Co., near Magdalena, will put in an electric plant to light and run their works. A telephone or telegraph line will be put up to connect with Magdalena.

G. B. Earnshaw has taken over the Cerro Colorado mine, near Altar, 50 miles southwest from Santa Ana, and is prepar-

ing to operate the property. A 50-stamp mill will be built. The Cerro Colorado is a low-grade gold proposition, said to be well developed.

Vera Cruz.

A company organized under the laws of Delaware has a tract of land in the State of Vera Cruz and has sunk several wells at El Caguas. Oil is reported as having been found in paying quantities, although the wells have only been dug and not drilled. Drilling will be started, writes W. W. Canada, United States Consul at Vera Cruz.

Zacatecas.

L. Breidenbach of Monterey is preparing to put up a plant at Zacatecas, for treatment of 600,000 tons of ore on a dump of an old mine in that camp.

Commercial Paragraphs.

H. C. PARMELEE has bought the interest of S. B. Weld in the firm of Parmelee & Weld, chemists and assayers, Denver, Colo.

REDFIELD DRILL CO., Denver, Colo., report shipping one of their hand-power rock drills to Grants Pass, Or., and one to Los Angeles, Cal.

J. A. TRAYLOR, 509 Equitable Building, Denver, Colo., is representing through the Western States the Hodge Iron Co. of Houghton, Mich.

THE Chicago office of the Nernst Lamp Co., in charge of A. E. Fleming as district manager, has been removed from 638 National Life building, La Salle street, to 99 East Lake street.

RAND DRILL CO. of New York is sending out a mailing card which is a novelty. It is in the shape of the new "Imperial" hammer, the address being written on the barrel and a 1 cent stamp fitting into the handle. On the reverse side are a few suggestive lines.

S. W. TRAYLOR of New York has closed a contract for the Colorado Iron Works Co. of Denver, Colo., for a 75-ton rolling and concentrating mill at Silverton, Colo., for the Ruby Basin Mine & Tunnel Co. Eight of the new Traylor centri-pact screens will be installed.

S. W. TRAYLOR, engineer and designer of smelting and concentrating plants, stamp mills, etc., has organized the Traylor Engineering Co. for the manufacture and sale of his recently patented Traylor centri-pact screen. The company is now equipping a plant in Newark, N. J., for the manufacture of this screen, and will have offices at 118 Liberty street, New York City.

THE authorities in charge of the 300,000 H. P. plant at the St. Louis Exposition have installed a large No. 3 Cross oil filter manufactured by the Burt Mfg. Co. of Akron, Ohio. The Cross oil filter has also been ordered by the C. H. Bradley Co. of Pittsburg, Pa., for use in connection with their exhibit at the fair. Likewise the Buckeye Engine Co. of Salem, Ohio, and the De Laval Steam Turbine Co. of Trenton, N. J., have ordered No. 3 American filters, to be used at the fair in connection with their exhibits.

THE Canadian Rand Drill Co., Sherbrooke, Quebec, reports having closed with the Canadian Westinghouse Co. of Hamilton, Ontario, for a Rand-Corliss compound air compressor. This machine is designed to furnish air for the various pneumatic appliances throughout the works, and is to be driven by a Westinghouse motor through a Morse chain drive. The International Coal & Coke Co., Coleman, Alberta, have placed an order with the Canadian Rand Drill Co. for a 300 H. P., steam driven, Rand duplex compressor.

THE Tetrault improved concentrating table has been in operation the past three months at the custom mill of the Progressive Concentrating & M. Co., of Boulder, Colo., writes that company. The table is 6 feet by 10 feet long and has a capacity of 15 tons per day. They say the machines are making a saving of 85% to 93½% on test runs of from 5 to 100-ton lots. Further information can be obtained from the manufacturers of the tables, the Progressive Concentrating & M. Co., E. C. Pohle, president, and A. Tetrault, superintendent, Boulder, Colo.

Obituary.

J. G. MEIGGS, an American engineer, died at London, Eng., on the 21st inst. Deceased was born in New England seventy-seven years ago. He left the United States for Peru, where, with his brother, Henry Meiggs, they built the Oroya railway. Since living in London, Meiggs built several important railroads in Argentina.

Personal.

W. H. KINNON has returned to Denver, Colo., from Bland, N. M.

DR. F. WILDER has been appointed State Geologist of Iowa.

W. H. BRAY, a mine manager of Nevada City, Cal., is in San Francisco, Cal.

J. H. WEBER of Chicago, Ill., is in San Francisco, Cal., on mining business.

F. C. COX of Phœnix, Ariz., is in San Francisco, Cal., on mining business.

F. F. BULLEN, a mining man of Victoria, B. C., is in San Francisco, Cal.

J. MOLDER has resigned as superintendent of the Home C. Co., at Morenci, Ariz.

R. W. HINTON is superintendent at the Velvet concentrator, near Rossland, B. C.

R. T. HILL is now consulting geologist Greene Con. Copper Co., Cananea, Mexico.

A. H. BROWN, a mine owner of Kennett, Shasta county, Cal., is in San Francisco, Cal.

B. M. PATTISON is now superintendent Shattuck-Arizona Copper Co., Bisbee, Ariz.

C. M. MEYER of New York City is at Florence, Colo., conducting milling operations.

C. M. FUELLER of Denver, Colo., has been examining mining property at Silver Cliff, Colo.

WEBB SMITH, superintendent of the Kennedy mine at Jackson, Cal., is in San Francisco, Cal.

N. L. JENKINS is superintendent of the Home C. Co., at Morenci, Ariz., vice J. Molder resigned.

J. F. MEIKLE, manager of the Black Eagle mine, at Malheur, Or., is visiting in Los Angeles, Cal.

J. CHALMERS of Denver, Colo., has returned there from a professional trip to Rinconada, N. M.

J. H. KINKEAD, superintendent of the Kentuck mine at Virginia City, Nev., is in San Francisco, Cal.

W. H. HILL, formerly of Prescott, Ariz., is general foreman of the Anita C. Co., near Williams, Ariz.

G. W. RYALL of Baltimore, Md., has returned East from an examination of mining interests in Sonora, Mex.

G. P. DILLMAN of San Francisco, Cal., is in Chicago, Ill., on his return from a trip through the Eastern States.

E. T. WALLACE, a mine owner of Yreka, Siskiyou county, Cal., is in San Francisco, Cal., on mining business.

W. J. MAGEE, of Sutter Creek, Cal., is general manager of the South Eureka Mining Co., near Sutter Creek, Cal.

A. R. MIGNON, owner of La Bonanza and Guadalupe mines at Etzatlan, Jalisco, Mexico, is visiting in Ft. Worth, Texas.

SUPERINTENDENT W. E. SHARON of the Crown Point, Belcher et al. mines at Virginia City, Nev., is in St. Louis, Mo.

W. P. COPE is superintendent of the Lucky Cuss mines of the Gold Point M. & M. Co., near Murphy, Josephine county, Or.

ALBERT TRITTENBACH, superintendent of the Dutch mine at Quartz, Tuolumne county, Cal., is in San Francisco, Cal.

EMERSON GEE, who has been in Mexico for the last two months on mine examinations, has returned to Los Angeles, Cal.

JOHN DERN of Salt Lake City, Utah, is president and manager of the Uncle Sam Con. M. Co., operating in Tintic district, Utah.

P. L. YOUNG, M. E., is in San Francisco, Cal., from Chilo, South America, and is going to Dawson City, Yukon Territory.

T. ROBINSON of Eureka, Nev., is manager of the Bay State mine of the Newark M. & M. Co., at Newark, White Pine county, Nev.

J. HOOPER is superintendent of the Mitchell copper mines in the Huachuca mountains, near Bisbee, Ariz., vice J. Piper, resigned.

H. DEC. RICHARDS has returned to San Francisco, Cal., from a trip to Mexican mines. He will soon leave for his mines in Amador Co., Cal.

R. STUART BROWNE of San Francisco, Cal., has gone to Placer county, Cal., to report on a cyanlding proposition. He will return about July 1st.

R. J. COLEMAN, president of the company operating the Lluvia de Oro mines, Choix, Sinaloa, Mex., has returned from a short trip to Denver, Colo.

R. G. COLLINS has resigned as mechanical superintendent at the Washoe smelter at Anaconda, Mont., and will go to Chicago, Ill., where he will be connected with a steel company.

GEORGE D. JAMES of Denver is in the vicinity of Frisco and Curtin, Summit county, Colo., on professional business for Chicago and Kansas City interests and will return to Denver shortly.

G. H. ARLETT, at Chihuahua City, Chihuahua, Mexico, has closed his assay office and chemical laboratory and will take charge of the mining operations of G. W. Boyce and his several companies in Mexico.

J. PIPER, who has been in charge of developments at the Mitchell mines in the Huachuca mountains, near Bisbee, Ariz., has resigned to accept the superintendency of the Hartford iron mine, in northern Michigan, one of the properties of the Oliver Iron M. Co.

Trade Treatises.

"Oil vs. Grease" is the title of a neat pamphlet issued by the Joseph Dixon Graphite Co., of Jersey City, N. J., in which is set forth the advantages of the lubricants made by that firm.

The Crocker-Wheeler Co. of Ampere, N. J., has issued Bullotin No. 45, descriptive of the electric plant of the Government printing office at Washington, D. C. It is profusely and handsomely illustrated and shows another of the varied uses of electricity in the industries.

The Dean Bros. Steam Pump Works of Indianapolis, Ind., have just issued catalogue No. 44, illustrating and describing their various forms of pumps and air compressors, large and small, for varied uses, together with carefully prepared tables for the use of those making use of this class of machinery.

The Dixon Graphite Co. of Jersey City, N. J., have issued two interesting little pamphlets entitled "Dixon's Graphite Cup Greases" and "Dixon's Ticonderoga Graphite Grease," respectively. They treat of the various forms of lubricant manufactured by that company and the means of applying them.

Supplement No. 2 to catalogue 77, issued by Arthur Koppel, 66-68 Broad street, New York City, N. Y., applies solely to Baldwin locomotives. By an arrangement with the Baldwin Locomotive Works he announces his ability to furnish Baldwin locomotives of all classes and sizes, narrow or standard gauge, and for all kinds of motive power at standard prices. A copy of the catalogue will be sent to any address.

Advance sheets of catalogue No. 36 constitute Compressor Catalogue No. 35 from the Ingersoll-Sergeant Drill Co., and is in itself a compendium of down-to-date depiction of this form of power appliance. It is mostly high-class illustrations, with a little reference. For the first time appears a portraiture of the new works at Phillipsburg, N. J. The great Corliss air compressor operated by the Homestake M. Co., Lead, South Dakota, is shown, as are the electric-driven air compressors of the St. Louis, Mo., Transit Co. A copy of this catalogue will be sent on request by addressing the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York, N. Y.

Books Received.

Bulletin No. 1 of the fourth series of the Geological Survey of Ohio, Edward Orton, Jr., State Geologist, has made its appearance. It is largely devoted to the geology and production of natural gas and petroleum in that State.

"The Copper Handbook," for 1904, by Horace J. Stevens, has been received. This annual is devoted exclusively to the copper mining industry of the world, and has been published for four years. It takes up the history, geology, chemistry, mineralogy and metallurgy of copper, also the uses and commercial standing of the metal. Numerous copper deposits are technically described and the technology of the business is interesting and valuable. Price, bound in buckram, $5, prepaid, Horace J. Stevens, Houghton, Mich.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING JUNE 4, 1904

762,511.—SCRIP METER—C. E. Beach, Oakland, Cal.
762,375.—REMOVING SNOW—D. W. A. Beaudette, San Bernardino, Cal.
762,377.—VALVE GEAR—S. L. Berry, Nogales, Ariz.
762,378.—WAIST HOLDER—F. S. Boedefeld, S. F.
762,574.—IGNITER—A. J. Bradley, Oakland, Cal.
702,379.—TROLLEY WHEEL—J. S. Briggs, Los Angeles, Cal.
762,576.—WASH BOILER—J. L. & J. L. Brobst, San Mateo, Cal.
762,580.—CRUSHING MILL—J. M. Dyer, Douglas City, Cal.
702,395.—BALING PRESS—W. Eisenhauer, Spokane, Wash.
762,581.—SELF ADJUSTING WAIST—Louise Fogus, S. F.
762,476.—FROST PREVENTER—J. W. Fulton, Pomona, Cal.
762,708.—SPARKING DEVICE—R. B. Hain, Los Angeles, Cal.
762,406.—VALVE—S. S. Herrick, S. F.
762,585.—HARVESTER—F. S. Holley, Stockton, Cal.
762,588.—STOVE—S. W. Jackson, Selma, Cal.
762,416.—SEPARATOR—R. W. Jessup, S. F.
762 637.—ANIMAL EXTERMINATOR—J. O. Johnson, Visalia, Cal.
762,728.—FOUNTAIN PEN—J. W. Langdon, Walla Walla, Wash.
762,729.—DOOR OPENER—T. E. Lee, Chulavista, Cal.
762,425.—ELECTRICAL BATTERY—J. R. Lord, S. F.
762,546.—REFERENCE DEVICE—A. H. Merrill, Florence, Cal.
762,835.—GATE OPENER—H. C. Morgan, Eugene, Or.
762,595.—SASH LOCK—J. H. Moskow, S. F.
762,435.—UNDERREAMER—O'Donnell & Willard, Los Angeles, Cal.
762,553.—CALIPERS—P. S. Palmer, Spokane, Wash.
762,862—FIRE ARMS—R. M. G. Phillips, Los Angeles, Cal.
762,556.—WRENCH—C. U. Reams, Suisun, Cal.
762,660.—OIL BURNER—L. A. Schulze, S. F.
762,490.—PILE—E. A. Smith, Colby, Wash.
762,601.—STORING OIL—A. J. Smithson, Portland, Or.
762,499.—VACUUM LIFTER—J. H. Sprague, Seattle, Wash.
762,447.—EXPLOSIVE—E. Steele, Mill Valley, Cal.
762,448.—ROTARY ENGINE—A. T. Stimson, Eureka, Cal.
762,772.—COAT—F. Terramorse, S. F.
762,506.—AXLE NUT—A. Uren, Seattle, Wash.
762,774.—CONCENTRATOR—Van Meter & Boss, S. F.
762,781.—VEHICLE—J. S. Walker, Anderson, Cal.
768,448.—UNDERREAMER—A. Willard, Los Angeles, Cal.
762,790.—WORKING SHIPS—W. Williams, Oakland, Cal.
762,793.—BOTTLE—C. M. Young, S. F.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

SKIRT AND WAIST HOLDER.—No. 762,378. June 14, 1904. F. S. Boedefeld, San Francisco, Cal. This invention relates to improvements in means for holding the skirt and waist or bodice portions of women's garments in position. Its object is to provide a simple device which may be quickly secured to or removed from the garments, which will be adjustable to the movements of the wearer, and which will not strain nor tear the parts to be held together

SASH LOCK.—No. 762,595. June 14, 1904. J. H. Moskow, San Francisco, Cal. The object of this invention is to provide a cheap, simple, durable and attractive device which may be attached to either side of any sash to lock two sashes together and prevent their rattling, and which will permit the upper and lower sashes to be locked together, either when closed or when opened, and when so locked together in any desired open position the size of the opening cannot be enlarged by any one on the outside.

COATS.—No. 762,772. June 14, 1904. F. Terramorse, San Francisco, Cal. This invention consists in such a combination and arrangement of the coat with foldable flaps that when used as a walking coat it will have the usual shape of such coat; but when the wearer desires to ride horseback, and it is necessary that the lower part of the coat be extended to accommodate itself to the changed position of the wearer, flaps are so attached that they may be extended and arranged for that purpose.

WRENCH.—No. 762,556. June 14, 1904. C. U. Reams, Suisun, Cal. The object of this invention is to provide a wrench of simple construction which may be easily and quickly engaged with a pipe or a nut which is readily adjustable to a variety of sizes of pipes or nuts which may be operated in a confined space and which may be successively actuated without being removed from pipe or nut.

COMBINATION DIVIDER AND CALIPER.—No. 762,553. June 14, 1904. P. S. Palmer, Spokane, Wash. This invention relates to an improved combination tool, and particularly to a combined adjustable divider and caliper with means for determining instantly the center of a circle or a point midway between the ends of the caliper or divider.

TRAVELING HARVESTER.—No. 762,585. June 14, 1904. F. S. Holley, Stockton, Cal. This machine is designed for cutting, threshing and cleaning grain, and said machine is mounted upon wheels and adapted to travel over the field in which the grain stands, being propelled either by animal or mechanical power. The invention consists in a means for changing the position of one bearing wheel relative to the other in such a manner that the threshing and cleaning mechanism of the apparatus may be maintained substantially level in a direction transverse to the line of travel and when the machine is traveling upon sidehills or inclined ground which would otherwise throw the said mechanism out of level.

Latest Market Reports.

SAN FRANCISCO, June 24, 1904.

METALS.

SILVER.—Per oz., Troy: London, 25⅜d (standard ounce, 925 fine); New York, bar silver, 55¾c, refined (1000 fine); San Francisco, 55¼c; Mexican dollars, 46½c San Francisco, 45½c New York.

COPPER.—New York: Standard, $12.75; Lake, 1 to 3 casks, $12.75; Electrolytic, 1 to 3 casks, $12.50; Casting, 1 to 3 casks, $12.25; San Francisco: $15.00. Mill copper plates, $17.00; bars, 18@24c. London: £56 7s 6d spot per ton.

There is no material change in copper prices from last week. The market remains quiet, and it seems difficult to predict the immediate future of the metal.

LEAD.—New York, $4.50; Salt Lake City, $3.50; St. Louis, $4.25 San Francisco, $4.50, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½, sheet 7, bar 5¼c; pig, $4.85. London: £11 10s ℔ long ton.

SPELTER.—New York, $4.87½; St. Louis, $5.00; London, £21 17s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb. lots, 7c.

In the Missouri-Kansas zinc field the shipments are said to have exceeded the output last week by 1000 tons, thus reducing the surplus. It is thought there will be no cut in prices by ore buyers. There is a demand for the high-grade ores—as high as $38.50 per ton being reported for 63% ore. The market price of the metal shows a slight advance.

TIN.—New York, pig, $25.50@25.75; San Francisco, ton lots, 28c; 500 lbs., 28½c; 200 lbs., 29c; less, 29½c; bar tin, ℔ lb., 30@32½c. London, £116 17s 6d spot.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.00 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $44.50@45.50, large lots; London, £8 San Francisco, local, $43@43.50 ℔ flask of 75 lbs.; Denver, $46.00. Export, $43.00@43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 17.75c; San Francisco, Plumbers', 100-lb. lots, 15.25c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 40@47c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30@34c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $13.10@13.35; gray forge, $12.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@23.00; open hearth billets, $23.00@23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case, ½c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1 and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4 and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LIME.—Santa Cruz, $1.25 country, $1.25 city. ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California carload lots, $2.10 f. o. b. at works; small lots, $2.45 ℔ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7¾c; Hallett's, 6¾c; San Francisco, 1000-lb. lots, 8c; 300@500-lbs., 8¼c; 100-lb. lots, 10½c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50 per 1000; 4x, $6.50; 5x, $8; Lion, $9, in lots not less than 1000.

FUSE.—Triple tape, $3.60 per 1000 feet; double tape, $3.00; single tape, $2.65; Hemp, $2.10; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11½c ℔ set; 14 oz., 40s., 10c.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3¼c ℔ lb.; Cal. s. soda, bbls., $1.20@1.40 ℔ 100 lbs.; sks., $1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2@3c; flour sulphur, French, 3½@3¾c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.00; Southfield, $8.00. Cargo lots, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $11.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $11.50, long ton.

BONE ASH.—Extra No. 1, 5@6c ℔ lb. No. 1, 4@5c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb., 7c; less than 500 lbs., 7¼c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ℔ lb., 60c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

ALUMINUM.—No. 1., 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs, 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ℔ lb., $3.50.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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A COMPETENT ASSAYER AND MILL MAN, School of Mines graduate, with over five years' practical experience, knowledge of Spanish, desires any position leading to advancement. Address "Experience," care of this office.

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ASSAYER, WITH KNOWLEDGE OF BOOKkeeping, wants position with mine or mill. Address J. L., this office.

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WANTED—POSITION AS MANAGER OR Superintendent of mining property. Gold and silver with concentration, or free milling, preferred. Have been a large operator for twenty years, having mined, milled or handled $13,000,000 of ore. Have experienced captains and mill men at immediate command. References and unquestioned standing. Address G, Box 1338, Denver, Colo.

YOUNG MAN EXPERIENCED IN MINE BOOKkeeping, time-keeping, shorthand and typewriting, desires work. Knowledge of Spanish. References. Address C. A. J., 320 Haight St., San Francisco, Cal.

WANTED.

PARTNER WITH SOME MINING KNOWLedge and $2000 working capital wanted in ore shipping and brokerage business. Highest references given. Address M. M., care of Mining and Scientific Press.

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DEPARTMENT OF THE INTERIOR, U. S. Geological Survey, Washington, D. C., May 26, 1904. Sealed proposals, in duplicate, will be received at the office of the United States Reclamation Service, at Reno, Nevada, until 2 o'clock P. M., July 15, 1904, for the construction of about 37 miles of main distributing canals, involving about 1,500,000 cubic yards of earthwork, with diverting dam, regulating gates, spillways, falls, weirs, and bridges, for the diversion and conveyance of about 1,800 cubic feet of water per second from Carson River at a point about 4 miles west of Leetville, Nevada, to irrigable lands in Carson Sink Valley. Bids will be received on (A) Excavation and embankment for one or more divisions or all the work. (B) Headworks. (C) Falls, spillways, weirs, lateral headgates, and pipe drains. (D) Highway bridges. Specifications, form of proposal and particulars may be obtained after May 26, 1904, by application to L. H. Taylor, Reno, Nevada, and to the Chief Engineer of the Reclamation Service, Washington, D. C., at whose offices the plans may be inspected. Each bid must be accompanied by a certified check of $1,000, payable to the Secretary of the Interior, as a guaranty that the bidders will, if successful, promptly execute a satisfactory contract and furnish bond in the sum of 20 per cent for the faithful performance of the work. The right is reserved to reject any or all bids, to waive technical defects, or to accept one part of a bid and reject the other, as the interest of the service may require. Proposals must be marked, "Proposals for Distributing Canals, Truckee-Carson Project, Nevada." Bidders are invited to be present. THOS. RYAN, Acting Secretary.

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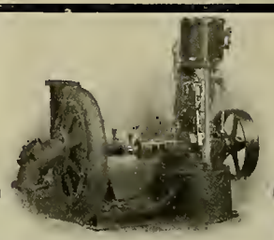

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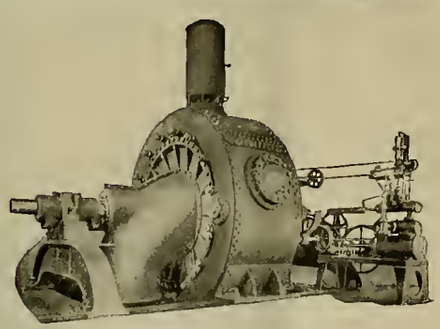

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